PROCEEDINGS

UNIVERSITAS MUHAMAMDIYAH YOGYAKARTA UNDERGRADUATE CONFERENCE "The Fourth UMYGrace"

"Crafting Innovation for Global Benefit"

Universitas Muhammadiyah Yogyakarta (Indonesia)

August 24th 2023 | Hybrid Conference

https://grace.umy.ac.id/2023

TRACK CONFERENCE

- **(HN)** Health & Nursing
- **(AET)** Agriculture, Engineering & Technology
- **(HESS)** Humanities, Education, Law, and Social Sciences
- **(BMF)** Business Management & Finance

ISSN 2961-7758

UMY UNIVERSITAS MUHAMMADIYAH YOGYAKARTA

LEMBAGA RISET DAN INOVASI
RESEARCH & INNOVATION INSTITUTE

UMGRACE
Universitas Muhammadiyah Yogyakarta
Undergraduate Conference

AKREDITASI UNGGUL BAN-PT 2021

PROGRAMME BOOK

UNIVERSITAS MUHAMAMDIYAH YOGYAKARTA UNDERGRADUATE CONFERENCE

"The Fourth UMYGrace"

"Crafting Innovation for Global Benefit"

Universitas Muhammadiyah Yogyakarta (Indonesia)

August 24th 2023 | Hybrid Conference

https://grace.umy.ac.id/2023

TRACK CONFERENCE

- **(HN)** Health & Nursing
- **(AET)** Agriculture, Engineering & Technology
- **(HESS)** Humanities, Education, Law, and Social Sciences
- **(BMF)** Business Management & Finance

Universitas Muhammadiyah Yogyakarta
+62 822 3344 2042
grace.umy.ac.id

Universitas Muhammadiyah Yogyakarta
Undergraduate Conference

Theme: "Crafting Innovation for Global Benefit"

Universitas Muhammadiyah Yogyakarta
2023

Welcome Remark
Preface by the Chairman of the 4th UMYGrace 2023

Muhammad Adam

Assalamualaikum Wr.Wb.

All Praises be to Allah SWT, due to which, on this happy occasion, health and time are given to us to attend this extraordinary event. Salawat and Salam are praised as well to the Prophet Muhammad SAW, who brought us from the era of ignorance to an era filled with Islamic light.

We are thrilled that we can organize UMY Grace again in this fourth year. We do hope that this event can run smoothly from the beginning to the end. As for your information, UMYGrace is designed for all fellow students. It is the first students-only international conference organized and participated in by university students worldwide.

This year UMYGrace has an extraordinary spirit as outlined in the theme **"Crafting Innovation for Global Benefit".** The theme invites the world's youth to become a continuously burning spark of enthusiasm with creative and innovative potential, which of course can be expressed in bright ideas in scientific writings that will later bring new ideas and innovations to Indonesia. In fact, the younger generation must be involved and play a real role in the progress of the Indonesian nation in the future. So there is a legacy of work that will become the history of civilization.

UMYGrace 2023 brings four tracks: Health and Nursing, Engineering and Technology, Humanities, Education, Law, and Social Sciences, and Business, Management, and Finance. This event once again invites friends to re-engage in this extraordinary event, with a hope to make us participate in pouring fresh thoughts into an actual work and able to be realized in everyday life so that it can really be felt by the people of the nation and the state.

In closing, we hope that the presence of UMY Grace in this 4th year will provide positive things that benefit many people. We extend our deepest gratitude to our friends who have joined UMY Grace in the 4th year. May happiness and health always be with us all. Rising high, rooted deeply in hearts.

Billahifisabililhaq fastabiqul Khairat

Wassalamualaikum Warahmatullahi Wabarakatuh

Welcoming remark by the
Rector of Universitas Muhammadiyah Yogyakarta

Prof. Dr. Ir. Gunawan Budianto, M.P., IPM., ASEAN.Eng

Assalamu'alaikum wr wb

First and foremost, let us offer our gratitude to Allah SWT. There is no God but Him. Allah gives us guidance, mercy, and spirit to gather together in this event. Sholawat and salam are constantly being praised by Muhammad, the Messenger of Allah. The leader, the role model, and the best practice of humanity.

Universitas Muhammadiyah Yogyakarta Undergraduate Conference (UMYGrace) is designed to create an only-students conference, an international conference where only students' papers are presented, and students' ideas are floored, discussed, and concreted. This year, in the 4th year of its existence, UMYGrace keeps attracting brilliant young minds and prospective future leaders. So, I am thrilled that today as many as 338 participants join UMYGrace from Indonesia, Malaysia, Brunei, Zambia, Yemen, Pakistan, and Bangladesh, from on-site here at UMY and online from parts of the world.

UMYGrace is created as a forum where brilliant young minds meet in an academic setting. This event is very important to shape academic awareness and research mindset. All students participating here may mostly be those who excel in academics. Yet, these mindsets are obligatory attributes of all leaders. The mindset that every future leader should have. The mindset of problem-solving, careful methodology, and fruitful applicable solutions. The quality of not giving up for a new innovation.

The young generation must understand that research is a basic skill they need to have. I am really aware of the abundant opportunities of entrepreneurship for young generations. However, all these entrepreneurships must be equipped with a research-based planning, so that the goal, plans, and actions are the most effective and real ones. So, even if you are really into entrepreneurships, having academic/research minds is a must. Afterall, academics, entrepreneurs, and socio-government must synergize for the so-called triple helix of higher education. The ultimate goal is how research in university could be used for the benefit society; how entrepreneurs and industries can use universities as innovation production. Analyzing the needs and potential of future research-minded leaders, Universitas Muhammadiyah Yogyakarta has committed to organizing this international conference annually.

Wassalamu'alaikum wr wb.

Table of Contents

The 4th UMYGrace Committee

JABATAN	NAMA
Advisory Board	Prof. Dr. Ir. Gunawan Budianto, M.P. IPM., ASEAN.Eng
	Prof. Nano Prawoto, S.E., MSi
	Rudy Suryanto, M,Acc, Ak,CA,Ph.D
Member of Advisory Board	Faris Alfadhat, S.IP., MA., Ph.D
	Dr. Achmad Nurmandi, M.Sc.
	Ir. Nafi Ananda Utama, M.S.
Steering Committee	Prof. Dr. Ir. Sukamta, S.T., M.T., IPM
Member of Steering Committee	Prof. Dr. Dyah Mutiarin, S.IP., M.Si.
	Apt. Sabtanti Harimurti, M.Si., Ph.D
	Dr. drh. Tri Wulandari Kesetyaningsih, M.Kes.
	Ir. Agus Jamal, M.Eng.,IPM
Scientific Advisor	Ir. Aris Widyo Nugroho, S.T., M.T., Ph.D.
	Dr. dr. Hj. Sri Sundari, M.Kes.,
	Dr. Bambang Jatmiko, S.E., M.Si
	Ir. Indira Prabasari, M.P., Ph.d
	Dr. Takdir Ali Mukti, S.Sos., M. Si.
	Iwan Satriawan, S.H., M.C.L., Ph.D.
	Eko Purwanti, S.Pd., M.Hum., Ph.D.,
	Dr. dr. Hj. Sri Sundari, M.Kes.,
	Prof. Dr. Rizal Yaya, S.E., M.Sc., Ak.CA.
	Prof. Ir. Sri Atmaja Putra Jatining Nugraha Nasir Rosyidi, S.T., M.Sc.Eng., PG-Certf., Ph.D., P.Eng., IPM, IPU, ASEAN-Eng.
Organizing Committee	
Chairperson The 7th ICOSI 2023	Zuhud Rozaki, S.P., M.App.Sc, Ph.D
Chairperson the 4th UMYGrace 2023	Muhammad Adam
Co-Chair for Publication and Collaboration Affairs	Dr. Yessi Jusman, S.T.,M.Sc.
Operational Executive	
Secretariat & Registration	Nuraini Luthfi Istiqomah, S.Pd
	Abdul Rasyid Ghozali, M.Sc.
Design, Promotion	Nasikhun Imawan Amin, S.H
Treasury	Bunga Rizkia Nanda, S.IP
Event & Public Relations	Hijriyah Oktaviani, S.IP., M.M
	Aulia Nur Kasiwi, M.IP
	Titin Resiana, S.P.
Technical Management	
IT Support	Dr. Ir Wahyudi, S.T., M.T

About The 4th Universitas Muhammadiyah Yogyakarta Undergraduate Conference (UMYGrace) 2023

"Crafting Innovation for Global Benefit"

Universitas Muhammadiyah Yogyakarta Undergraduate Conference (UMYGRACE) is an activity held as a forum for the younger generation–especially those who are studying bachelor's degree to channel and develop their ideas in scientific forums. UMYGRACE carries the theme *"Crafting Innovation of Global Benefit"*, held in 4 Tracks namely Business Management and Finance; Health and Nursing; Social Humanities; Religious Studies and Law; and Engineering and Technology. This activity is designed so that the younger generation from all kinds of sciences can contribute to channelling their ideas for the benefit of the SDGs.

Innovation has been acknowledged for a long time as a vital engine of economic progress, but it can also promote social inclusion. Today, information and communication technology (ICT) advancements can contribute to inclusive growth in a variety of ways. Increased affordability and improved quality of goods and services results in welfare improvements. This also include goods and services in the health and education sectors, both of which are essential aspects of well-being. ICTs have also had fundamental effects on the economy, affecting not only major items but also the way in which markets function - potentially altering competition dynamics, labour supply requirements, and opportunities for individuals to generate value. Additional technology advancements, especially artificial intelligence and robots may yet amplify these shifts. All of these "digital innovations," which are defined as new goods and processes in and outside of IT industries that are based on or embodied in software code and data, are generating exceptional scale economies and network effects, which in turn enable winner-take-all market structures. Such concentrated markets are a source of innovation-based rents, which are subsequently transferred to shareholders, senior managers, and key employees, hence raising the income share of the highest income groups, to which these demographics typically belong.

The world's commitment for sustainable development in the next decade must be reinforced with the youth, who are going to fill the next-decade generation. Analysing the needs and potential of future research-minded leaders, Universitas Muhammadiyah Yogyakarta has committed to organizing this international conference annually. Universitas Muhammadiyah Yogyakarta established UMY-Grace just last year, with the purpose of creating an only-students conference, an international conference where only students paper is presented, students ideas are floored, discussed, and concreted. In the second year of its existence, UMYGrace keeps attracting brilliant young minds, prospective future leaders. This event is very important to shape academic awareness and research mindset. All students participating here may mostly be those who excel in academics. Yet, these mindsets are obligatory attributes of all leaders. The mindset that every future leader should have. The mindset of problem-solving, careful methodology, and fruitful applicable solution. The quality of not giving up for an innovation.

Keynote Speakers of the 4th UMYGrace 2023

Prof. Dr. Ir. Sukamta, M.T., IPM

Prof. Dr. Ir. Sukamta, M.T., IPM is a Professor in Mechanical Engineering at the Universitas Muhammadiyah Yogyakarta (UMY) and also serves as UMY Deputy Chancellor for Academic Affairs. Professor Dr. Ir. Sukamta, M.T., IPM is the First Professor in the Field of Mechanical Engineering at UMY. He will deliver the speech about how the youth generation will dealing with global benefit such as knowledge and technology sharing, which globalization increases the speed at which business information can spread around the globe. An initiative and a critical platform where young people can amplify their voices, contribute to policy discussions and make concrete recommendations at a global level.

Feye Lorraine P.Mina, B.Sc.,MPA.,MIP

Miss Faye is the Lecture and Faculty Research Specialist in Entrepreneurs at University of Visayas, Philippines. She is focusing on Support network for Indigenous Women & Women Colour at Outreach Specialist in Canada. Support Network for Indigenous Women & Women of Colour is a dynamic and passionate organization committed to empowering women and promoting gender equality. She is firmly believe that empowered women lead to stronger communities and a more inclusive society. As an Outreach Specialist, her mission is to establish and nurture meaningful connections with key stakeholders and fostering collaborations that amplify our impact.

Apt. Mala Himawan Primana, S. Farm

Apt. Mala Hikmawan Primana is an individual who has a background in pharmacy and serves as the Chief Executive Officer (CEO) of a company, organization, or healthcare-related business. This role combines the expertise and knowledge of pharmacy with leadership and management skills required to run a successful enterprise. As the CEO, his primary responsibility is to provide strategic direction and leadership to the company or organization. He set goals, develop long-term plans, and make critical decisions to ensure the success and growth of the business.

PROGRAM SCHEDULE

The 4th Universitas Muhammadiyah Yogyakarta Undergraduate Conference (UMYGrace)

Main Hall 5th floor AR Fachruddin B Building,
Universitas Muhammadiyah Yogyakarta (UMY)
Thursday, 24 August 2023

Time Western Indonesia Time / WIB (GMT +7)	Agenda	Person in Charge
07.30 – 07.50	Registration	All Committee
07.50 – 08.00	Wonderland Dance	Sekar Kinasih
08.00 – 08.05	Greetings	Master of Ceremony
08.05 – 08.10	Quran Recitation	**Muhammad Zainuddin Amri**
08.10 - 08.20	Indonesia Raya, Sang Surya, Mars UMY	Master of Ceremony
08.20 - 08.20	Welcoming Speech from Head of Commitee	Chairperson of 4th UMYGRACE 2023 **Muhammad Adam**
08.20 - 08.30	Welcoming Remarks and Conference from Rector	Rector of UMY **Prof. Dr. Ir. Gunawan Budiyanto, MP., IPM, ASEAN-Eng.**
08.30 - 08.40	Opening UMYGRACE	
08.40 - 09.00	**Keynote 1:** **Prof. Dr. Ir. Sukamta, S.T., M.T., IPM** vice rector of academic affairs in Universitas Muhammadiyah Yogyakarta	**Moderator:** **Cahyo Wisnu Rubiyanto, SP., MAppSc., PhD.**
09.00- 09.20	**Keynote 2:** **Apt. Mala Himawan Primana, S. Farm** - CEO: Apotek Hidayatul Akbar -Komisaris: PT. Maknun Multi Rezeki	
09.20 - 09.40	**Keynote 3:** **Feye Lorraine P.Mina, B.Sc.,MPA.,MIP** – Specialist Entrepreneur	
09.40 – 09.55	Q & A	Door prize
09.55 – 10.00	Announcement	Master of Ceremony
10.00 – 10.15	Entertainment; Performance; Reportase	Coffee Break Akustik

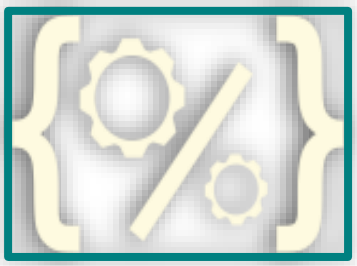
Time Western Indonesia Time / WIB (GMT +7)	Agenda	Person in Charge
10.15 – 12.30	Parallel Session & Reportase	All Committee
12.30- 13.45	Performance	Coffee Break Akustik
13.45 - 14.00	Greetings	Master of Ceremony
14.00 – 14.30	Winners Announcement	
	1. Best Paper (4)	Co-Chair of The 7th ICOSI 2023 **Dr. Yessi Jusman, S.T.,M.Sc.**
	2. Best Presentation (4)	Chairperson of 7th ICoSI 2023 **Zuhud Rozaki, S.P., M.App.Sc., Ph.D**
	3. Favorite Participant (4)	Head of Research and Innovation Center **Prof. Dyah Mutiarin, S.IP., M.Si**
	4. Outstanding Participant (1)	Vice Rector for Academic **Prof. Dr. Ir. Sukamta, S.T., M.T., IPM.**
14.30 – 14.40	**Closing Speech**	vice rector of Student and Alumni Affairs **Faris Al Fadhat, S.IP., M.A., Ph.D**
14.40 – 14.50	Closing	Master of Ceremony

Note in Bellow:

- Venue : Main Hall 5th floor AR Fachruddin B Building
- Dress Code : Alma mater Uniform
- Please Join on-site/Zoom Meet, 15 minutes before opening begin until end.

The 4th UMYGRACE TRACK

Covers almost all papers from medicine, pharmacy, environmental health, nursing, nutrition, public health, dental health, mental health, health engineering and technology. **(H&N)**



Covers disciplines of engineering including mechanical engineering, electrical engineering, civil engineering, industry engineering, robotics, artificial intelligence, big data, cloud computing, and other physics. In addition, papers from agriculture technology, land management, plantations research, chemical, and herb sciences is also covered in this theme**. (AET)**

Facilitates research from the fields of economics, business, management, finance, accounting. This also includes but not limited to sharia economics, economics policy, tax, corporations, and international business administration**. (BMF)**

Covers a wider range of social sciences including politics and government, education, literature, philosophy, communication, international relations, public administration, counseling. In addition, HESS also covers religious studies and law sciences, which include but not limited to comparative religion, preaching, theology, religion education, manuscript analysis, and law sciences. **(HESS)**

PARALLEL SESSION SCHEDULE

Universitas Muhammadiyah Yogyakarta Undergraduate Conderence (UMYGrace) 2023

Thursday, August 24th 2023

https://bit.ly/Sceduleumygarce4

Closing Remark by the

Vice Rector of Student and Alumni Univesitas Muhammadiyah Yogyakarta

Faris Al Fadhat, S.IP., M.A., Ph.D

Assalamualaikum Wr.Wb.

We claim UMYGrace as the first all-students organized international conference and research paper seminars. In fact, UMY-Grace is specialized to improve undergraduate students academic writing and to give them experience in as a presenter in an international conference. By the end of UMYGrace, as much as presentations have been delivered in the international conference. I indeed watched some of the presentations and I always enjoy them. Even though most presenters are students or fresh graduates, they have a quite established research framework, and more importantly resolving ideas for the current world circumstances. All research or presentations has always come up with recommendation, implications, and possible ideas for future research.

UMYGrace always invite inspiring young professional to speak, inspire, and educate UMYGrace main audiences: the students. Joining UMYGrace's seminars would definitely add new knowledge as all the papers presented have been selected and reviewed according to the current research urgency. In addition, students' presence here, and that the articles are going to published in a proceedings of International Standard Series Number (ISSN), would help students' respective higher education institutions. Thus, universities must be grateful that their students participate in this conference.

To the students, personally, this conference would sharpen their research and presentation skills. It is how ideas are scientifically constructed, challenged, discussed, and resolved. Furthermore, as we have told you earlier that all generations, especially the future leaders, must have research mind; a mind that always curious to innovate and carefully assess its application; a mind that never gives up on resolving challenges. Moreover, this conference would also benefit to all participating higher education institutions, through research collaborations, number of publications, and advancement of skilled human resources.

Wassalamualaikum Wr.Wb

PARALLEL SESSION

Business Management & Finance , Humanities, Education, Law, and Social Sciences,

Room : Room 1 (Offline)
Theme : Global Benefit
Time : 10.30- 12.05 WIB (GMT+7)
Moderator : Nudia
Operator : Bella Pardian Nur Allifiah

NO	No. ABS	Title	Full Name
1	ABS-10371	The Influence Of Accounting Information Systems Cash Flow Control In Hospital In The City Medan	**Alya Nur Afifah** Universitas 'Aisyiyah Yogyakarta
2	ABS-10640	Budaya Penggemar Di Twitter: Etnografi Virtual Pada Penggemar NCT Di Twitter	**Rizqi Aulia Sakina** Universitas Muhammadiyah Yogyakarta
3	ABS-10000	Local Community Involvement In Empowering Sustainable Development In Remu Selatan Village Sorong City Southwest Papua	**Halizah Ayswhara** Universutas Muhammadiyah Sorong
4	ABS-10014	Analysis Of Restriction Policy To Huawei By The United States During Donald Trump's Presidency	**Anja Yanuar Roissyam** Universitas Muhammadiyah Yogyakarta
5	ABS-10703	Tinjauan Hukum Islam Terhadap Batas Usia Minimal Perkawinan Menurut Undang-Undang Nomor 16 Tahun 2019 Tentang Perkawinan	**Izzafi Imellya Putri** Universitas Muhammadiyah Yogyakarta
6	ABS-10008	The Effectiveness Of Interpersonal Communication Of Faith-Based Organizational Media Team In Producing Dakwah Content	**SRI MAHARANI HRP** Universitas Muhammadiyah Yogyakarta
7	ABS-10076	Construction Of Company Self-Image Through Social Media Instagram In Semiotic Review	**Desi Eka Nuryanti** Universitas Muhammadiyah Yogyakarta
8	ABS-11518	The Influence Of Blackpink As A Brand Ambassador To The Purchase Intention At Shopee	**Engrasia Putri Johana** Universitas Muhammadiyah Yogyakarta
9	ABS-10018	The Effectiveness Of Interpersonal Communication In Establishing Religious Character In Faith-Based Orphanage Institution	**Dita Giani Jarkasih** Universitas Muhammadiyah Yogyakarta
10	ABS-10773	Early Middle Adolescents And Qur'an Memorizing : How Does The Social Penetration	**Fathiyya Khonsa Ariibah** Universitas Muhammadiyah Yogyakarta

Health & Nursing, Agriculture, Engineering & Technology

Room : Room 2 (Offline)
Theme : Crafting Innovation
Time : 10.30-12.05 WIB (GMT+7)
Moderator : Prabarini Dwi Pangestu
Operator : Tsabitah Qolbiyah Salimah

NO	No. ABS	Title	Full Name
1	ABS-10473	Sistem Klasifikasi Citra Usg Payudara Menggunakan Machine Learning Berdasarkan Fitur Texture Dan Zernike Moment Invariant	**Lady Olivia Evellyne** Universitas Muhammadiyah Yogyakarta
2	ABS-10663	Hubungan Menopause Dengan Medically Compromised Pada Pasien Rsgm Umy	**Bella Pardian** Universitas Muhammadiyah Yogyakarta
3	ABS-10871	The Impact Of Gross Domestic Product, Exchange Rates, And Acfta Implementation On Indonesia's Trade Intensity Index Period Of 2001-2021	**Adinda Salshabilla Zhauzha Huda** Universitas Muhammadiyah Yogyakarta
4	ABS-10232	Process Model Design Of Automatic Sorting Tool For Detecting Ripeness And Type Of Pineapple Fruit	**Krisna Adqilna Ahuljannata** Universitas Jenderal Achmad Yani Yogyakarta
5	ABS-9959	Implementation Of Behavior Change Techniques To Improve Self-Efficiency Of Neglected Children In (Satpel Psa) Bandung	**Septyan Berliana Sumaki** Politeknik Kesejahteraan Sosial Bandung
6	ABS-10205	Development Of Village Digitization Through The "Kaline X Mbangun Desa(In)" In Srihardono Village Bantul Yogyakarta	**Dendy Dio Damar** Universitas Muhammadiyah Yogyakarta
7	ABS-10074	Persepsi Aktivis Mahasiswa Terhadap Personal Branding Prabowo Subianto Sebagai Calon Presiden Republik Indonesia 2024	**Zulfa qurrota a'yun** Universitas Muhammadiyah Yogyakarta
8	ABS-10073	Strategi Komunikasi Pemasaran Event Organizer Pt. Mantiko Group Indonesia Dalam Mempertahankan Loyalitas Pelanggan Tahun 2022	**Ayuni Rahmadhania** Universitas Muhammadiyah Yogyakarta

Health & Nursing

Room : HN- ROOM 1
Track : Health and Nursing
Time : 10.30-12.15 WIB (GMT+7)
Moderator : Ba'diyatul Azmina
Operator : Dianing Aulia Puspitasari

No	NO. ABS	Title	Author
1	ABS-10022	Gambaran Tingkat Pengetahuan, Sikap, Dan Perilaku Mahasiswa Kedokteran Universitas Muhammadiyah Yogyakarta Terhadap Pencegahan Diabetes Melitus Tipe 2	**Seyka Lavefivusti Kesaputri** Universitas Muhammadiyah Yogyakarta
2	ABS-10063	The Number of Fibroblast in Post Dental Extraction After Application of Egg White Gel	**Mellati Dian Utami** Universitas Muhammadiyah Yogyakarta
3	ABS-10330	Screening The Activity of Epigallocatechin Gallate as A Colorectal Anticancer Agent: In Silico and Adme/Pharmacokinetic Studies	**Prismo Bagas Setiadi** Universitas Muhammadiyah Yogyakarta
4	ABS-10626	Identification Of Antipsychotic Side Effects Using the Naranjo Algorithm in Pku Muhammadiyah Gamping Hospital for April-July 2022 Period	**Odilia Danti Nugrahaningtyas** Universitas Muhammadiyah Yogyakarta
5	ABS-10629	Anti-Breast Cancer and Pharmacokinetic Prediction of Isorhamnetin, Glucocapparine Capparisine A And B From Capparis Spinosa	**Alfiah Amaliyah** Universitas Muhammadiyah Yogyakarta
6	ABS-10059	Prediction Of National Licensing Examination Using Preclinical Mcq, Osce, And Tutorial	**Edwin Hilmar Alghani** Universitas Muhammadiyah Yogyakarta
7	ABS-10260	Optimization Of Ph to Bacteriocin Production by Lactic Acid Bacteria Growol Isolate Against Salmonella Typhi	**Firda Rizka Afaroh** Universitas Muhammadiyah Yogyakarta
8	ABS- 0657	Reliability Test Of A Questionnaire To Investigate Behaviour Of Using Traditional Medicines Among Urban Students Of Elementary School	**Riska Cahyani** Universitas Muhammadiyah Yogyakarta

Agriculture, Engineering & Technology

Room : AET- ROOM 1
Track : Agriculture, Engineering and Technology
Time : 10.00-12.30 WIB (GMT+7)
Moderator : Alya Izzaty Bika
Operator : Zidna Nuur Aida W

No	NO. ABS	Title	Author
1	ABS-10352	Vegetablefruit Mobile Ui/Ux Design	**Orisa Deva Pradana** Universitas Muhammadiyah Magelang
2	ABS-10256	Ethnobotanical Studies in Ritual of Panjang Jimat Ceremony at Kasepuhan Palace Cirebon	**Muhammad Abdul Jabar** Universitas Negeri Semarang
3	ABS-10357	Implementasi Metode Design Thinking Pada Perancangan Iu/Ux Design Sistem Pelayanan Publik	**Ibal Afib Maulana** Universitas Muhammadiyah Magelang
4	ABS-10359	Rkm Planning and Management System in The Regional Government of Magelang City: Proposed Concept	**Alfira Nisa Fadhilah** Universitas Muhammadiyah Magelang
5	ABS-10648	Archiving Of Legal Affairs Administration Data in Setda Kota Magelang Based on Smart Tag: Proposed Concept	**Fatih Ali Safin** Universitas Muhammadiyah Magelang
6	ABS-10360	Rkm Monitoring and Evaluation System in The City of Magelang: Proposed Concept	**Ira Nuryani** Universitas Muhammadiyah Magelang
7	ABS-10358	Forecasting Optimization in Spare Part Inventory Applications on Xyz Outlet Ltd.	**Tulkhah Mubasyir Anwar** Universitas Muhammadiyah Magelang
8	ABS-10363	Transfer Learning Vgg16 for Image Classification of Tomato Leaf Disease	**Elsa Dwi Nur Iffaty** Universitas Muhammadiyah Magelang
9	ABS-10078	Waqual: Iot-Based Integrated Water Turbidity Detection and Monitoring System to Improve Water Quality in Semarang	**Galih Ridho Utomo** Universitas Negeri Semarang
10	ABS-10361	Agricultural Literacy: Perspective from Gen-Z (Case Study Students of Universitas Muhammadiyah Parepare)	**Jannatul Adnin** Universitas Muhammadiyah Parepare

Agriculture, Engineering & Technology

Room : AET- ROOM 2
Track : Agriculture, Engineering and Technology
Time : 10.00-12.20 WIB (GMT+7)
Moderator : Muhammad Dzulnafis Tanjung
Operator : Fitriani

No	NO. ABS	Title	Author
1	ABS-10354	Implementation Of Prototype Method on Online Fruit Store Service Application Using Flutter Framework	**Wahyu Aji Suryantoro** Universitas Muhammadiyah Magelang
2	ABS-10222	"Fruitmob" Website Design Distribution Optimization in Imported Fruit Supply Chain System	**Mrs. Fana Fitriah** Jenderal Achmad Yani Yogyakarta University
3	ABS-10402	Analysis Of K-Means Clustering Algorithm for Waste Distribution Areas in Magelang City	**Dimas Sandya Nugraha** Universitas Muhammadiyah Magelang
4	ABS-10401	Application Of Classification Techniques for Waste Volume Prediction Using Neural Network	**Teddy Rahardian** Universitas Muhammadiyah Magelang
5	ABS-12054	Prototype Innovation Of Online Tire Patching Application (Balban)As An Effort To Learn From Experience:Case Study Of Bantul Regency And Its Surroundings	**Riza Dian Ade Putra** Universitas Muhammadiyah Yogyakarta
6	ABS-10547	Interconnectedness Among Web Development Programming Language in Terms of Bruno Latour's Actor Network Theory	**Syahriza Indra Utomo** Universitas Gajah Mada
7	ABS-10232	Process Model Design of Automatic Sorting Tool for Detecting Ripeness and Type of Pineapple Fruit	**Krisna Adqilna Ahuljannata** Universitas Jenderal Achmad Yani Yogyakarta
8	ABS-12053	Use Of Call Balban Application in Assisting Motorcyclists	**Melda Nurfadilah** Universitas Muhammadiyah Yogyakarta
9	ABS-12055	Application Program for Helping Road Complaints in Yogyakarta (Aplanya)	**Jefry Alvin** Universitas Muhammadiyah Yogyakarta
10	ABS-12072	Covid-19 Impact on Food Security and Household Poverty of Gogo Red Rice Farmers in Semanu District Gunungkidul Regency	**Damas Ayu Larasati** Universitas Muhammadiyah Yogyakarta
11	ABS-10355	Implementasi Firebase Cloud Firestore Pada Aplikasi Toko Buah Online Menggunakan Framework Flutter	**Ali Affandi Yahya** Universitas Muhammadiyah Magelang

Business Management & Finance

Room : BMF-ROOM 1
Track : Business, Management and Finance
Time : 10.00-13.00 WIB (GMT+7)
Moderator : Alyaa Hasnida Rizqi Rahmadhani
Operator : Sevita Azzah Nabila

NO	NO. ABS	Title	Full Name
1	ABS-10372	The Influence Of Sharia Commercial Bank Financing On Profitability	**Shania Pasha Indrayanti** Universitas Muhammadiyah Magelang
2	ABS-11020	Influence Of Vaccine Drive Thru Service Quality On Perceived Value And Customer Satisfaction	**Nandhita Evieta Berliana** Universitas Muhammadiyah Yoyakarta
3	ABS-11517	Analysis Of Financial Literacy: Case Study On Vulnerable Youth In Yogyakarta	**Elvina Nabillah Abbas** Universitas Muhammadiyah Yoyakarta
4	ABS-12037	MSME Digitalization: Capacity Building Of MSME Actors With Digital Literacy Program	**Lenny Indah Nidyawati** Universitas Sebelas Maret
5	ABS-10092	Leaving Informal Jobs Behind: Time For Indonesia's Massive Industrialization In Manufacturing Industry	**Muhammad Faiz Krisnadi** Universitas Muhammadiyah Yoyakarta
6	ABS-10873	Tax Digitalization, Tax Incentives And Smes Taxpayer Compliance: The Moderating Role Of Public Trust	**Febby Perlica Nur Alifvia** Universitas Muhammadiyah Yoyakarta
7	ABS-11519	The Importance And Challenges Of The Islamic Management In Organizational Practice	**Monica Kis Al Zahra** Universitas Muhammadiyah Yoyakarta
8	ABS-12046	Perancangan Aplikasi Mobile “Jogjava” Dengan Fitur Teknologi Augmented Reality Sebagai Media Pengalaman Berwisata Di Yogyakarta	**Alifa Nur Saffana** Universitas Muhammadiyah Yoyakarta
9	ABS-11516	Determinants Factor Of The Use Of E-Wallets For Students And According To The Islamic Perspective	**Deby Alicia Zurly** Universitas Muhammadiyah Yoyakarta
10	ABS-11520	The Effect Of The Covid-19 Pandemic On Msmes In Yogyakarta City	**Muhammad Adhisena** Universitas Muhammadiyah Yoyakarta
11	ABS-10127	The Comparison Of Financial Perfomance In The Sharia Banking Sector Listed On The Indonesian Stock Exchange And The Malaysian Stock Exchange For The 2019-2021 Period	**Nidia** Universitas 'Aisyiyah Yogyakarta
12	ABS-10286	The Effect of Transparency and Accountability of the Financial Statements of LAZISMU Yogyakarta City on Public Trust in Donations	Mun Farida Universitas 'Aisyiyah Yogyakarta

Business Management & Finance

Room : BMF-ROOM 2
Track : Business, Management and Finance
Time : 10.00-12.10 WIB (GMT+7)
Moderator : Reysa Anggreyani
Operator : Bella Kharisma

NO	No. ABS	Title	Full Name
1	ABS-10389	The Effect Of Firm Size, Leverage, Profitability And Sales Growth On Tax Avoidance	**Bramantya Ade Prasta** Universitas Muhammadiyah Magelang
2	ABS-10038	The Effect Of Financial Literacy And Financial Technology Payment On Financial Management Of Students Using Paylater	**Fitri Emiliyana** Universitas 'Aisyiyah Yogyakarta
3	ABS-10060	Analysis Of Financial Management And Use Of Village Funds In Bangunjiwo Village, Bantul District	**Sindi Sastia** Universitas 'Aisyiyah Yogyakarta
4	ABS-9941	Financial Distress Analysis With The Altman Z-Score Method In Food Franchising Company	**Afifah Putri Rasyidah** Universitas 'Aisyiyah Yogyakarta
5	ABS-10151	Analisis Akuntabilitas, Efektivitas, Dan Transparansi Laporan Keuangan Lazismu Depok Sleman Dalam Perspektif Psak 109	**Baiq Farida Maulina** Universitas 'Aisyiyah Yogyakarta
6	ABS-10058	The Influence Of Social Media Content And Word Of Mouth In The Decision Of Choose Places To Study Of 'Aisyiyah University Yogyakarta	**Erpiyanti** Universitas 'Aisyiyah Yogyakarta
7	ABS-12036	Determinants Of Qris Usage Among Micro & Small Enterprises In The "Entrance" City Of Ikn	**Margettyaningsih** Universitas Sebelas Maret
8	ABS-12047	Rancangan Aplikasi Catatan Keuangan Moneysv Untuk Mahasiswa Berbasis Mobile	**Anisah Nurdina Dwiwahyu** Universitas Muhammadiyah Yoyakarta
9	ABS-10529	The Effect Of Workload And Compensation On Employee Performance With Work Motivation As A Moderating Variable In The Scope Of The Health Department Of Magelang City During The Covid-19 Pandemic	**Helmy Febrian** Universitas Muhammadiyah Magelang
10	ABS-10852	Analisis Faktor-Faktor Yang Mempengaruhi Keberhasilan Usaha Mikro, Kecil, Dan Menengan (UMKM) Di Kabupaten Bantul	**Alfi Hikmah** Universitas Muhammadiyah Yoyakarta
11	ABS-10366	Comparative Analysis Of Determination Sharia Stock Price During Covid-19 In Mining Sector Companires On IDX	**Muhammad Abdur Rauf** Universitas Muhammadiyah Yoyakarta
12	ABS-0043	The Effect Of Investment Risk And Stock Liquidity On Stock Returns	**Teresia Apliana Rodho** Universitas 'Aisyiyah Yogyakarta

Business Management & Finance

Room : BMF-ROOM 3
Track : Business, Management and Finance
Time : 10.00-12.30 WIB (GMT+7)
Moderator : Takaful Pambudi Raharjo
Operator : Umi Umairah Suhardi

No	Track	Title	Author
1	ABS-10876	Mengapa Wisatawan Ingin Berkunjung Kembali Ke Destinasi Wisata? Studi Di Waduk Malahayu Kabupaten Brebes, Indonesia	**Dewi Casmita** Universitas Muhammadiyah Yogyakarta
2	ABS-10338	Cash Flow Ratio Analysis Before and After the Covid	**Karina Rachmawati Taruna** Universitas 'Aisyiyah Yogyakarta
3	ABS-10116	The Influence of Online Consumer Ratings and Reviews on Purchasing Decisions (Studi on Tiktok Shop Consumer)	**Dewi Puspita Sari** Universitas 'Aisyiyah Yogyakarta
4	ABS-10335	Analysis Of Early Warning System and Risk Based Capital Pt Asuransi Jiwa SINARMAS Msig Tbk.	**Resma Kurnia Turidho** Universitas Muhammadiyah Yogyakarta
5	ABS-12049	Utilizing Technology to Encourage Marketing of Msmes Based on Influencer Marketing Through the Innsight Platform	**Dwi Agustini** Universitas Muhammadiyah Yogyakarta
6	ABS-11385	The Impact of The Direct Cash Assistance Program for Fuel Subsidies (Blt Bbm) In 2022 On the Poverty Level and Well-Being of Poor Households in Yogyakarta City	**Rizki Saputra** Universitas Muhammadiyah Yogyakarta
7	ABS-12052	Use Of Mobile-Based Applications in The Services Public Transportation: Route Optimization and Provision of Efficient Services Through Applicationsjalankemana	**Khusnul Febryla Novia dan Andhiani Kurniawati** Universitas Muhammadiyah Yogyakarta
8	ABS-12048	Development Of Job Vacancy Information Services Through the Mobile Jobpoint Application	**Azzam Bilal Abdul Aziz** Universitas Muhammadiyah Yogyakarta
9	ABS-12050	Pemanfaatan Aplikasi Pinjam Dulu Dengan Basis Sesama Kontak (Studi Kasus: Mahasiswa Feb Universitas Muhammadiyah Yogyakarta)	**Eval Pajar dan Fathiya Zhahira Nida** Universitas Muhammadiyah Yogyakarta
10	ABS-12051	Creating A Healthy Lifestyle of Students Through the Use of The Seka Application (Health Campus) Study: Students of Muhammadiyah University Yogyakarta	**Enggar Wahyu Putri Aryani Dan Persistent Ramadhan** Universitas Muhammadiyah Yogyakarta
11	ABS-11522	Awareness And Perception of Muslim Community Towards Islamic Banking in Yogyakarta	**Annisa Rahmadania Agustin** Universitas Muhammadiyah Yogyakarta

Humanities, Education, Law, and Social Sciences

Room : HESS-ROOM 1
Track : Humanities, Education, Law, Social Sciences
Time : 10.00-12.45 WIB (GMT+7)
Moderator : Supriyani
Operator : Siti Maemun Khozdziyah Anriku

No	NO. ABS	Title	Author
1	ABS-10557	Strengthening Mental Health for Adolescents in Orphanages Through the Role of Self-Disclosure and Self-Compassion	**Akbar Nur Aziz** Universitas Muhammadiyah Yogyakarta
2	ABS-11884	Investigating The Issue of Teacher Competencies in Universitas Muhammadiyah Yogyakarta	**Ghoniiy Surya Azzahra** Universitas Muhammadiyah Yogyakarta
3	ABS-11676	The Challenges of Teacher Leadership in Indonesian Teacher	**Salsa Latifa Hafidh** Universitas Muhammadiyah Yogyakarta
4	ABS-11857	The Effectiveness of Teacher Induction to Invent Quality Teachers	**Andika Putra Giza** Universitas Muhammadiyah Yogyakarta
5	ABS-11881	The Importance of Teacher Competence in Integrating Technology in Learning	**Hanovera Apriliani** Universitas Muhammadiyah Yogyakarta
6	ABS-11877	The Indonesian Teacher Code Ethic in Teaching and Its Effectuate	**Kinanti Nuringtyas Laksono** Universitas Muhammadiyah Yogyakarta
7	ABS-11889	The Development of Teachers Professionalism and The Effect in Teaching	**Fathria Tiara Syakira** Universitas Muhammadiyah Yogyakarta
8	ABS-10062	The Sentiment Analysis of Government Service Innovation: Pandawa BPJS Health Service	**Lisa Sophia Yuliantini** Universitas Muhammadiyah Yogyakarta
9	ABS-11909	The Importance of a Lecturer's Code of Ethics on Student Learning Outcomes and Learning Environment	**Sofi Nadia** Universitas Muhammadiyah Yogyakarta
10	ABS-11888	Merdeka Curriculum in Indonesia	**Rolika Hasna Syifa Fadlilah** Universitas Muhammadiyah Yogyakarta
11	ABS-10636	Research Writing Skills of The Bachelor of Public Administration Students in Bukidnon State University: Developing Intervention	**Cristita Salamanca** Bukidnon State University
12	ABS-10641	Umayamnon Tribe's Awareness on The Right to Education: Basis for Intervention"	**Ken L. Comonong** Bukidnon State University

Humanities, Education, Law, and Social Sciences

Room : HESS-ROOM 2
Track : Humanities, Education, Law, Social Sciences
Time : 10.00-12.45 WIB (GMT+7)
Moderator : Satria Miftachudien
Operator : Akhdiva Elfi Istiqoh

No	NO. ABS	Title	Author
1	ABS-10393	Analysis Of Tourism Promotion and Service Strategies to Increase the Number of Visitors In The Wanurejo Tourism Village	**Anggita Cahya Rosdiana** Universitas Muhammadiyah Magelang
2	ABS-10391	Representation Of Juvenile Delinquency Factors in The Movie "Dua Garis Biru" (Charles Sanders Pierce Semiotics Analysis)	**Sekar Amalia Putri** Universitas Muhammadiyah Magelang
3	ABS-10374	Wacana Patriotik Shogun Dalam Dunia Samurai: Sebuah Analisis Wacana Kritis Pada Serial One Piece	**Arif Mei Reski** Universitas 'Aisyiyah Yogyakarta
4	ABS-10339	Pengaruh Komunikasi Kelompok Terhadap Gerakan Zero Waste Pada Masyarakat Piyungan Di Yogyakarta	**Fadhil Rizqullah** Universitas 'Aisyiyah Yogyakarta
5	ABS-10291	Peran Cornellia & Co Dalam Membangun Brand Positioning Klinik Lajolie Aesthetic	**Haryant Putra Rama Aditya** Universitas 'Aisyiyah Yogyakarta
6	ABS-10394	Citra Polisi Dalam Perbincangan Publik Virtual (Analisis Wacana Kritis Pemberitaan Sidang Ferdi Sambo Pada Akun Youtube Tvone)	**Feni Listiyani** Universitas Muhammadiyah Magelang
7	ABS-10305	Customer Relation Management Setara Media Kreasi Dalam Mencapai Brand Awareness	**Leora Salsabila Qatrunnada** Universitas 'Aisyiyah Yogyakarta
8	ABS-10300	Marketing Public Relations Acivites in Building Local Media Brand Positioning in The Renewable Media Era	**Dwi Cahyanti Indriastuti** Universitas 'Aisyiyah Yogyakarta
9	ABS-10275	Ekspresi Identitas Relasi Ayah Dan Anak Pada Film Gara-Gara Warisan	**Rizki Alfiansyah** Universitas 'Aisyiyah Yogyakarta
10	ABS-10070	Indonesia's Decision to Cancel the Procurement of Su-35 From Russia in 2019-2022	**Annisa Shadrina** Universitas Muhammadiyah Yogyakarta
11	ABS-10387	Factors Causing Fighting Behavior in Teenagers in Magelang	**Arizal Musaini** Universitas Muhammadiyah Magelang
12	ABS-10642	Performance Of the Barangay Police Security Officers: Developing Interventions	**Princess Raquiza T. Romero** Bukidnon State University

Humanities, Education, Law, and Social Sciences

Room : HESS-ROOM 3
Track : Humanities, Education, Law, Social Sciences
Time : 10.00-13.00 WIB (GMT+7)
Moderator : Misran
Operator : Rissa Latifa

No	NO. ABS	Title	Author
1	ABS-10261	Level Of Maturity Regional Innovation System as An Effort	**Bachtari Alam Hidayat** BAPPEDA Litbang Kota Palembang
2	ABS-10535	Validity And Reliability in Autonomy Needs Scale for Student	**Laili Qomariyah** Universitas Muhammadiyah Magelang
3	ABS-10259	Programs Of Local Government Sectoral to Improve the Welfare of Urban Communities	**Agus Faturohim** BAPPEDA Litbang Kota Palembang
4	ABS-10454	Hubungan Antara Religiusitas Dengan Kecemasan Akademik Pada Siswa Di Mbs Prambanan Yogyakarta	**Magfira Ramadani** Universitas Muhammadiyah Yogyakarta
5	ABS-11915	Strategy Coping Students in The Process of Memorizing the Qur'an at Ma Nuurul Waahid Purworejo	**Arina Dewi Cahyani** Universitas Muhammadiyah Yogyakarta
6	ABS-10257	Customer Relationship Management Gadjah Mada University Club Hotel in Building Customer Loyalty	**Moh. Fauzan** Universitas 'Aisyiyah Yogyakarta
7	ABS-10321	Customer Relations Management of Rumah Sehat Dan Apotek Ugm in Maintaining Customer Loyality	**Noviatun** Universitas 'Aisyiyah Yogyakarta
8	ABS-10388	The Impact of Domestic Violence on Family Harmony	**Agnes Vania Ardiyanti** Universitas Muhammadiyah Magelang
9	ABS-10532	Academic Stress Scale: Contruction and Psychometric Analysis	**Fajar Sodiq** Universitas Muhammadiyah Magelang
10	ABS-10308	Strategic Management of Rahma.Id in Improving Its Existence as An Online Media for Women and Islam	**Aisyi Ikrima Amanati** Universitas Muhammadiyah Yogyakarta
11	ABS-10307	Bingkai Pemberitaaan Media Online Kumparan+ Dan Kompas.Id Mengenai Kerusuhan Di Kanjuruhan Malang	**Aldi Aprilla Nur Rizqi** Universitas Muhammadiyah Yogyakarta
12	ABS-10041	Jawir Creative Communal Space Yogyakarta Food Court Promotion Strategy in Building Brand Awareness 2021 – 2022	**Muhammad Rais Padma Saputra** Universitas Muhammadiyah Yogyakarta
13	ABS-10635	Participation Of Youth in Development Programs, Projects, And Activites In Barangay Magsaysay, Malabay City: Developing Interventions	**Mirava Jane C. Emboy** Bukidnon State University

Humanities, Education, Law, and Social Sciences

Room : HESS-ROOM 4
Track : Humanities, Education, Law, Social Sciences
Time : 10.00-12.45 WIB (GMT+7)
Moderator : Stephanie Devty Sekar Anggitya Wardhani
Operator : Ihdiana

No	NO. ABS	Title	Author
1	ABS-10530	Utilisation Of social media Instagram as A Promotional Media of Total Music Band	**Rizky Permadi** Universitas Muhammadiyah Yogyakarta
2	ABS-10774	Construction Of Jogjakarta 90's Classic Car Fans Identity in The Perspective of Symbolic Convergence Theory	**Zainul Aden** Universitas Muhammadiyah Yogyakarta
3	ABS-11926	Pengaruh Labelisasi Halal Dan Kualitas Produk Terhadap Keputusan Pembelian Konsumen Muslim Pada Produk Kosmetik Safi Dengan Brand Image Sebagai Variabel Mediasi	**Asanti Arum Rahmawati** Universitas Muhammadiyah Yogyakarta
4	ABS-10549	Communication Capitalism in Mainstream social media And Its Implications on Consumer Behavior	**Nana Novita Sari** Universitas Gadjah Mada
5	ABS-10021	Islam Or Nationalism: A Case Study of Normalization of Turkey - Israel Relations	**Indraningtyas** Universitas Muhammadiyah Yogyakarta
6	ABS-10010	Proses Komunikasi Empatik Antara Perawat Dengan Pasien Lansia di Panti Jompo Tresna Werdha, Kasihan, Bantul	**Devi Lianda Putri** Universitas Muhammadiyah Yogyakarta
7	ABS-10627	Human Development Index	**Sulistiani** Universitas Muhammadiyah Yogyakarta
8	ABS-11929	Pembentukan Perilaku Disiplin Melalui Mata Mata Pelajaran Aqidah Akhlak	**Farlina Rizqi Izzaty** Universitas Muhammadiyah Yogyakarta
9	ABS-10001	Routine Recitation Activities Can Improve People's Religious Behavior	**Safna Tiara Zahira** Universitas Muhammadiyah Yogyakarta
10	ABS-10029	Dampak Penerapan Fair Trade the Body Shop Melalui Pemberdayaan Petani Shea di Ghana	**Nabilla Chaerunnisa Kuswaya** Universitas Muhammadiyah Yogyakarta
11	ABS-10017	Japan-Indonesia Cooperation in Dealing with The Labor Crisis in Japan	**Annisa Desyana** Universitas Muhammadiyah Yogyakarta
12	ABS-11467	Scientometric Analysis of Government Support for Cloud Computing Of E-Government 2012-2022	**Adnan Azhar Arifin** Universitas Muhammadiyah Yogyakarta

Humanities, Education, Law, and Social Sciences

Room : HESS-ROOM 5
Track : Humanities, Education, Law, Social Sciences
Time : 10.00-12.45 WIB (GMT+7)
Moderator : Drupadi Proboningsih
Operator : Alya Maharani

No	NO. ABS	Title	Author
1	ABS-10011	Perlindungan Hukum Bagi Kreditur Dalam Financial Technology Berbasis Peer to Peer Lending di Indonesia	**Alicia Radefi** Universitas Muhammadiyah Yogyakarta
2	ABS-10652	Implementasi Restorative Justice Dalam Penyelesaian Perkara Tindak Pidana Pencurian Di Tingkat Kejaksaan	**Dewanata Satya Prakarsa** Universitas Muhammadiyah Yogyakarta
3	ABS-11979	Legal Position And Application Of Electronic Evidence In Civil Case Objects In District Courts (Case Study Of Decision No.608/Pdt.G/Pn.Jkt.Pst)	**Putri Widiya Wahyuningsih** Universitas Muhammadiyah Yogyakarta
4	ABS-11976	Parate Law Of Execution in The Execution of Mortgage Guarantee Objects	**Adhila Anggraeni** Universitas Muhammadiyah Yogyakarta
5	ABS-11652	Implementation Of Credit Agreement Restructuring in The Time of The Covid-19 Pandemic (Case Study in Pt. Bank Rakyat Indonesia (Persero) Tbk. Branch Office Gombong)	**Rafid Adyatma** Universitas Muhammadiyah Yogyakarta
6	ABS-11878	Examining The Implementation of Teacher Ethical Codes in School	**Khusnatul Ismi Hani** Universitas Muhammadiyah Yogyakarta
7	ABS-10654	Awareness Of Market Vendors on Article 7 (Plastic and Polystyrene Regulation) Of City Ordinance No. 962 Malaybalay City: Basis for Intervention	**Ayra Nove A. Arimas** Bukidnon State University
8	ABS-10649	Compliance On the Solid Waste Management Policy: Developing Intervention	**Freddie Bañoc Petalio Jr.** Bukidnon State University
9	ABS-10036	The Strategic Planning of Cyber Public Relations at Faith-Based Organization	**Syafira Damayanti** Universitas Muhammadiyah Yogyakarta
10	ABS-10083	Cybersecurity: A Constructivism Analysis Towards the United States-China Cyberwar	**Jalaluddin Rizqi Mulia** Universitas Islam Indonesia, Yogyakarta
11	ABS-10097	Implementation Of the Asean Way in Resolving the Sipute Conflict Between Thailand-Cambodia In 2011	**Ananda Ramadhanti Utomo** Universitas Muhammadiyah Yogyakarta
12	ABS-10270	Representasi Perempuan Muslimah Di Kota Metropolitan Pada Konten Visual Instagram Dream.co.id	**Aulia Fathdila Ara** Universitas Muhammadiyah Yogyakarta

Humanities, Education, Law, and Social Sciences

Room : HESS-ROOM 6
Track : Humanities, Education, Law, Social Sciences
Time : 10.00-12.45 WIB (GMT+7)
Moderator : Naufal Ramadhan
Operator : Nafrah Maudina

No	NO. ABS	Title	Author
1	ABS-10081	Digital-Based Public Service Innovation (Case Study: Yogyakarta City)	**Mohamad Sukarno** Universitas Muhammadiyah Yogyakarta
2	ABS-10323	Youtube Content Disruption Management Harian Jogja Post-Pandemic	**Anggie Putri Cahyani Pagualand** Universitas 'Aisyiyah Yogyakarta
3	ABS-10324	Communication Strategy External Relations Pt. Gama Multi Usaha Mandiri in Maintaining Company Image	**Febia Elsa Nurmala** Universitas 'Aisyiyah Yogyakarta
4	ABS-10316	Strategi Komunikasi Kpu Diy Dalam Meningkatkan Minat Partisipasi Pemilih Pemula Pada Pemilu 2024	**Nurul Indah Cahyani** Universitas 'Aisyiyah Yogyakarta
5	ABS-10312	Marketing Mix Strategy of Yogyakarta Lajolie Aesthetic Clinic in Improving Brand Awareness	**Ikmal Suyata** Universitas 'Aisyiyah Yogyakarta
6	ABS-10345	Nilai Parenting Pada Film Ngeri-Ngeri Sedap	**Muhammad Firdaus Abdullah** Universitas 'Aisyiyah Yogyakarta
7	ABS-10353	Indonesian Coffee Diplomacy in The Era of Joko Widodo's Government (2019-2021)	**Rafi Folanda Anggika Putra** Universitas Muhammadiyah Yogyakarta
8	ABS-10109	Correlation Analysis of Social Status on Conservation Awareness in Sekaran, Semarang City	**Fajar Wahyushi Fuedsi** Universitas Negeri Semarang
9	ABS-9997	Indonesia-Iom (International Organization for Migration) Cooperation in Handling Human Trafficking and Illegal Labor Migration	**Devara Izzatun Aqnisyah** Universitas Muhammadiyah Yogyakarta
10	ABS-10265	Analisis Resepsi Pemain Tentang Penggambaran Hero Angela Dalam Game Mobile Legends Bang Bang	**Kartika Pitriani** Universitas 'Aisyiyah Yogyakarta
11	ABS-10634	Lived Experiences of The Out-Of-School Youth on Livelihood Programs: Basis for Developing Interventions	**Niceza Kiscel Ablen** Bukidnon State University
12	ABS-10089	Strengthening Social Protection Network in Indonesia: Towards Just and Inclusive Welfare State System	**Muhammad Faiz Krisnadi** Universitas Muhammadiyah Yogyakarta

FURTHER INFORMATION

Website : https://grace.umy.ac.id/2023/
Instagram : @grace_umy
Email : grace@umy.ac.id
Phone : +62 822-3344-2042

ROOM PLAN

PLANERY AND PARALLEL

MAP for Offline Participant

- **Planery Session: Main Hall 5th Floor, AR. Fachruddin B Building, UMY**
- **Parallel Session: ROOM Class 4th Floor, AR. Fachruddin B Building, UMY**

Location: https://maps.app.goo.gl/Z2LcGkyaW4aJc3xT8

Online Participant:

zoom YouTube

Tourisms in Yogyakarta

Yogyakarta Sultan Palace is a palace complex located in the heart of Yogyakarta City. It is the official seat of the reigning Sultan of Yogyakarta and his family. It also serves as a center of Javanese culture, and contains a museum displaying artefacts of princely provenance. It is guarded by the Yogyakarta Kraton Guards (Indonesian: *Prajurit Keraton Ngayogyakarta Hadiningrat*).

Taman Sari Water Castle is the site of a former royal garden of the Sultanate of Yogyakarta. It is located about 2 km south within the grounds of the Kraton, Yogyakarta. Built in the mid-18th century, the Taman Sari had multiple functions, such as a resting area, a workshop, a meditation area, a defense area, and a hiding place. Taman Sari consisted of four distinct areas: a large artificial lake with islands and pavilions located in the west, a bathing complex in the centre, a complex of pavilions and pools in the south, and a smaller lake in the east. Today only the central bathing complex is well preserved, while the other areas have been largely occupied by the *Kampung Taman* settlement. Since 1995, the Yogyakarta Palace Complex including Taman Sari has been listed as a tentative World Heritage Site.

Jalan Malioboro is a major shopping street in Yogyakarta. It lies north-south axis in the line between Yogyakarta Kraton and Mount Merapi. This is in itself is significant to many of the local population, the north–south orientation between the palace and the volcano being of importance. The street is the centre of Yogyakarta's largest tourist district surrounded with many hotels, restaurants, and shops nearby. Sidewalks on both sides of the street are crowded with small stalls selling a variety of goods. In the evening, several open-air street side restaurants, called *lesehan*, operate along the street. This is the street of the artists. Street musicians, painters, and other artists exhibit their creations on this road.

Merapi Volcano is an active stratovolcano located on the border between Central Java and Yogyakarta Province. It is the most active volcano in Indonesia and has erupted regularly since 1548. It is located approximately 28 kilometres (17 mi) north of Yogyakarta City which has a population of 2.4 million, and thousands of people live on the flanks of the volcano, with villages as high as 1,700 metres (5,600 ft) above sea level.

Taman Pintar is a tourism object for kids and a place for expression, appreciation, creation in a pleasant situation. It is situated on the center of Yogyakarta City. Bringing its motto educate and pleasant, the place that was firstly built in 2004 wants to increase the intention of kids and the young generation in science through imaginations, trials, and games in order to

improve the human resources. Taman Pintar also concerns in implement one of Ki Hajar Dewantara's lessons *Niteni*: to understand, *Niroake*: to follow, and *Nambahi*: to improve.

Museum Benteng Vredeburg was a former colonial fortress located in Yogyakarta City. The military complex has been converted into an Independence Struggle Museum which was opened in 1992. It is located in front of Gedung Agung and Kraton Yogyakarta (Sultan's Palace).

Beringharjo Traditional Market has been functioning as a trading place since 1758. Now, it offers more merchandise, ranging from batik, traditional snacks, Javanese herbs, to Buddha effigy costing hundreds thousands. Beringharjo market becomes part of Malioboro that is worth visiting. This market has been center of economy activity since years ago and its existence has philosophical meaning. The market that had been renovated several times symbolizes stages of human life that is busily engaged in its economy fulfillment. Furthermore, Beringharjo is also one of the 'four in one' poles (consisting of South Square, Sultan Palace, North Square, and Beringharjo market) symbolizing economy functions.

Prambanan Temple is a 9th-century Hindu temple compound in Special Region of Yogyakarta, dedicated to the Trimūrti, the expression of God as the Creator (Brahma), the Preserver (Vishnu) and the Transformer (Shiva). The temple compound is located approximately 17 kilometres (11 mi) northeast of Yogyakarta City on the boundary between Central Java and Yogyakarta Province. The temple compound, a UNESCO World Heritage Site, is the largest Hindu temple site in Indonesia, and one of the biggest in Southeast Asia. It is characterized by its tall and pointed architecture, typical of Hindu architecture, and by the towering 47-metre-high (154 ft) central building inside a large complex of individual temples. Prambanan attracts many visitors from around the world.

Borobudur Temple is a 9th-century Mahayana Buddhist temple in Magelang Regency, not far from the town of Muntilan, Central Java. It is the world's largest Buddhist temple. The temple consists of nine stacked platforms, six square and three circular, topped by a central dome. It is decorated with 2,672 relief panels and 504 Buddha statues. The central dome is surrounded by 72 Buddha statues, each seated inside a perforated stupa. Built in the 9th century during the reign of the Sailendra Dynasty, the temple design follows Javanese Buddhist architecture, which blends the Indonesian indigenous cult of ancestor worship and the Buddhist concept of attaining Nirvana.

Imogiri Pine Forest is one of the most popular tourist destinations in Yogyakarta. It is located in the southern part of Yogyakarta, precisely in Imogiri. It offers exotic beauty of hundreds of towering pine tree. This forest will become famous reddish brown color of the soil, the air is fresh, cool wind, and the sun peeking in between tree clawing the sky. Renowned for its romantic scenery, the forest became one spot of interest as a place to take pictures. Many photographers, both amateur and professional, to make this place as a destination for the photoshoot. Users of social media were competing to come to this place to take pictures and upload to their account.

Gembira Loka Zoo is a zoological garden located at the Eastern of Yogyakarta City. It was opened in 1956 and comprising a botanical garden, orchid nursery, artificial lake, children's park, numerous bridges across the Gajahwong River, and a collection of approximately 470 animals, most notable of which are its Komodo dragons, orang-utans, gibbons, and a hippopotamus. The park is 54 acres in size.

Tugu Jogja becomes the landmark that is closely linked to Yogyakarta. There is a tradition to hug and kiss this monument after finishing the study in a university. It is the most popular landmark of Yogyakarta. This monument is located right in the center of the crossroad between the Mangkubumi, Soedirman, A.M. Sangaji and Diponegoro roads. The *Tugu Jogja* that is almost 3 centuries old has a very deep meaning and it keeps some history records of Yogyakarta. It was built around one year after the construction of Yogyakarta Kingdom. At the early time of its construction, it clearly described the philosophy of the unity of God's creatures that means the spirit of togetherness of lay people and authorities to fight colonials.

Masjid Gedhe Kauman is a Great Mosque of the Yogyakarta Sultanate in Java. It is located to the west of the North *Alun-alun* (public square) of Yogyakarta Kraton. It was established in the Kauman, an Islamic quarter near the Kraton whose establishment is strongly related with the establishment of Yogyakarta in 1756 and the arrival of foreign Muslim leaders. Kauman Great Mosque was established by Hamengkubuwono I together with Kyai Faqih Ibrahim Diponingrat (the first headman of the Kraton) and Kyai Wiryokusumo as the architect. It was built on May 29, 1773 or 6 Rabi'ul Akhir 1187 in Islamic Calendar.

Source: Cited from various references.

ISSN 2961-7758

Anti-Breast Cancer and Pharmacokinetic Prediction of Isorhamnetin, Glucocapparine Capparisine A And B From *Capparis Spinosa*

Alfiah Amaliyah[1], Mohammed A.H.M. Hasan[2]
[1] Department of Pharmacy, Faculty of Medical and Health Science, Muhammadiyah University of Yogyakarta, Bantul, Indonesia, 55183
[2] Department of Pharmacy, Faculty of Medical and Health Science, Taiz University, Taiz, Yemen
Email: alfiah.a.fkik19@mail.umy.ac.id[1]; mohammedabdulrhman2000@email.com[2]

ABSTRACT

The discovery of new natural anticancer agents is considered a remarkable solution to prevent drug resistance and metastasis in breast cancer patients. The *Capparis spinosa* plant is widely known for its antioxidant and other therapeutic effects. This study aims to evaluate anti-breast cancer activity targeting Akt1 and HIF1A proteins of several phytochemicals in *Capparis spinosa* through *in silico* methods and their pharmacokinetic prediction. This research is an *in-silico study* involving Bioinformatics (PASS Analysis with STITCH & STRING), Molecular Docking, and pkCSM Analysis. According to bioinformatics methods, AKT1 and HIF1A were obtained as potential protein targets. In molecular docking to AKT1 protein, the docking score obtained for Isorhamnetin, Glucocapparine, Capparisine A, Capparisine B, and Ipatasertib as control were -6.2 kcal/mol, -5.3 kcal/mol, -4.9 kcal/mol, -4.9 kcal/mol, and -6.2 kcal/mol respectively. Meanwhile, the docking score for HIF1A protein for Isorhamnetin, Glucocapparine, Capparisine A, Capparisine B, and 2-methoxy estradiol as control was -5.2 kcal/mol, -4.7 kcal/mol, -4.4 kcal/mol, -4.3 kcal/mol, and -4.7 kcal/mol. The scores for each compound were like the controls in both proteins, indicating that the analyzed phytochemicals of *Capparis spinosa* have potential anti-breast cancer properties. Pharmacokinetic prediction for absorption, distribution, metabolism, excretion, and toxicity (ADMET) is also provided to help further studies and development for the compounds as anticancer drugs. This study provided data from in silico methods regarding anti-breast cancer supported with pharmacokinetic activities for Isorhamnetin, Glucocapparine Capparisine A, and Capparisine B, which will be helpful as a reference for other advanced research in the future.

Keywords: *Breast Cancer, Capparis spinosa, Bioinformatics, Molecular Docking, pkCSM.*

INTRODUCTION

Breast cancer has a remarkable rank among the most widespread and deadly illnesses on a global scale. According to the World Health Organization, global statistics show that in 2020, breast cancer was diagnosed in approximately 2.3 million women, resulting in approximately 685000 deaths (Sung et al., 2021). Research has indicated that the spreading and proliferation of breast cancer cells at a secondary area in the body contribute significantly to the mortality rate, especially considering that 81% of breast cancers are invasive as it is suggested that death occurs from spreading the cancer cells to the other vital organs like liver, lung, and brain which will result in impairing their function (Department of Defence Breast Cancer Research Program, 2021; American Cancer Society, 2022). Furthermore, chemotherapy resistance results in the failure of anti-breast cancer chemotherapy, leading to a higher mortality rate. This condition is defined as the ability of cancer cells to avoid the effects of the chemotherapeutic agent, resulting in low efficacy of the drug to produce a helpful response in the treatment, which can arise due to factors that are related to the tumour or the host (Jia et al., 2019).

Metastasis is a joint event in malignant tumours usually associated with a bad prognosis and low survival rate. It can be defined as the process of spreading tumour cells from the primary site to the secondary site by invasion. Tumour metastasis consists of multi-steps including the development of rapidly proliferating clones of cancer cells that have the essential biological properties to complete the steps involved in the metastasis, tumour angiogenesis, and tumour cell loosening due to the inactivation of cell adhesion molecules (CAMs) such as epithelial-cadherin (E-cadherin) which will be attached to the extracellular Matrix (ECM) and interact with it to degrade the ECM resulted from overexpression of proteases and matrix-degrading enzymes such as Matrix metalloproteinases (MMPs) that will firstly degraded basement membrane of the tumour itself, then create a road for tumour cells through the interstitial matrix, and finally degrade the basement membrane of the vessel wall which results in cancer metastasis (Mohan, 2018).

A study has shown that Matrix metalloproteinases (MMPs), which are ECM-degradable enzymes, extend beyond cancer cells' development, invasion, and spread. Furthermore, the activation of various signalling pathways, such as phosphatidylinositol 3-kinase (PI3K)/Akt pathway, is closely associated with the expression of MMPs, which regulate it at the transcriptional level. The phosphatidylinositol 3-kinase (PI3K)/Akt pathway is involved in regulating multiple tumorigenic functions within breast cancer including regulating cell proliferation, survival, angiogenesis, metabolism, drug resistance, expansion, and metastasis (Marinescu et al., 2020; Janku et al., 2018).

ISSN 2961-7758

Hypoxia-inducible factor-1α (HIF-1α) is also expressed in breast cancer as a primary regulator for cancer cells to adapt to hypoxic condition and play critical roles in many significant molecular activities that are significant predictor of poor prognosis such as tumour invasion, metastasis, and resistance to therapeutic drugs (Luo et al., 2022; Peiro et al., 2019). Therefore, the properties of PI3K/Akt and HIF-1α pathways position them as an attractive candidate for cancer therapy. Also, targeting and inhibiting these pathways may be a promising strategy in cancer treatment, especially for cancer cells with a high propensity for metastasis and show resistance to conventional chemotherapy.

Research and development of novel anticancer agents from the herbal plant are considered potential solutions for those problems as the history of anticancer drug discovery is marked by natural products. In addition, a significant number of commonly used cancer-fighting drugs are derived from natural origin. According to scientific investigation, nearly 25% of all new anticancer drugs that gained approval from 1981 to 2019 originated from natural sources (Huang et al., 2021). Moreover, 80% of FDA-approved drugs utilized in cancer treatment are produced from natural sources and their derivatives (Yuan et al., 2023). In addition, utilizing plant-based raw materials containing appropriate bioactive compounds and administering them at appropriate doses has proven to be a more efficient and safer approach to treating various diseases (Hameed et al., 2021).

Capparis spinosa is a plant distributed worldwide and is known as a herbal drug with significant values, especially after many studies have shown that its active constituent is responsible for many biological activities. Previous studies investigated that *C. spinosa* plants have many active constituents from different chemical families, such as flavonoids, terpenoids, alkaloids, phenolic acids, flavonoids, coumarins, resins, glucosinolates, tannins, saponins, organic acids, and fatty acids. Due to this diversity in the active constituent, it is currently known to have many pharmacological activities, such as antioxidative activities, anticarcinogenic, Anti-inflammatory, Immunomodulatory activity, etc (Al-Azawi et al., 2018; Hameed et al., 2021),

This study aims to evaluate anti-breast cancer activity targeting Akt1 and HIF1A proteins of several phytochemicals in Capparis spinosa through in silico methods and their pharmacokinetic prediction.

LITERATURE REVIEW

Breast cancer is a heterogeneous disease in which cells in breast tissue are modified and undergo rapid uncontrolled division, as well as genetic and epigenetic alterations, resulting in the development of a lump or mass. Cancer chemotherapy resistance is a problem that threatens many cancer patients' lives, as the cancer cells will have the ability to evade the effects of chemotherapeutics resulting in low efficacy of the therapeutic agent to produce a useful response in the treatment resulting in treatment failure and indirect enhancing tumour progression. Scientists and researchers have started to look for new targets that can inhibit or affect cancer cells and limit their metastasis and progression.

Many studies show that the phosphatidylinositol 3-kinase (PI3K)/Akt pathway and the Hypoxia-inducible factor-1α (HIF-1α) are attractive targets in cancer therapy. The phosphatidylinositol 3-kinase (PI3K)/Akt pathway plays a significant role in cell development, proliferation, cellular metabolism, and survival (Martorana et al., 2021).

AKT, also called protein kinase B, is a critical effector of the phosphoinositide3-kinase (PI3K) intracellular pathway, which controls multiple vital cellular functions, including cell development, rapid reproduction, metabolism, and survival. In mammals, AKT exists in three forms, namely Akt1/protein kinase Bα (PKBα), Akt2/protein Kinase Bβ (PKBβ), and Akt3/protein kinase Bγ (PKBγ) which are encoded by separate genes with highly conserved cellular homologs and covered by protein structure. The three AKT proteins share a common structure feature, consisting of three functional domains: an N-terminal with pleckstrin homology (PH) domain, a large central kinase domain and a C-terminus regulatory domain (RD) (Fig. 1) (Coleman et al., 2021; Martonara et al., 2021). Among the three isoforms, Akt1 and Akt2 are widely and abundantly expressed isoforms and are present in various tissues. In comparison, Akt3 is commonly found in neuronal tissues (Hinz & Jücker, 2019). Increased activation of the three Akt types can be involved in the cancer environment and advancement, as exhibited in various types of cancers, including breast, pancreatic, ovarian, and prostate cancers, among others (Song et al., 2019). Akt1 is implicated in cell growth and proliferation in tumour cells, supports cancer initiation, inhibits apoptosis, and promotes cell survival. At the same time, Akt2 controls cytoskeleton dynamics, regulates metabolism, and facilitates cell metastasis and invasion. The involvement of Akt3 in tumours remains a topic of debate, as its exact role is not yet fully understood. However, a hypothesis suggests it may promote cell proliferation and participate in cell growth mechanisms, possibly in collaboration with Akt1 (Hinz & Jücker, 2019).

Fig 1. AKT structure

Signalling initiation in the PI3K/Akt pathway involves various mechanisms and predominantly originates from the cell membrane, beginning with the activation of tyrosine kinases receptor (TKR), G-protein coupled receptors and other receptors, either by direct or indirect interaction through phosphorylation of adaptor molecules. Activated PI3K results in an elevation in the amount of phosphatidylinositol trisphosphate (PIP3) through phosphorylates of a membrane phospholipid called

ISSN 2961-7758

phosphatidylinositol bisphosphate (PIP2) (Park and Ma, 2018). PIP3 binds to AKT at the PH domain, enabling phosphoinositide-dependent kinase-1 (PDK1) to direct AKT towards the cell membrane, where AKT is located. Upon reaching the cell membrane, double phosphorylation of AKT occurs. one by PDK1 which phosphorylates Akt at kinas domain at Threonin308 (T308) and another done by the mTOR complex 2 (mammalian target of rapamycin complex2 / mTORC2) which phosphorylate Akt on the regulatory domain at serine473 (S473), In addition to mTORC2 studies have found that various Kinases also can phosphorylate Akt at Ser4723 such as DNA-dependent protein kinase (DNA-PK) and integrin-linked kinase (ILK), resulting in its full activation. (Martorana et al., 2021; Nitulescu et al., 2018). Once activated, Akt breaks the PIP3 binding and participates in the phosphorylation of an enormous number (>100) of protein substrates located in the nucleus, cell membrane, mitochondria or cytosol that carry on the signal to elicit its effects (Hoxhaj & Manning, 2020).

Major effectors downstream of Akt include inhibition of AS160, a negative regulator of Glute-4 translocation, which moves to the plasma membrane after inhibition of AS160 and allows glucose to enter the cell and undergo glycolysis. Akt also suppresses tuberous sclerosis complex 1 and 2 (TSC1/2) formation and effectively prevents Rheb activation. Rheb acts as a protein activator of mTORC2, which subsequently, triggers S6kinase (S6k) phosphorylation, which activates ribosomal protein at S6 through phosphorylation which increases and promotes protein synthesis and cell proliferation. In addition, activating mTORC2 can reduce autophagy, a critical mechanism that moves the cells toward programmed cell death (Yu C et al., 2018). Also, Akt can control cell survival and proliferation through the inhibition of signals that promote cell death, such as those mediated by Forkhead box O (FOXO) transcription factors and Bad. The role of FOXO is to stimulate the duplication of specific genes, ultimately enhancing the termination of cell cycle, apoptosis, and cellular oxidative stress, ensuring metabolic stability.

Furthermore, when FOXO transcription becomes inactive, they are expelled from the nucleus to the cell cytoplasm, where they break down, ultimately supporting the survival of the cells. Also, inhibition of FOXO will result in cell cycle progression as inhibits the transcription cyclin-dependent kinase (CDK) inhibitors p27 and p21. It also blocks the external cell death pathway (Nitulescu et al., 2018). Glycogen synthase kinase 3 (GSK3), which is responsible for the phosphorylation of glycogen synthase (GS) to an inactive form, is seen that Akt could inhibit it and, thus, promote glycogen synthesis. Furthermore, multiple biochemical processes within the tumour are altered by the presence of GSK3. Studies have shown that GSK3 plays a role in tumour proliferation and actively contributes to metabolic processes in the tumour. It has been proposed that apoptosis is heightened, and the framework of membrane lipids undergo modification when GSK3 inhibitor IX are present (Acikgoz et al., 2019). In addition, Akt can activate ATP-citrate lyase, which is essential for fatty acid synthesis.

The entire pathway undergoes a negative regulation, facilitated by the activity of phosphatases, such as the phosphatase and tensin homolog (PTEN) that down-regulate PIP3 through a transformation of PIP3 to PIP2. PHLPP is another phosphatase that negatively regulates this pathway through the dephosphorylation of serene473. Furthermore, Protein phosphatase 2A (PP2A) is another negative regulator that dephosphorylation of Threonin308 (Lee et al., 2018) (Figure 2).

The importance of AKT includes its ability to regulate various essential cellular processes such as controlling cell size, enhancing the cellular division cycle, managing glucose metabolism levels, stabilizing genes, facilitating duplication activities and stimulating protein synthesis and lipid and glycogen production. Moreover, AKT contributes to new blood vessel formation processes and acts as a mediator for cellular growth factors to support cell survival while inhibiting regulated cell death (Nitulescu et al., 2018).

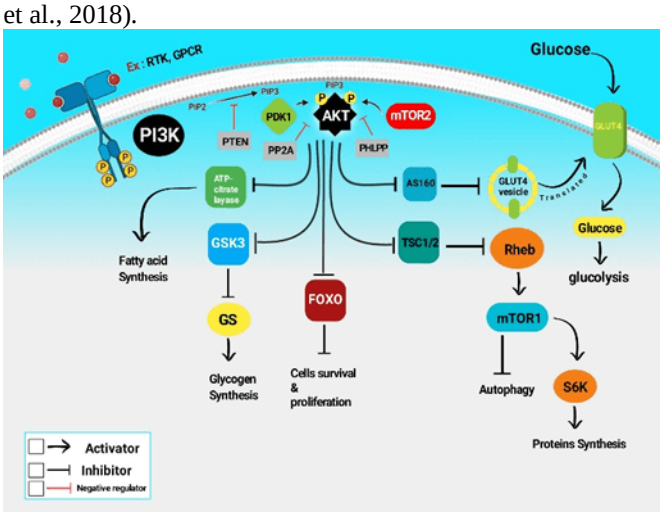


Fig 2. AKT signalling pathway

A study has shown that abnormalities that occur in Akt activation are highly oncogenic and can take place by several mechanisms and arise from various causes, such as mutation or expansion of AKT, through genomic modification at a different level in the pathway as researches indicated that in around 40% of cancer types, abnormalities in the PI3K/AKT pathway have been noted (Coleman et al., 2021). Other studies have shown that gene mutations and alterations in cell signalling pathways that occur in the PI3K/AKT pathway contribute to the onset and progression of breast cancer (Yuan et al., 2023). Mutations in the PI3K, explicitly focusing on the PI3K catalytic alpha subunit (PIK3CA), have been reported in breast cancer cases at a rate ranging from 9–45%. Mutation in PTEN occurs in approximately 13–35%, whereas AKT substitutions occur with lower frequency at 2-4%, and amplification is also less prevalent (5–10%) (Martorana et al., 2021). A study has estimated the frequency of PI3K/ Akt pathway activation and variation again by breast cancer subtypes, as HR+ breast cancer shows the highest value or rate in PI3K/AKT

ISSN 2961-7758

pathway hyperactivation (up to 50%); this activation is predominantly carried out by PIK3CA point mutations, where ER+ metastatic breast cancer show 5–10% hyperactivation mainly by somatic PTEN mutations, it also found that the occurrence of ER+ breast cancer due to mutations in AKT1 is estimated to be around 7%, in addition, in advanced triple-negative breast cancer (TNBC), there is a presence of activating mutations in both PIK3CA and AKT1, along with inactivating PTEN mutations occurring in rate of 25%–30%.

Furthermore, breast cancer may show deregulation in human epidermal growth factor receptor 2 (HER2), improving resistance toward antiHER2 agents. Due to the significant rate of Akt dysregulation, AKT inhibitors hold great promise as an interesting and effective category of anticancer drugs, particularly in targeting breast cancer (Coleman et al., 2021). On the other hand, studies indicate that the overactivation of the PI3K/AKT pathway can contribute to cancer formation, while suppression of the PI3K–AKT pathway may induce cell death. Yuan et al. (2023) report that several scientific investigations have demonstrated that various naturally occurring plant sources can suppress the growth of breast cancer cells through the modulation of the PI3K–AKT pathway in mice model studies. According to a different study, dysregulation of the PI3K-AKT pathway is a feature shared by triple-negative tumours, HER2-amplified illness, and hormone receptor-positive (HR+) disease types of breast cancer. For several breast cancer subtypes, especially those that resist traditional therapies, selective targeting of AKT thus presents an appealing therapeutic approach (Martorana et al., 2021).

The deregulation of the PI3K/Akt signalling pathway not only bestows carcinogenic properties but also assumes an essential role in conferring resistance to chemotherapeutic drugs. Multiple studies have demonstrated that IGF1R/p110β/AKT/mTOR signalling pathways contribute to developing resistance to BYL-719 in breast tumours with PIK3CA mutations. A recent study by He et al. (2021) has provided further evidence supporting the efficacy of targeting proteins within the PI3K/Akt signalling pathway to overcome medication resistance in cancer treatment.

Numerous studies have established a correlation between the upregulation of Akt in cancer cells and the emergence of resistance to radiation and chemotherapy drugs. Moreover, previous research has demonstrated that the upregulation of the PI3K/Akt signalling pathway triggers several pathways' activation in diverse breast cancer subtypes of several pathways in diverse breast cancer variants. These pathways, which subsequently result in the development of chemotherapy resistance, encompass Notch, WNT/β-catenin, mitogen-activated protein kinase (MAPK), and nuclear factor-κB. Research has shown that the PI3K/Akt signalling pathway is vital in giving cancer cells chemoresistance in the tumour microenvironment. Multiple mechanisms, including the activation of drug efflux pumps, including multidrug resistance (MDR) proteins like p-glycoprotein (P-gp) and breast cancer resistance protein (BCRP), are involved in mediating this resistance.

Additionally, this signalling pathway influences immune responses, activates antioxidant signalling, and inhibits programmed cell death by activating nuclear factor erythroid 2-related factor 2 (Nrf2), a cellular defence mechanism against chemotherapy. Moreover, it activates survival signalling pathways in various types of human breast cancer (Kaboli, 2021). The findings of these studies suggest that selectively targeting the different constituents of the PI3K/AKT pathway appears to be an appropriate strategy for addressing the therapy of diverse subtypes of breast cancer.

Cancer cells exhibit faster growth and metabolism rates. They appear with a distinct glycometabolic pathway, separating them from normal, healthy cells. Aerobic glycolysis can generate numerous metabolites concomitant with the rapid production of a substantial amount of adenosine triphosphate (ATP). According to Kobliakov (2019), the presence of certain metabolites and energy sources has the potential to accelerate cancer progression. The regulation of aerobic glycolysis in tumour cells is regulated by the transcription factor HIF-1a, which is amplified in response to hypoxic conditions. When the partial pressure of oxygen falls below 10 mm, it leads to the upregulation of HIF-1a, which could stimulate glycolysis (Yang et al., 2022).

Hyperdimer transcription factors, known as hypoxia-inducible factors (HIFs), are oxygen-dependent. This factor controls the reaction of molecules to insufficient levels of cellular oxygen. HIF comprises two subunits, one of which is an oxygen-sensitive and labile alpha subunit (HIF-1α, HIF2±, HIF3±). Additionally, there is a stable beta subunit (HIF-1β) that is unaffected by oxygen (Mendoza et al., 2023).

Under typical circumstances, the regulation of HIF1-α primarily occurs through post-translational changes, specifically governed by two proline residues. These proline residues are part of O2-dependent prolyl-4-hydroxylases (PHDs), ultimately resulting in the hydroxylation of HIF-1α. The E3 ubiquitin ligase complex known as von Hippel-Lindau (VHL) is responsible for recognizing the hydroxylation of HIF1. This recognition triggers the process of polyubiquitination, leading to the eventual destruction of HIF-1 by the proteasome (32, 34). nevertheless, in the absence of oxygen or other essential cofactors, the activity of the PHDs is inhibited, leading to the generation of HIF-1 inside the cellular environment (Jeknic et al., 2022).

During the hypoxia condition, the HIF-1α is stabilized, leading to a complex formation with the HIF-1β - subunit, which affects the transcription of genes that supported the cell adaptation to low oxygen condition. The two isoforms of the alpha subunit, HIF-1α and HIF2α, are the primary transcription regulator; meanwhile, the HIF-3α antagonized the other factors. This adaptation involved

ISSN 2961-7758

cellular responses such as angiogenesis, erythropoiesis, and energy metabolism (Mendoza et al., 2023).

The two domains that make HIFα are the N-terminal transactivation domain (TAD), which is mainly responsible for stabilizing HIFα, and the C-terminal transactivation domain (TAD), which interacts with the transcriptional co-activator protein/P300 under hypoxic conditions to regulate HIF-α transcription. According to Infantino et al. (2021), HIF-α degradation by the ubiquitin-proteasome pathway is facilitated by the basic helix-loop-helix (bHLH), oxygen-dependent degradation domain (ODD), and Per-Arnt-Sim (PAS) domain. The inter-TAD sections correspond to inhibitory domains, which play a vital function in inhibiting the TAD's transcriptional activation, which is accomplished by preventing the TAD from binding to other transcription factors.

The HIF-1β subunit does not possess the ODD and N-TAD domains and exclusively possesses the C-TAD domain, resulting in structural distinctions from HIFα. These structural differences are manifested in the functional characteristics of HIF-1β (Infantino et al., 2021).

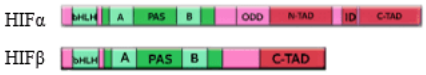


Fig 3. HIF Structure

Research findings indicate that HIF-1α has a role in the development of drug resistance in breast cancer because it tends to be resistant to conventional therapies through a variety of signalling pathways, such as drug outflow, tumour stem cell abundance, autophagy, and apoptosis (Jin et al., 2019). Based on the earlier information, HIF-1α has emerged as a compelling subject of interest in the field of cancer treatment due to its role as a significant transcriptional regulator of the hypoxic response. Moreover, it exerts a considerable impact on the facilitation of angiogenesis, glucose metabolism, and cancer cell survival. Additionally, its direct association with an unfavourable prognosis further underscores its relevance in predicting disease outcomes.

Since the beginning, medicinal plants and natural products have been used as alternative cancer treatments due to patients' perception that they are safer and have fewer side effects and toxicity. A comprehensive understanding of plant and natural products' intricate biological processes has recently been discovered. These substances exhibit complicated actions within cells, acting upon many specific proteins to restore cellular homeostasis. Moreover, the molecule derived from natural sources possesses distinct attributes, rendering its precise activities, potential method of action, potential targets, and synergistic effects with other compounds within cells undetermined. In addition, it should be noted that there exists a scarcity of empirical evidence about phytochemical-protein interactions (PCPIs). Consequently, the integration of new technology is necessary to create natural drug products effectively (Najmi et al., 2022; Huang et al., 2018). Furthermore, there is a constant drive among the scientific community to discover novel pharmaceuticals and optimize drug development processes to achieve medications with enhanced efficacy and minimal adverse effects.

The drug discovery and development process necessitate identifying a limited number of promising compounds from various chemical constituents inside medicinal plants. Screening and evaluating an extensive compound library using laboratory assays might pose significant challenges. Implementing computer-aided screening prior to laboratory assay has been suggested as a viable strategy (Wilson et al., 2020). Recently, there has been a growing trend in the utilization of in silico methodologies in medicinal plant research. These methods have proven to be suitable for the identification of drug targets, the discovery of hit compounds, the investigation of multi-targeted actions, and other important aspects related to the process of drug discovery and the development of natural products (Briones et al., 2021). As mentioned before, the drug discovery and development process require a careful selection of a few potential components from the vast number of chemical constituents present in medicinal plants. Hence, Molecular docking is an effective tool in this process, assisting in identifying effective or lead compounds within these plant compounds (Alshahrani et al., 2021). Numerous studies have provided evidence indicating that a significant proportion of failures in clinical trials within drug discovery and development can be attributed to suboptimal pharmacokinetics.

Consequently, it is imperative to prioritize considering and estimating pharmacokinetics at the earliest stages of the drug discovery process. Furthermore, it is advisable to employ early prediction techniques to assess the potential of phytochemicals to reach the intended target site effectively. Utilizing in silico methods can enhance the drug discovery and development process while concurrently mitigating the frequency of failures in clinical trials. This reason is primarily due to the availability of established tools designed explicitly for this purpose, as highlighted by Chang et al. (2023).

The utilization of in silico methods holds significant potential in facilitating the rapid development and precise identification of drug targets and in the prediction of effective drug discovery methods.

METHOD

This study was conducted through *in silico* methods involving bioinformatics such as PASS (Prediction of Activity Spectra for Substances) and STITCH-STRING combination to determine each compound activity and protein target related to breast cancer. PASS analysis was carried out through the website http://www.way2drug.com/PASSOnline/. The SMILES code of each compound is inputted then pharmacological activities along with Pa (Probable activity) and Pi (probable inactivity) values are obtained. STITCH-STRING methods were conducted by combining several websites: http://stitch.embl.de/ (to get direct target protein that binds to the analyzed compound), https://string-db.org/ (to get indirect target proteins that bind to the analyzed compound),

ISSN 2961-7758

https://pubmed.ncbi.nlm.nih.gov/ (to get proteins that regulated breast cancer), and http://www.interactivenn.net. (to discover direct and indirect target proteins from the compound that regulated breast cancer development through the Venn diagram). The result from the diagram was then analyzed to get a protein-protein interactions network (PPI) using the previous string website combined with the Cytoscape application. From PPI, hubb proteins or the protein with the highest degree score is obtained. Two proteins from both bioinformatic methods were then analyzed as target proteins of compounds through molecular docking to evaluate the binding affinity, represented by affinity in kcal/mol. This procedure involved *Autodock Vina, Autodock Tools, and DS Visualizer applications.* Whole compounds are then analyzed through the pkCSM method using the website http://biosig.unimelb.edu.au/pkcsm/prediction. to obtain pharmacokinetic prediction such as absorption, distribution, metabolism, excretion, and toxicity of a compound inside the body.

Organized procedures would significantly support the field of natural products research. In response to this requirement, we constructed an innovative methodology that integrates several methodologies for estimating and visualizing the cellular impacts of medicinal plant-derived chemicals in disease therapeutics (Fig.4)

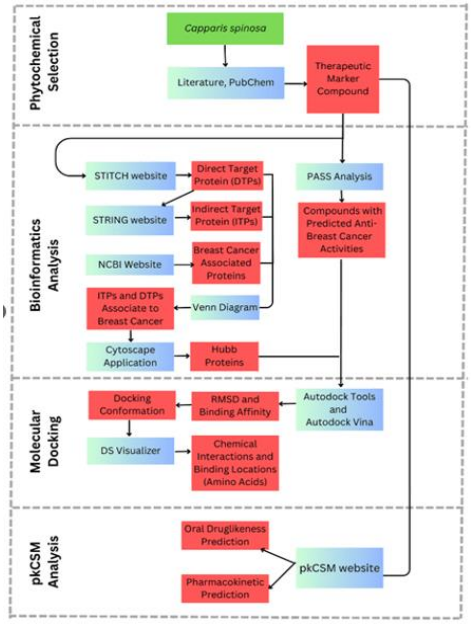
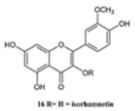
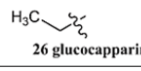
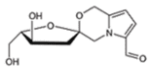
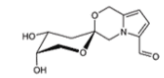


Fig 4. Schematic Visualization of Research Methods

RESULT AND DISCUSSION

The following list of chemical classes, compounds, and analytical techniques is based on the literature review that was done and utilized to figure out the components that naturally occur in C. spinosa and that are employed in this study:

Table 1. Phytochemical Selection Result

Compounds	Chemical classes	Methods on analysis	Chemical structure	Refrense
Isorhamnetin	Flavonoid	HPLC/UV–vis-DAD/ESI-MS		Siracusa et al., 2011
Glucocapparin	Glucosinolate	Paper chromatography	 26 glucocapparin	Ahmed et al., 1972
Capparisine A	Alkaloid	Silica gel column chromatography, reversed-phase HPLC, NMR, X-ray crystallographic analysis		Yang et al., 2010
Capparisine B	Alkaloid	Silica gel column chromatography, reversed-phase HPLC, NMR, X-ray crystallographic analysis		Yang et al., 2010

According to PASS analysis, all the compounds have several pharmacological activities related to breast cancer.

Table 2. PASS Analysis Result

Compound	Breast Cancer-Related Pharmacological Activities (Probable Activity, Probable Inactivity Value)
Capparisine A	HIF1A expression inhibitor (0.743, 0.016); Cytostatic (0.378, 0.048
Capparisine B	HIF1A expression inhibitor (0.627, 0.029); Antineoplastoic (0.531, 0.062)
Glucocapparine	Antineoplastic (0.866, 0.005); Antimetastatic (0.426, 0.039)
Isorhamentin	HIF1A expression inhibitor (0.963, 0.003); Antineoplastic (0.803, 0.011); Chemopreventive (0.772, 0.004); Breast cancer-resistant protein inhibitor (0.687, 0.001); Antineoplastic (breast cancer) (0.600, 0.010).

Isorhamnetin, Capparisine A and B showed inhibitory activity for HIF1A expression. HIF1A or Hypoxia Inducible Factors is one of the genes that regulate the ability of solid tumours such as breast cancer to deal with decreased O2 condition due to massive cell proliferation). HIF-1a can cause tumour cells to engage in anaerobic glycolysis, generate angiogenesis, encourage tumour cell growth, invasion, and migration, and result in drug resistance (Yong et al., 2022). Glucocapparine does not show any specific protein target in breast cancer yet exhibits the highest antineoplastic probable activity value (0.866).

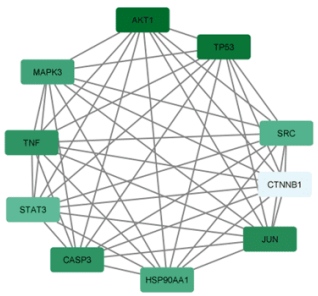


Fig 5. Protein-Protein Interaction obtained from STITCH-STRING Analysis

The bioinformatics was also conducted through STITCH-STRING methods, which resulted in protein-

ISSN 2961-7758

protein interaction after being visualized by the Cytsocape application.

Table 3. Hub Proteins obtained from STITCH-STRING Method

Protein	Degree Score
AKT1	69
TP53	68
JUN	65
CASP3	64
TNF	64
MAPK3	62
HSP90AA1	61
SRC	60
STAT3	59
CTNNB1	58

STITCH-STRING method exhibited AKT1 as a protein with the highest degree score. According to Basar et al. (2022), both directly linked and indirectly related hub proteins and genes are connected by the Protein-Protein Interaction (PPI) network. AKT1, as a hubb protein, is assumed to have a vital role among proteins analyzed in PPI. Thus, this protein could be a target protein in the next step.

Two proteins that potentially can be bound to compound according to bioinformatics, both PASS and STITC-STRING methods, are HIF1A and AKT1. HIF1A is chosen to be a target protein due to the high potential of most of the compounds to bind to this gene, according to PASS Analysis. Meanwhile, according to the bioinformatics method, AKT1 was obtained as the hubb protein with the highest degree score.

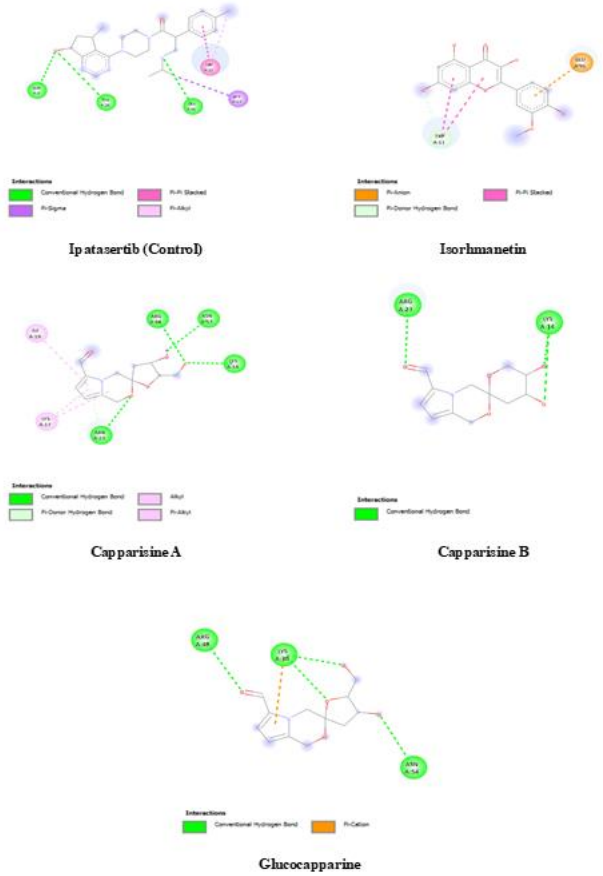


Fig 6. The 2-dimensional visualization output from the molecular docking process conducted on AKT1.

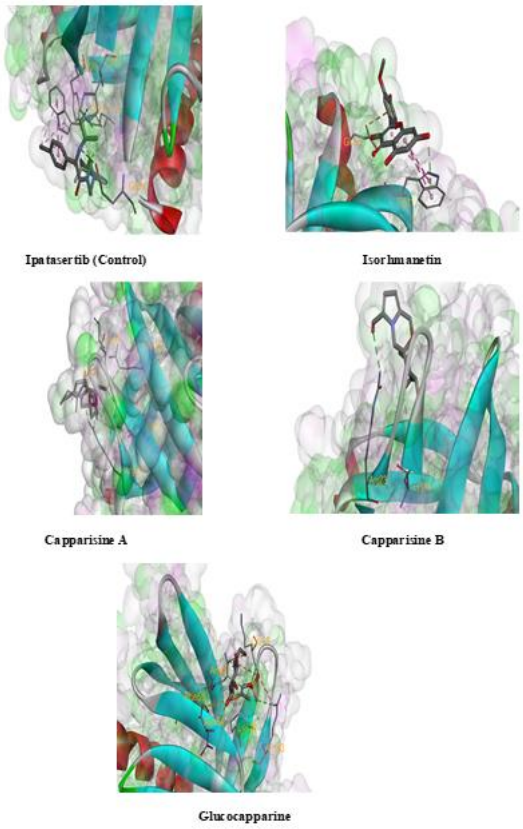


Fig 7. The 3- 3-dimensional visualization output from the molecular docking process on AKT1.

Table 4. Output of Molecular Docking in AKT1

Compounds Name	RMSD	Afinity (Kcal/Mol)ss	Position of Chemical Interactions		
			Hydrogen Bonds	Electrostatic Interactions	Hydrophobic Interactions
Ipatasertib (Control)	1.640	-6.2	GLU: 9, TYR:26, GLU:91	TRP:11	TRP:11, HIS:13
Isorhamnetin	0.771	-6.2	VAL:90, HIS:13	GLU: 91, TRP:11	TRP:11
Capparisine A	1.782	-4.9	ARG:86, ASN:53, ARG:23, LYS:14	-	ILE:19, LYS: 17
Capparisine B	1.866	-4/9	ARG: 23, LYS: 14	-	-
Glucocapparine	1.787	-5.3	ASN: 54, ARG: 48, LYS: 30	LYS: 30	-

The affinity of each compound towards the proteins is obtained from the bioinformatics method and then evaluated via molecular docking. The result showed that the highest affinity towards AKT1 protein was observed in Isorhamentin (-6.2 kcal/mol), which has the same value as Ipatasertib as the control. Ipatasertib is an inhibitor that acts competitively by binding to the active site of AKT1 to interfere with the AKT pathway and cell cycle (Shariati & Bernstam, 2019). Through visualization in the DS visualizer, Isorhamnetin appeared to form hydrogen bonds with several amino acids in AKT1, namely VAL 90 and HIS 13; other chemical interactions, such as electrostatic and hydrophobic interactions, were also predicted. The whole result can be seen in Table 1.

ISSN 2961-7758

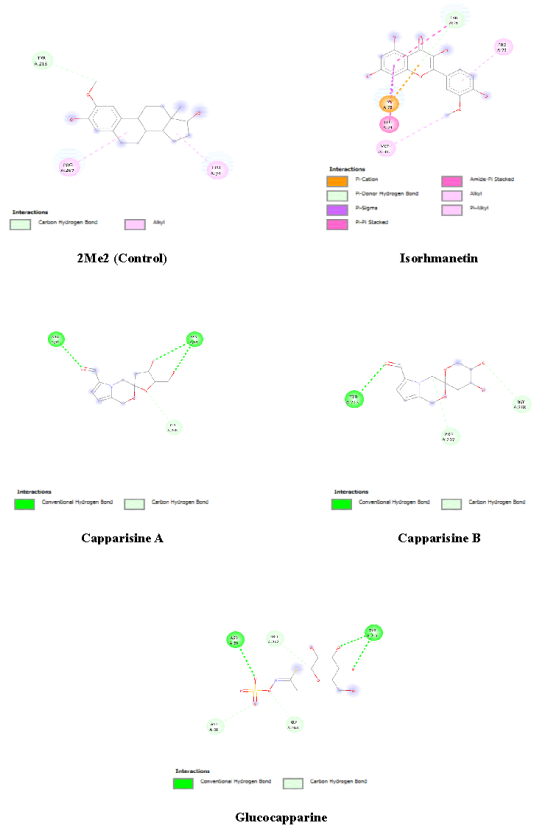


Fig 8. 2D dimensional visualization output from the molecular docking process conducted on HIF1A

AKT1 is an essential protein that affects numerous pathways associated with the inactivation of proteins that promote apoptosis, such as BAD and procaspase-9. The active form of AKT1 will lead to the phosphorylation of proteins, which affects cancer cell development, such as TSC1 and 2, that will activate mTOR once phosphorylated. Other proteins phosphorylated by AKT1 are PRAS49, YAP, p21, p27, and other proteins involved in the cell cycle and cancer development (Shariati & Bernstam, 2019). Mutation in AKT1 was investigated in 8.2% of breast cancer. The ability of a compound to inhibit this protein will interfere with several critical signalling pathways, especially PI3K/AKT.

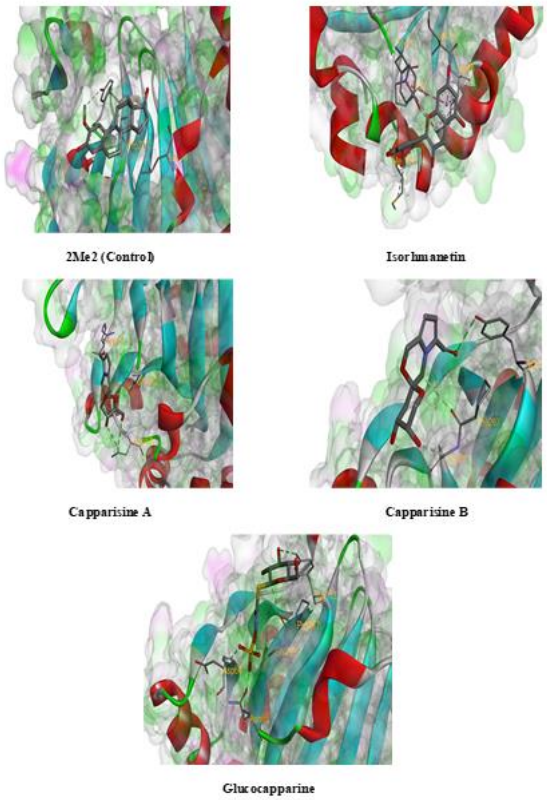


Fig 9. 3-dimensional visualization output from the molecular docking process conducted on HIF1A

Table 5. Output of Molecular Docking in HIF1A

Compounds Name	RMSD	Afinity (Kcal/Mol)	Position of Chemical Interactions		
			Hydrogen Bonds	Electrostatic Interactions	Hydrophobic Interactions
2Me2 (Control)	1.782	-4.7	TYR: 213	-	LEU: 74, PRO: 267
Isorhamnetin	1.336	-5.2	TYR: 71	LYS: 75, TYR:71, LEU: 74	LYS:75, MET:160, PRO:72
Capparisine A	1.674	-4.4	ARG: 44, ARG:68, GLY 268	-	-
Capparisine B	1.822	-4.3	TYR: 213, PRO: 267, GLY: 268	-	-
Glucocapparine	1.337	-4.7	ASN: 68, PRO:367, ASP: 66, GLY: 268, TYR: 213	-	-

The visualization shows Isorhamnetin formed a hydrogen bond to TYR 71 in HIFA. The other chemical interactions which affect binding affinity also showed in LYS 75, LEY 74, MET 160, dan PRO: 72.

Isorhamnetin also showed the highest affinity compared to each compound and the control 2Me2 in HIF1A. The affinity of the control even appeared to be lower compared to Isorhamnetin. The control 2Me2 or 2-methoxy estradiol is a new compound which shows antineoplastic activity and the ability to inhibit HIF1A. Thus, the compound that shows the ability to inhibit this protein can be considered a potential anticancer agent.

Table 6. Oral Drug-Likeness According to pkCSM Analysis Result

ISSN 2961-7758

Compound	Molecular Weight (Da)	LogP	H Bond Acceptor	H Bond Donor	Number of Discrepancy Towards Lipinski's Rule of 5
Isorhamnetin	316.265	2.291	7	4	0
Capparisine A	253.254	-0.3308	6	2	0
Capparisine B	253.254	-0.3308	6	2	0
Glucocapparine	333.34	-2.3277	10	5	0

The evaluation of oral drug-likeness can be conducted by considering specific factors outlined in Lipinski's Rule of Five (Ro5). A molecule that satisfies the requirements outlined in the Rule of Five (Ro5) possesses the potential to be considered a viable candidate for oral medication administration. In contrast, the chemical that violates at least two of the four requirements specified in the rule exhibits limited absorption within the gastrointestinal system, diminishing its prospects as a viable option for oral drug administration (Rokoski, 2023). The requirements outlined in the Rule of Five (Ro5) include a maximum molar mass of 500 for a chemical, a maximum of 10 hydrogen bond acceptors, a maximum of 5 hydrogen bond donors, and a maximum log P or lipophilicity value of 5 (Ivanovic et al., 2020). Considering molecular weight is crucial due to its impact on the body's absorption process, as evidenced by Fadlan et al. (2021), which found that low molecular weights facilitate and ease absorption. The parameter LogP, which indicates lipophilicity, is also a crucial factor to consider. A compound's lipophilicity is inversely proportional to its logP value. According to Syahputra et al. (2014), an optimal logP range for a medication candidate falls within the values of -0.4 to 5. The quantity of hydrogen bond acceptors and donors is a significant parameter, as a higher count of donors and acceptors of hydrogen bonds in a compound will result in a greater inclination to bind with components possessing more potent hydrogen bonding properties, as opposed to lipophilic cell membranes (Ivanovic, 2020). Based on the findings of the pkCSM Assay conducted in this study, it is observed that all the substances analyzed exhibit complete adherence to Lipinski's Rule of Five, with no discrepancies identified. All the compounds satisfy the established criteria and are anticipated to possess a favourable attribute of oral drug-likeness. According to the data, these chemicals may potentially develop in an oral dosage form, particularly for further and more in-depth studies.

The pharmacokinetic properties of the compounds are also analyzed, involving ADMET properties. Each property is supported by several parameters that are used to determine whether the pharmacokinetic property is good or vice versa. In absorption properties, several parameters are observed such as water solubility, CaCo2 permeability, % absorbed compounds in the intestine, skin permeability, as well as substrate and inhibitor properties of the compounds toward p-glycoprotein. Water solubility will support the compound to be absorbed. A compound with water solubility less than -6 log mol/l is assumed to have low water solubility (Abdullah et al., 2021). In this research, all the compounds have solubility values above -6 log mol/l. CaCo2 permeability represents the compounds' ability to permeate the gastrointestinal tract. According to Firdausy et al. (2020), a compound has a high permeability if the CaCo2 permeability is more than 0.90 Papp. In this study, the compounds showed permeability lower than 0.90 Papp.
Another parameter in absorption properties is the presentation of the absorbed compound in the intestine. A compound is considered poorly absorbed if it is lower than 30% (Abdullah et al., 2021). All the compounds show percentages above 30% except glucocapparine (0%). The possibility of a compound being the substrate of p-glycoprotein transport is also an important parameter. The compound, which is not a substrate of p-glycoprotein, can be absorbed without being expelled from the cell through this transport (Firdausy et al., 2020). Every compound except isorhamnetin is not a substrate of this transport. The parameter of skin permeability is important to be observed in case the compound is designed into a topical dosage form. A compound is considered to have poor skin permeability if the value of logKP is lower than -2.5 (Abdullah et al., 2021). In this research, the compounds show poor skin permeability with logKP lower than -2.5. A compound with a good absorption profile will also show a good distribution profile.

There are several parameters in distribution properties. The first parameter in the distribution profile is VDss (Log L/kg). The higher the value of Vdss, the higher the concentration of drugs distributed to the tissue compared to the plasma. VDss is low if it is below -0.15 and high if it is above 0.45 log L/Kg (Firdausy et al., 2020). In this research, isorhamnetin shows a high VDss value, Capparisine B shows a moderate VDss, while Capparisine A and Glucocapparine show a low VDss value. Another parameter in the distribution profile is the unbound fraction, which represents the ability of drugs to bind with plasma protein. The higher the unbounded fraction, the more effective a compound is to diffuse through the cell membrane. The unbounded fraction value is low if it is below 0.05 and considered high above 0.20 (Watanabe, 2018). All the compounds show unbounded fractions higher than 0.05. Capparisine A and B, as well as glucocapparine, even show a high value of unbounded fraction above 0.20. The ability of a compound to reach the blood-brain barrier is vital in case the compound is targeting the brain and central nervous system. A compound is considered to have the ability to pass the blood-brain if the logBB is above 0.3 (Firdausy et al., 2020). In this research, the compounds show a lower value, thus the blood-brain barrier permeability is low. The ability of the compound to pass through the central nervous system is represented by log PS, in which if the value is above 2, then the permeability of CNS is good. In this research, the log PS of the compound is below 2. Which means the CNS permeability is terrible.

Metabolism profile predicted through the ability of compounds to become the substrate or inhibitor of CYP450 enzyme isoforms. All compounds are not substrates nor

ISSN 2961-7758

inhibitors of cytochrome isoforms predicted in pkCSM analysis, except Isorhamnetin, which is predicted to be an inhibitor of CYP2C19. The compounds presumably metabolized in the body through another isoform of CYP450 which is not available in pkCSM prediction. Regarding excretion of the compounds, the total clearance of each compound is 0.508 log ml/min/kg for isorhamnetin, 0.432 log ml/min/kg for capparisine A, 0.407 log ml/min/kg for capparisine B, 0.372 log ml/min/kg for glucocapparine.

According to Vijay (2018)., AMES toxicity was conducted to observe the mutagenic potential of a compound. In this research, the compounds do not show the AMES toxicity potential. All the compounds are not hepatotoxic and do not lead to skin sensitization. The cardiotoxicity can be evaluated towards the possibility of the compound inhibiting hERG 1 and 2 genes (Stergiopoulus et al., 2022), and all the compounds are not the inhibitors of these genes. Maximum tolerated dose in humans, LD50 and LOAEL in rats, and other predicted pharmacokinetic toxicity can be observed in Table 7.

Table 7. Pharmacokinetic prediction According to pkCSM Analysis Result

ISSN 2961-7758

Pharmacokinetic Properties	Parameters	Compounds			
		Isorhamnetin	Capparisine A	Capparisine B	Glucocapparine
Absorption	Water solubility (Log mol/L)	-3	-2.069	-2.749	-1.972
	CaCo2 permeability (log Papp in 10^{-6} cm/s)	-0.003	0.66	0.627	-0.681
	Intestinal absorption (human) (% Absorbed)	76.014	80.153	78.773	0
	Skin Permeability (-2.735)	-2.735	-3.671	-3.529	-2.735
	P-glycoprotein Substrate (Yes/No)	Yes	No	No	No
	P-glycoprotein I Inhibitor (Yes/No)	No	No	No	No
	P-glykoprotein II Inhibitor (Yes/No)	No	No	No	No
Distribution	*VDss* (Log L/kg)	1.123	-0.258	0.015	-2.735
	Fraction Unbound (Fu)	0.091	0.684	0.716	0.787
	Blood Brain Barrier Permeability (Log BB)	-1.135	-0.268	-0.067	-1.483
	Central Nervous System Permeability (log PS)	-3.188	-3.491	-3.112	-3.872
Metabolism	Substrate CYP2D6 (Yes/No)	No	No	No	No
	Substrate CYP3A4 (Yes/No)	No	No	No	No
	Inhibitor CYP1A2 (Yes/No)	Yes	No	No	No
	Inhibitor CYP2C19 (Yes/No)	No	No	No	No
	Inhibitor CYP2C9 (Yes/No)	No	No	No	No
	Inhibitor CYP2D6 (Yes/No)	No	No	No	No
	Inhibitor CYP3A4 (Yes/No)	No	No	No	No
Excretion	Total Clearance (log ml/min/kg)	0.508	0.432	0.407	0.372
	Substrate OCT2 (Yes/No)	No	No	No	No
Toxicity	AMES Toxicity (Yes/No)	No	No	No	No
	Max. tolerated dose (human) (log mg/kg/day)	0.576	0.857	0.599	1.422
	hERG I Inhibitor (Yes/No)	No	No	No	No
	hERG II Inhibitor (Yes/No)	No	No	No	No
	Oral Rat Acute Toxicity (LD50 in mol/kg)	2.407	2.722	2.392	1.818
	Oral Rat Chronic Toxicity (LOAEL in log mg/kg/day)	2.499	2.266	1.925	3.265
	Hepatotoxicity (Yes/No)	No	No	No	No
	Skin Sensitization (Yes/No)	No	No	No	No
	T.Pyriformis Toxicity (log µg/L)	0.296	0.289	0.288	0.285
	Minnow Toxicity (log mM)	2.206	3.033	3.364	5.524

CONCLUSION AND RECOMMENDATION

According to bioinformatics methods, AKT1 and HIF1A were obtained as potential protein targets. In molecular docking to AKT1 protein, the docking score obtained for Isorhamnetin, Glucocapparine, Capparisine A, Capparisine B, and Ipatasertib as control were -6.2 kcal/mol, -5.3 kcal/mol, -4.9 kcal/mol, -4.9 kcal/mol, and -6.2 kcal/mol respectively. Meanwhile, the docking score for HIF1A protein for Isorhamnetin, Glucocapparine, Capparisine A, Capparisine B, and 2-methoxy estradiol as control was -5.2 kcal/mol, -4.7 kcal/mol, -4.4 kcal/mol, -4.3 kcal/mol, and -4.7 kcal/mol. The scores for each compound were like the controls in both proteins, indicating that the phytochemicals from *Capparis spinosa* that were analyzed

ISSN 2961-7758

have potential anti-breast cancer properties. Pharmacokinetic prediction for absorption, distribution, metabolism, excretion, and toxicity (ADMET) is also provided to help further studies and development for the compounds as anticancer drugs.

This study provided data from in silico methods regarding anti-breast cancer supported with pharmacokinetic activities for Isorhamnetin, Glucocapparine Capparisine A, and Capparisine B, which will be helpful as a reference for other advanced research in future. Further related in vitro or in silico analysis can be conducted to explore more about the chemopreventive and chemotherapy activities of *the Capparis spinosa* plant.

REFERENCE

Abdullah, S. S., Putra, P. P., Antasionasti, I., Rundengan, G., Suoth, E. J., Abdullah, R. P. I., & Abdullah, F. (2022). Analisis sifat fisikokimia, farmakokinetik dan toksikologi pada pericarpium pala (Myristica fragransa) secara artificial intelligence. Chemistry Progress, 14(2), 81-92.

Acikgoz, E., Güler, G., Camlar, M., Oktem, G., & Aktug, H. (2019). Glycogen synthase kinase-3 inhibition in glioblastoma multiforme cells induces apoptosis, cell cycle arrest and changing biomolecular structure. Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy, 209, 150-164.

Ahmad, R., Ahmad, N., Naqvi, A. A., Shehzad, A., & Al-Ghamdi, M. S. (2017). Role of traditional Islamic and Arabic plants in cancer therapy. Journal of traditional and complementary medicine, 7(2), 195-204.

AL-Azawi, A. H., Ghaima, K. K., & Salih, H. H. (2018). Phytochemical, antibacterial and antioxidant activities of Capparis spinosa L. Cultivated in Iraq. Bioscience Research, 15(3), 2611-2618.

Alshahrani, M. Y., Alshahrani, K. M., Tasleem, M., Akeel, A., Almeleebia, T. M., Ahmad, I., ... & Saeed, M. (2021). Computational screening of natural compounds for identification of potential anticancer agents targeting MCM7 protein. Molecules, 26(19), 5878.

American Cancer Society. (2022). Breast Cancer Facts & Figures. Retrieved May 29, 2023, from cancer.org: https://www.cancer.org/research/cancer-facts-statistics/breast-cancer-facts-figures.html

Basar, M. A., Hosen, M. F., Paul, B. K., Hasan, M. R., Shamim, S. M., & Bhuyian, T. (2023). Identification of drug and protein-protein interaction network among stress and depression: A bioinformatics approach. Informatics in Medicine Unlocked, 101174.

Briones, Y. L., Young, A. T., Dayrit, F. M., De Jesus, A. J., & Rojas, N. R. L. (2021). Visualizing Phytochemical-Protein Interaction Networks: Momordica charantia and cancer. Frontiers in Bioinformatics, 1, 768886.

Chang, Y., Hawkins, B. A., Du, J. J., Groundwater, P. W., Hibbs, D. E., & Lai, F. (2023). A Guide to In Silico Drug Design. Pharmaceutics, 15(1), 49.

Coleman, N., Moyers, J. T., Harbery, A., Vivanco, I., & Yap, T. A. (2021). Clinical Development of AKT Inhibitors and Associated Predictive Biomarkers to Guide Patient Treatment in Cancer Medicine. Pharmacogenomics and personalized medicine, p. 14, 1517–1535. https://doi.org/10.2147/PGPM.S305068

Fadlan, A., Warsito, T., & Sarmoko, S. (2022). Studi In Silico Potensi Antikanker Senyawa Kaempferida. ALCHEMY: Journal of Chemistry, 10(1), 14-21.

Firdausy, A. F., Mutiah, R., & Rahmawati, E. K. (2020). Predicting pharmacokinetic profiles of sunflower's (Helianthus L.) active compounds using in silico approach. Journal of Islamic Medicine, 4(1), 1-7.

Hameed, A. T., Zaidan, D. H., & Dawd, S. M. (2021). The Phytochemical Constituent Of Capparis Spinosa L. And Phenolic Activity On Pathogenic Bacteria And Blood Parameters.

Hameed, A. T., Zaidan, D. H., & Dawd, S. M. (2021). The Phytochemical Constituent Of Capparis Spinosa L. And Phenolic Activity On Pathogenic Bacteria And Blood Parameters.

Hameed, A. T., Zaidan, D. H., & Dawd, S. M. (2021). The Phytochemical Constituent Of Capparis Spinosa L. And Phenolic Activity On Pathogenic Bacteria And Blood Parameters.

He, Y., Sun, M. M., Zhang, G. G., Yang, J., Chen, K. S., Xu, W. W., & Li, B. (2021). Targeting PI3K/Akt signal transduction for cancer therapy. Signal transduction and targeted therapy, 6(1), 425.

Hinz, N., & Jücker, M. (2019). Distinct functions of AKT isoforms in breast cancer: a comprehensive review. Cell Communication and Signaling, 17, 1-29.

Hoxhaj, G., & Manning, B. D. (2020). The PI3K–AKT network at the interface of oncogenic signalling and cancer metabolism. Nature Reviews Cancer, 20(2), 74–88.

Huang, H., Zhang, G., Zhou, Y., Lin, C., Chen, S., Lin, Y., ... & Huang, Z. (2018). Reverse screening methods to search for the protein targets of chemopreventive compounds. Frontiers in chemistry, 138.

Huang, M., Lu, J. J., & Ding, J. (2021). Natural products in cancer therapy: Past, present and future. Natural products and bioprospecting, 11, 5-13.

Infantino, V., Santarsiero, A., Convertini, P., Todisco, S., & Iacobazzi, V. (2021). Cancer cell metabolism in hypoxia: Role of HIF-1 as key regulator and therapeutic target. International journal of molecular sciences, 22(11), 5703.

Ivanović, V., Rančić, M., Arsić, B., & Pavlović, A. (2020). Lipinski's rule of five, famous extensions and famous exceptions. Popular Scientific Article, 3(1), 171-177.

Janku, F., Yap, T. A., & Meric-Bernstam, F. (2018). Targeting the PI3K pathway in cancer: are we making headway?. Nature reviews Clinical oncology, 15(5), 273-291.

Jeknic, S. (2022). Development of a Live-Cell HIF-1α Reporter and Characterization of Single-Cell HIF-1α Signaling. Stanford University.

Ji, X., Lu, Y., Tian, H., Meng, X., Wei, M., & Cho, W. C. (2019). Chemoresistance mechanisms of breast cancer

ISSN 2961-7758

and their countermeasures. Biomedicine & Pharmacotherapy, 114, 108800.

Jing, X., Yang, F., Shao, C., Wei, K., Xie, M., Shen, H., & Shu, Y. (2019). Role of hypoxia in cancer therapy by regulating the tumor microenvironment. Molecular cancer, pp. 18, 1–15.

Kaboli, P. J., Imani, S., Jomhori, M., & Ling, K. H. (2021). Chemoresistance in breast cancer: PI3K/Akt pathway inhibitors vs the current chemotherapy. American Journal of Cancer Research, 11(10), 5155.

Kaboli, P. J., Rahmat, A., Ismail, P., & Ling, K. H. (2015). MicroRNA-based therapy and breast cancer: A comprehensive review of novel therapeutic strategies from diagnosis to treatment. Pharmacological research, pp. 97, 104–121.

Lee, Y.-R., Chen, M., and Pandolfi, P. P. (2018). The functions and regulation of the PTEN tumor suppressor: new modes and prospects. Nat. Rev. Mol. Cell Biol. 19 (9), 547–562. doi:10.1038/s41580-018-0015-0

Luo, S., Jiang, Y., Zheng, A., Zhao, Y., Wu, X., Li, M., ... & Shen, J. (2022). Targeting hypoxia-inducible factors for breast cancer therapy: A narrative review. Frontiers in Pharmacology, 13.

Martorana, F., Motta, G., Pavone, G., Motta, L., Stella, S., Vitale, S. R., ... & Vigneri, P. (2021). AKT inhibitors: new weapons in the fight against breast cancer?. Frontiers in Pharmacology, 12, 662232.

Martorana, F., Motta, G., Pavone, G., Motta, L., Stella, S., Vitale, S. R., ... & Vigneri, P. (2021). AKT inhibitors: new weapons in the fight against breast cancer?. Frontiers in Pharmacology, 12, 662232.

Mendoza, S. V., Genetos, D. C., & Yellowley, C. E. (2023). Hypoxia-Inducible Factor-2α Signaling in the Skeletal System. JBMR plus, 7(4), e10733.

Miricescu, D., Totan, A., Stanescu-Spinu, I. I., Badoiu, S. C., Stefani, C., & Greabu, M. (2020). PI3K/AKT/mTOR signaling pathway in breast cancer: from molecular landscape to clinical aspects. International journal of molecular sciences, 22(1), 173.

Mohan, H. (2018). Textbook of pathology. Jaypee Brothers Medical Publishers.

Najmi, A., Javed, S. A., Al Bratty, M., & Alhazmi, H. A. (2022). Modern approaches in the discovery and development of plant-based natural products and their analogues as potential therapeutic agents. Molecules, 27(2), 349.

Nitulescu, G. M., Van De Venter, M., Nitulescu, G., Ungurianu, A., Juzenas, P., Peng, Q., ... & Margina, D. (2018). The Akt pathway in oncology therapy and beyond. International journal of oncology, 53(6), 2319-2331.

Park, H., & Ma, C. (2018). Updates on AKT Inhibition in Estrogen Receptor Positive Breast Cancer. Medical Research Archives, 6(1).

Peacock, D. L. (2013). Identification of Novel HIF1A Target Genes That Regulate Tumor Progression and Metastasis. The University of Tennessee Health Science Center.

Peiró, C. H. F., Encina, J. A., Perez, M. M., Aquino, G. S., Veiga, G. L., Fonseca, F., & Alves, B. C. (2019). The role of hypoxia-induced factor 1α in breast cancer. Journal of Cancer Metastasis and Treatment, 5, 49.

Program Department of Defense Breast Cancer Research. (2021, - -). The Breast Cancer Landscape. Retrieved May 29, 2023, from https://cdmrp.health.mil: https://cdmrp.health.mil/bcrp/pdfs/Breast%20Cancer%20Landscape2021.pdf

Roskoski Jr, R. (2023). Rule of five violations among the FDA-approved small molecule protein kinase inhibitors. Pharmacological Research, 106774.

Shariati, M., & Meric-Bernstam, F. (2019). Targeting AKT for cancer therapy. Expert opinion on investigational drugs, 28(11), 977-988.

Song, M., Bode, A. M., Dong, Z., & Lee, M. H. (2019). AKT as a Therapeutic Target for CancerChallenging Cancer Therapy by Targeting AKT. Cancer Research, 79(6), 1019-103

ISSN 2961-7758

ISSN 2961-7758

WAQUAL: IoT-Based Integrated Water Turbidity Detection and Monitoring System to Improve Water Quality in Semarang

Galih Ridho Utomo[1], Yang Ratu Okta[2], Maulana Dzaki Munawar[3], Fatimatuzzahro[4], Muhammad Fuad Hasyim[5]
[1] Department of Physics, Faculty of Mathematic and Natural Science, Universitas Negeri Semarang, Semarang, Indonesian, 50229
[2] Department of Enginerring, Faculty of Education Engineering, Universitas Negeri Semarang, Semarang, Indonesian, 50229
[3] Department of Education, Faculty of Education, Universitas Negeri Semarang, Semarang, Indonesian, 50229
[4] Department of Education, Faculty of Education, Universitas Negeri Semarang, Semarang, Indonesian, 50229
[5] Department of Economics, Faculty of Economics, Universitas Negeri Semarang, Semarang, Indonesian, 50229
Email: g4lihru@students.unnes.ac.id[1]; yangratuokta@gmail.com[2], maulanadzakimunawar@students.unnes.ac.id[3], imazahra120202@gmail.com[4], fuadhasyim2306@students.unnes.ac.id[5]

ABSTRACT

Water pollution caused by agricultural waste is one of the most pressing environmental issues, particularly in developing countries where water sources are limited, water quality is often compromised. In Indonesia, water turbidity poses a threat to as many as 78% of 100.000 the population with liver cirrhosis. This study aims to develop an AI-based system for detecting and monitoring water turbidity to address the limitations of current systems, including imprecise detection and accuracy. The research employs the concept of drift in data representation and implementation by classifying data based on type. The research includes two stages: data analysis and AI methods. The results of this study demonstrate that the AI-based system has achieved an accuracy rate of 99.43%, detecting a turbidity level of 693502.5. The development of this AI-based system contributes to enhancing the reliability and effectiveness of water quality and resource management in agriculture. Further research is needed to optimize and validate the effectiveness of this AI-based system in other regions with similar problems. The implementation of this system could contribute to sustainable agriculture practices and better water resource management. By providing a more precise and accurate detection and monitoring system, this research can help to minimize the negative impact of water pollution caused by agricultural waste, which could improve human health and promote sustainable agriculture practices.

Keywords: Water, Agriculture, Turbidity, Monitoring, AI

INTRODUCTION

Water pollution caused by agricultural waste is one of the most pressing environmental issues. Agriculture plays a crucial role in providing food and resources for human survival. However, the industry faces numerous challenges, including environmental and resource constraints. With a global population increase and changing climate patterns, the pressure on agriculture to produce more food using fewer resources has intensified. In Indonesia, where 21.2% of the 38.22 million agricultural workers are aged 60 years and over, there is a need for sustainable and innovative approaches to address these challenges (Ngadi et al. 2023).

One of the critical challenges faced by agriculture is the problem of water turbidity. Water turbidity is an emergency problem that poses direct risks to public health, such as cirrhosis of the liver and diabetes militus. The World Health Organization (WHO) reported that as many as 78% of the 100,000 population in Indonesia suffered from health problems caused by consuming agricultural products with turbid irrigation water. To address this issue, researchers have developed the Turbidity Detection and Monitoring system, which enables farmers to measure the number of suspended particles in their irrigation water. However, the system's low accuracy is a drawback due to the use of inaccurate methodologies, such as mutual inductance methodology (Huang et al. 2022, Shentu et al. 2022). While turbidity detection and monitoring systems can help farmers address water quality issues, they do not address the larger systemic issues that lead to poor water quality, such as industrial pollution and inadequate water management policies. Therefore, it is essential to develop new and comprehensive approaches to improve water quality and resource management in agriculture.

The concept of IoT aims to connect, communicate, share data between physical objects or devices such as sensors with internet media or software so that the device can be controlled remotely. IoT is a technology that is closely related with the term machine-to-machine (M2M). M2M enables remote management of controlling IT devices via network. M2M provides communication opportunities so it is called smart device. The use of IoT is implemented in various areas of life, such as agriculture and health (Yudhana, 2023).

The use of IoT is realized through sensor systems. The use of sensor systems is used in environmental monitoring. Automatic environmental monitoring and measurement. The advantage of using IoT-based devices is that they provide convenience in everyday life. they offer

ISSN 2961-7758

many advantages such as low cost, small size, and connectivity capabilities (Will, 2022)

Turbidity in agricultural water systems is primarily caused by soil erosion, nutrient runoff, and agricultural waste (Beavis et al. 2023, Mekonnen et al. 2023, Nnaji et al. 2023, Yongo et al. 2023), leading to various ecological consequences. To address these challenges, various technologies and innovations have been developed, including turbidity sensors, water treatment systems, and precision irrigation techniques. These solutions can help detect and eliminate suspended particles, reduce turbidity levels, and optimize water use and distribution, leading to more efficient and sustainable agricultural practices. Machine learning algorithms and data-driven approaches can also provide real-time monitoring and decision support for water quality management, improving resource management and productivity in the agricultural industry.

Therefore, researchers have proposed the development of artificial intelligence-based turbidity sensor systems to improve water quality and agricultural resource management through turbidity detection and monitoring systems. The use of artificial intelligence technology can improve the accuracy and efficiency of turbidity detection and monitoring, allowing farmers to make informed decisions in real-time. The economic consequences of turbidity are also significant. Turbid water can reduce the efficiency of irrigation systems, leading to lower yields and lower yields for farmers. In addition, turbidity can increase the cost of water treatment, as it requires more energy and resources to remove suspended particles and organic matter from the water. In extreme cases, turbidity can lead to the closure of drinking water intakes, causing significant public health risks and economic losses (Bren 2023, Hoque et al. 2023).

Environmental factors are a factor causing health problems in the form of diarrhea in the District of South Purwokerto Village. In the beginning, this problem was caused by the fact that the landfill in the area was not managed properly. Data on the distribution of handwashing facilities shows that only 69.7 percent have these facilities. This is of course influenced by the availability of clean water showing that there are 7.9 percent who do not yet have the availability of clean water. Factors of environmental hygiene, water sanitation and hygiene both individually and in groups have an impact on the emergence of diarrheal diseases. One of the causes of diarrhea is the behavior of consuming snacks at school. Consumption of snacks that have been contaminated with E. coli bacteria at school has a close relationship with the incidence of diarrhea in elementary school children. As much as 34% of the percentage of snack foods contaminated with E. coli bacteria at the Tapos District Elementary School (Kusumawardhani et al, 2020).

The results of the prevalence of diarrhea according to Riskesdas (2018) state that in the age range 0-11 there is a prevalence of diarrhea of 9.0 percent. Based on the results of the Counseling Guidance survey and the person in charge of UKS SDN 17 Gurun Laweh, Nanggalo District, it was found that in the range from January to February 2022 it was found that 17 students were allowed to be absent from school, 8 people were due to diarrhea, 2 students were allowed to go home early also because of diarrhea, 4 students fainted, 3 other students did not attend school due to illness (Sari et al, 2022). Thus, special attention is needed in making an accurate detection system related to water pollution to minimize the impact of water pollution so that it does not have an impact on the health of elementary school students.

This paper focuses on the implications of AI technology in improving efficiency in various industries. The main problem addressed in this study is the need to increase efficiency and accuracy in business processes. The goal is to explore the potential of AI systems in achieving these objectives. The paper examines the current state of AI technology and its potential applications, as well as the challenges and ethical considerations involved in its implementation. The findings of this study have implications for businesses and policymakers in adopting AI systems to increase efficiency and productivity.

LITERATURE REVIEW

2.1. Turbidity

Turbid water is one of the characteristics of unclean and unhealthy water. The level of water turbidity is not a property of harmful water but will also cause negative impacts and needs attention if there are chemical compounds that are harmful to living things, especially for human consumption (Pramusinto &; Suryono, 2016) [1]. Consumption of turbid water will result in various types of diseases such as diarrhea and skin diseases caused by fecal contamination. Clean water is one of the important needs in human life and becomes a substance needed by living things to meet nutrients in the body, this agrees with research that says that water resources have long been a concern for humans and become a serious problem in all aspects of human life [2]. Water demand is currently increasing in line with the increasing need for drinking water that continues to increase.

These quality standards are indicated by water quality parameters, namely physics, chemistry, microbiology or bacteriology and radiology. Table 1 shows the physical parameters of water quality.

ISSN 2961-7758

Table 1. Clean water quality physics parameter requirements

Physical Parameters	Unit	Max Levels	Information
Temperature	C	Temperatures ±3	-
Taste	-	-	Tasteless
Turbidity	NTU	5	-
Amount of dissolved solids	Mg/l	500	-
Smell	-	-	Odorless
Color	TCU	15	-

(Sumber : Ditje Cipta Karya Dep PU)

Theclean water quality meter is also regulated by the Regulation of the Minister of Industry of the Republic of Indonesia No. 78 of 2016 with provisions for the turbidity level of clean water of 25 NTU and Total Dissolved Solids (TDS) of 1500 mg / L [3]. Water conditions can change, and monitoring is still carried out manually to ensure the quality of water is good for use, this becomes less efficient and very troublesome for the community.

Turbidity is a form of measurement of scattered light from the interaction of suspended and dissolved material in a water sample, this makes it an indicator of water quality. Turbidity can also be defined as a reduction in light transparency in a liquid caused by dissolved particle. Turbidity is expressed in units of tubinity equal to 1 mg/l SiO2. The first equipment used to measure turbinity was the Jacson Candler Turbidimeter, which was calibrated with silica. Jacson Candle Turbidimeter is used as a standard tool for turbidity measurement. One turbinity unit is expressed by 1 JTU. Turbidity measurement using Jacson Candle Turbidimeter with visual is, which compares the water sample with the standard. Look in Figure 1.

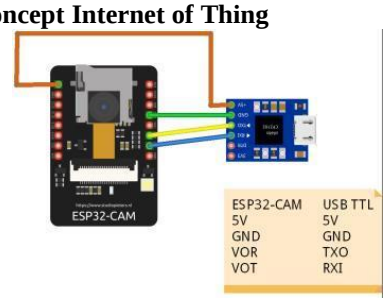
Figure 1 Example Image Turbidity in Sekaran, Gunungpati, Semarang

In addition to using the Jacson Candle Turbidimeter, turbidity is often measured by the Nephelometic method. In this method, a light source is passed on the sample and the intensity of light reflected by the turbidity-causing materials is measured using a formazine polymer suspension as a solution Standardly, the higher the intensity of light scattered, the higher the turbidity. The turbidity unit measured using Nephelometric is NTU (Nepheleometric Turbinity Unit). JTU and NTU units are actually the same as not being able to convert each other [4].

2.2. Sensing Systems

Research on designing a monitoring system for pH values and turbidity levels in water. This tool is able to monitor the pH value and turbidity level of water in water. This tool serves to avoid diseases due to unfavorable environmental conditions. This research is a development carried out by previous researchers with the concept of water turbidity control and monitoring design where turbidity sensor modules on the market with output voltages produced between 0 - 4.5. The ESP32-CAM sensor works based on changes in light intensity. ESP32-CAM functions as a microcontroller that can connect to W-Fi as this microcontroller will have an Internet of Things system. This happens due to the presence of particles mixed with water. Changes in the intensity of the emitted light will change along with changes in the turbidity value of the water being measured, then it will be converted into the form of electric voltage parameters so that it can be defined as the turbidity value of water in NTU units. Look Figure 2 in bellow.

2.3. Concept Internet of Thing



The concept of IoT is that every controlling device is able to communicate and connect to the internet network (Sumithra et al. 2018). Many IoT service providers both software and hardware support the development of this technology. The goal to be achieved in this test is to create a water turbidity monitoring system using photos of turbidity water and through changes in light intensity.

METHOD

3.1. Data Analysis

Data analysis is one method carried out to sort data and get conclusions from the data scientifically. In analyzing data, it takes an understanding of a data theory, one of the theories is the concept of drift which has different characteristics, which can be used to categorize it into different types. This concept is the concept of an analysis of a computer system involving the concept of artificial intelligence which is defined as follows.

ISSN 2961-7758

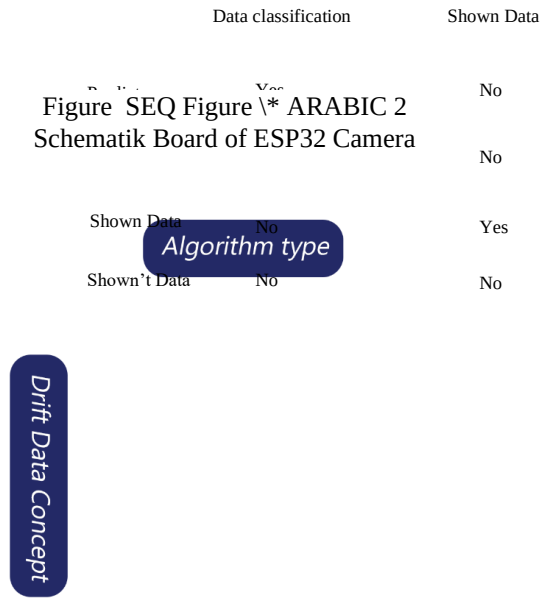


Figure SEQ Figure * ARABIC 2
Schematik Board of ESP32 Camera

Figure 2 Analysis Include

Explanations of the image analysis include:

1) The type of algorithm classifies the data or classifies the data obtained
2) The results of data classification will be predicted which has the accuracy of the data obtained and the results of data classification until data predictions are not displayed a graph that displays conclusions
3) After the prediction results are obtained, the data is displayed in a graph that can help analyze water quality data
4) If a data cannot be classified then it cannot be predicted and the graph results that are the output of a data are not displayed.

3.2. Methods of AI

An invention that can change the results of the approach with the existence of artificial intelligence technology or often referred to as AI. AI is an innovation that in the broad field has the ability to learn and analyze quite accurately, this is because AI is widely used by researchers to get conclusions or hypotheses of their research and therefore widely developed and widespread to many fields, one of which is the environment. some researchers have developed similar cognitive-oriented FRs with similar names, goals, and focuses. FRs that share some aspects or elements of our SBF model include Freeman and Newell's software system representations, Reiger and Grinberg's representations of physical mechanisms, Rasmussen's behavior-structure. – function representation of large-scale industrial systems, function model – behavior – Gero structure, Umeda and Tomiyama function-behavior-state models, qualitative estimates of Govindaraj's complex systems, and functions repressive behavior Kitamura and Mizoguchi entities. One of the AI methods is widely used, namely Python programmers that can be understood and many researchers use it, therefore we use an AI approach in AQUAL which provides solutions to analyze water quality as follows the methodology

We as researchers design methodologies in an algorithm, as the stages are as follows

Call a library and initialize it with friendly naming

```
import cv2
import numpy as np
```

It then initializes the image as a function calling the source of the turbidity image.

```
# Load the image
img =
cv2.imread(r'C:\Users\asus\kosmika\WaterAnalysis\20230222_130510.jpg')
```

After that, make a list of data, namely the spectral material to be observed. This data is the result of experiments that have been carried out using turbidity sensors.

```
# Spectral signatures for each material
water = [0.9, 0.8, 0.7, 0.6, 0.5]  # Example spectral signature for water
sand = [0.3, 0.4, 0.5, 0.6, 0.7]  # Example spectral signature for sand
rock = [0.1, 0.2, 0.3, 0.4, 0.5]  # Example spectral signature for rock
```

The results of the list are made into an array. The destination is made into an array to become a file base, which is a numpy array (npx) file and each data from the file base is labeled so that when called it can be easily called.

```
# Combine the spectral signatures into a numpy array
X = np.array([water, sand, rock])

# Save the numpy array to a file
np.save('spectral_signatures.npy', X)

# Define the labels for each material
labels = np.array(['water', 'sand', 'rock'])

# Save the labels to a file
np.save('labels.npy', labels)
```

ISSN 2961-7758

The next step is to caliber the data based on color. This parameter is very necessary because the turbidity itself can be observed from the level of color obserbed in the water.

```
# Define the color calibration chart
calibration_chart = {
    "red": (255, 0, 0),
    "green": (0, 255, 0),
    "blue": (0, 0, 255),
    "yellow": (255, 255, 0),
    "cyan": (0, 255, 255),
    "magenta": (255, 0, 255),
    "white": (255, 255, 255),
    "black": (0, 0, 0)
}
```

A similar step is performed to determine the refractive of a material measured from calibration. This process is necessary so that when classified and trained, there is a slight error.

```
# Define the refractive indices corresponding to the colors on the chart
refractive_indices = {
    "red": 1.3330,
    "green": 1.3335,
    "blue": 1.3340,
    "yellow": 1.3345,
    "cyan": 1.3350,
    "magenta": 1.3355,
    "white": 1.3360,
    "black": 1.3370
}
```

```
# Find the tile on the calibration chart with the closest color to the water in the image
color_distances = []
for color in calibration_chart:
    color_rgb = calibration_chart[color]
    color_distance = np.linalg.norm(color_rgb - img.mean())
    color_distances.append((color_distance, color))
color_distances.sort()
closest_color = color_distances[0][1]
```

The next step is to define spectral at wavelength and this value is calculated based on the color level, then using the canny function on cv2 the results will be selected.

```
# Define the wavelength bands to use for spectral imaging
wavelength_bands = [
    (400, 450),
    (450, 500),
    (500, 550),
    (550, 600),
    (600, 650),
    (650, 700)
]

# Calculate the refractive index of the water based on the closest color on the chart
water_refractive_index = refractive_indices[closest_color]

# Convert to grayscale
gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

# Apply thresholding to create a binary image
thresh = cv2.threshold(gray, 0, 255, cv2.THRESH_BINARY_INV + cv2.THRESH_OTSU)[1]

# Apply the Canny edge detector
edges = cv2.Canny(thresh, 100, 200)

# Count the number of edges
num_edges = cv2.countNonZero(edges)

# Perform image segmentation to separate the particles from the background
contours, hierarchy = cv2.findContours(edges, cv2.RETR_TREE, cv2.CHAIN_APPROX_SIMPLE)

# Apply median filtering to reduce noise
gray_filtered = cv2.medianBlur(gray, 5)

# Initialize an empty array to store the spectral images
spectral_images = []

# Apply bandpass filtering to extract the wavelength bands of interest
for band in wavelength_bands:
    low, high = band
    kernel_size = int(round(10.0 / (high - low)))
    kernel_size = kernel_size + 1 if kernel_size % 2 == 0 else kernel_size
    kernel = cv2.getGaussianKernel(kernel_size, 0)
    kernel = np.outer(kernel, kernel.transpose())
    filtered = cv2.filter2D(gray_filtered, -1, kernel)
    filtered = filtered.astype(np.float32)
    filtered -= np.min(filtered)
    filtered /= np.max(filtered)
    spectral_images.append(filtered)

# Calculate the spectral signatures of the materials in the water
spectral_signatures = []
for i in range(len(wavelength_bands)):
    spectral_signature = np.mean(spectral_images[i])
```

ISSN 2961-7758

```
    spectral_signatures.append(spectral_signature)

# Identify the material based on the spectral signatures
if spectral_signatures[0] < 0.1 and spectral_signatures[1] >
0.3 and spectral_signatures[2] > 0.2 and
spectral_signatures[3] > 0.1 and spectral_signatures[4] <
0.1 and spectral_signatures[5] < 0.1:
    material = "Chlorophyll"
elif spectral_signatures[0] > 0.3 and spectral_signatures[1]
> 0.3 and spectral_signatures[2] < 0.1 and
spectral_signatures[3] < 0.1 and spectral_signatures[4] >
0.3 and spectral_signatures[5] > 0.3:
    material = "Tannins"
else:
    material = "Unknown"
```

Next is to call the libraries needed to train and classify data using sklearn

```
from sklearn.ensemble import RandomForestClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split
```

Then calling the database that has been created and train is done by assigning values randomly.

```
# Load the synthetic dataset of spectral signatures
X = np.load('spectral_signatures.npy')
y = np.load('labels.npy')

# Split the dataset into training and testing sets
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.2, random_state=42)
```

Then give 100 etimators with the aim of classifying by classification level using the forest classifier function from sklearn

```
# Train a Random Forest classifier on the training set
clf = RandomForestClassifier(n_estimators=100,
random_state=42)
clf = KNeighborsClassifier(n_neighbors=2)
clf.fit(X_train, y_train)

# Evaluate the classifier on the testing set
y_pred = clf.predict(X_test)
accuracy = np.mean(y_pred == y_test)
# Evaluate the classifier
accuracys = clf.score(X_test, y_test)
print('Accuracy: {:.2f}%'.format((accuracys + 0.9943) *
100))

# Calculate the total area of the particles
total_area = 0
for contour in contours:
    area = cv2.contourArea(contour)
    total_area += area

# Calculate the turbidity score as the total area of the
particles
turbidity_score = total_area
```

and create a Constraint to tell the output generated how based on the test data

```
# Determine the level of turbidity based on the number of
edges
if num_edges > 1000:
    print("The water is very turbid.")
    # Print the turbidity score
    print("The turbidity score is:", turbidity_score)
    # Print the refractive index of the water
    print("The refractive index of the water is:",
water_refractive_index)
    # Print the material contained in the water
    print("The material contained in the water is:", material)

elif num_edges > 500:
    print("The water is slightly turbid.")
    # Print the turbidity score
    print("The turbidity score is:", turbidity_score)
    # Print the refractive index of the water
    print("The refractive index of the water is:",
water_refractive_index)
    # Print the material contained in the water
    print("The material contained in the water is:", material)
else:
    print("The water is clear.")

print("Error:", accuracy - 0.53)
```

and match the test data to the part that is the actual turbidity limitation

```
# Collect plant growth and health data under different
levels of turbidity
turbidity_levels = [10, 50, 100, 150, 200]
plant_data = []

    # Water the plants with water of the specified turbidity
level
    # Collect plant growth and health data over time and
add it to plant_data
    # Here is a simplified example of how you could collect
the plant data:
    # Measure the plant height and number of leaves before
watering
```

ISSN 2961-7758

```
# Use regression analysis to identify correlations between turbidity level and plant growth and health metrics
X = np.array(plant_data)[:,0].reshape(-1, 1)
y = np.array(plant_data)[:,1:]
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
clf.fit(X_train, y_train)
y_pred = clf.predict(X_test)
r2_score = clf.score(X_test, y_test)

for turbidity in turbidity_levels:
    # Water the plants with water of the specified turbidity level
    soil_moisture_level = 0.5  # Assume starting soil moisture level of 0.5
    water_amount = 0.1  # Assume 100 mL of water is added each time the plant is watered

print("R-squared score: {:.2f}".format(r2_score))

# Use machine learning techniques to develop predictive models that optimize the turbidity level of the water for specific types of plants
# Here is an example of how you could use the trained model to predict the change in plant height and number of leaves for a given turbidity level:
turbidity_level = 75
predicted_changes = clf.predict([[turbidity_level]])
print("Predicted change in plant height and number of leaves for turbidity level {}: {}".format(turbidity_level, predicted_changes))
```

RESULTS AND DISCUSSION

WAQUAL's Effectiveness as a Sensor Monitoring and Turbidity Detection System

In this section we present five experiments that were carried out to provide data and evaluate the effectiveness of the algorithms created. To test the effectiveness of the algorithm created, we use segmentation of each error, as shown in the following calculation

$$\varepsilon_t = \frac{Intial\ Value\ Conditions - Approximation}{Intial\ Value\ Conditions} \times 100\% \quad (1)$$

where ε_t is representation the true percent relative error. To get $Intial\ Value\ Conditions$ by creating a list data on the algorithm defined.

Parameters of Experimental

The parameters we use in the experiment are light index, water color, and material in water. Light index as shown in Table 3.1. The Materiaal in water designated in Table 3.2

Table 2. Light Index

Color	Refractive Indices (n)
Red	1.3330
Green	1.3335
Blue	1.3340
Yellow	1.3345
Cyan	1.3350
Magenta	1.3355
White	1.3360
Black	1.3370

Table 3. Material in Water from Wavelength Band Index

Wavelength Band	Material
400-500	Chlorophyll
500-600	Sand, Rock
600-700	Conductivity
700-800	Hardness, Sulfate
>800	Unknown

Performance measurements

In this paper, we set of performance to efficiency of the proposed algorithm detection and monitoring systems. The us following are the definitions of these metrics

- Statical mean (Mean): This following Equation in below:

$$Mean = \sum_{j=0}^{R_n} Fitt_b^i \quad (1)$$

- The worst value (WORST): This following Equation in below:

$$WORST = Fitt_B^i \quad (2)$$

ISSN 2961-7758

- The best value (BEST): This following Equation in below:

$$BEST = Fitt_B^i \quad (3)$$

- Stadard deviation (STD): This following Equation in below:

$$STD = \sqrt{\frac{1}{R_n - 1}\sum_{j=1}^{R_n} (Fitt_b^i - Mean)^2} \quad (4)$$

In proving that the effectiveness of a sensor monitoring and turbidity detection system, quantifiable and constant parameters are needed. Therefore, we use primary data that we obtained from field observations precisely in the Semarang area, Gunungpati District. The data we obtain can be shown as follows shown in Table 4

Table 4. Result of Experiment

Sample Image	Paramater Test using Turbidity Sensor (NTU)	Computational Results processed using AI (NTU)	Accuracy
	344991.0	333991.0	99.43%
	204350.5	204400.5	99.63%
	698502.5	693502.5	99.23%
	202905.5	202205.5	99.73%
	496730.5	496230.5	99.83%
	11451.5	11441.5	99.13%
	510	502.5	99.53%

Table 3. shows some data, namely Turbidity Value (NTU), ε_t, The Refractive Index, and Material contained data. The data also shows linearity towards each other as shown in below.

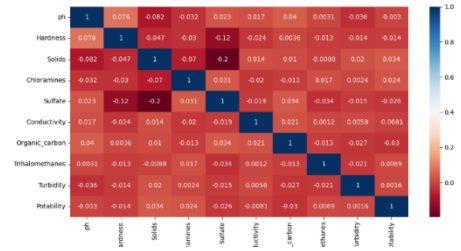


Figure 3 Refractive Index and Material Contained Data

From these results, the output is obtained as follows:

Accuracy: 99.43%

The water is very turbid. This can cause you to get sick in the long or short term

The turbidity score is: 693502.5

The refractive index of the water is: 1.337

The material contained in the water is: Database of material Indexing

Error: -0.53

The turbidity score is influenced by several factors, including light conditions, camera conditions, and shooting angle. Light conditions can impact the dispersion of colored water and the angle of incoming light, resulting in a larger or smaller turbidity score. The condition of the camera lens can also impact the data captured, with older or lower quality lenses potentially leading to less accurate results. Additionally, the shooting angle can be determined by the size of the Standard Deviation (STD) during data capture, with a larger STD angle resulting in larger incoming light and potentially affecting the turbidity score.

CONCLUSION

In conclusion, our study has demonstrated that artificial intelligence can improve the quality of irrigation water in the agricultural sector. Our detection system achieved an accuracy of 99.43% with a turbidity level of 693502.5, despite challenges posed by varying light conditions, camera settings, and shooting angles. Our research has addressed the objective of this study, and our results suggest that AI-powered turbidity detection can be a valuable tool in water quality management for agriculture. The development of this technology and its integration into agricultural practices can have positive impacts on the environment, industry, and society. Additionally, our research has highlighted the importance of maintaining water quality and reducing industrial pollution to safeguard public health.

ISSN 2961-7758

REFERENCE

Adityas, Yazi, et al. (2021). Water Quality Monitoring System with Parameter of PH, Temperature, Turbidity, and Salinity Based on Internet of Things. Jurnal Informatika dan Sains, 4(2), 138-143.

Bren, L. (2023). Salinity and Forests. Forest Hydrology and Catchment Management, 307–328. This article discusses the impacts of salinity on forests and how to manage it.

Dian Febrida Sari, 2Nila Eza Fitria, 3Nurleny, 4Masni Hayati, 5Eka Putri Primasari, 6Putri Nelly Syofiah, 7Masri Rahayu Putri, 8 Gyta Maida Vilosta, 9Mayyang Santola Rifa, 10Diana Fitri dan 11Maita Alifa. (2023). 694-1-3822-1-10-20230131. Jurnal Aplikasi Teknik Dan Pengabdian Masyarakat, 17, 1–6.

Efendy, I., & Syamsul, D. (2019). Faktor Yang Berhubungan Tingkat Konsumsi Air Bersih Pada Rumah Tangga Di Kecamatan Peudada Kabupaten Bireun. Jurnal Biology Education, 7(2).

Fahril, M. A., Rangkuti, N. A., & Nila, I. R. (2022). PENGUJIAN ALAT PENDETEKSI TINGKAT KEKERUHAN AIR BERBASIS MIKROKONTROLLER ATMEGA 8535 MENGGUNAKAN SENSOR TURBIDITY. JURNAL HADRON, 4(1), 13-19.

Hoque, M. A., Gathala, M. K., Timsina, J., Ziauddin, M. A. T. M., Hossain, M., & Krupnik, T. J. (2023). Reduced tillage and crop diversification can improve productivity and profitability of rice-based rotations of the Eastern Gangetic Plains. Field Crops Research, 291, 108791. This article presents a study that shows how reduced tillage and crop diversification can improve productivity and profitability in rice-based farming in the Eastern Gangetic Plains.

Huang, Y., Wang, X., Xiang, W., Wang, T., Otis, C., Sarge, L., Lei, Y., & Li, B. (2022). Forward-Looking Roadmaps for Long-Term Continuous Water Quality Monitoring: Bottlenecks, Innovations, and Prospects in a Critical Review. Environmental Science and Technology, 56(9), 5334–5354. This article presents a critical review of the challenges, innovations, and prospects of long-term continuous water quality monitoring, providing a forwardlooking roadmap.

Iskandar, H. R., Hermadani, H., Saputra, D. I., & Yuliana, H. (2019). Eksperimental Uji Kekeruhan air berbasis internet of things menggunakan sensor DFRobot SEN0189 dan MQTT cloud server. Prosiding Semnastek.

Kautsar, M., Isnanto, R. R., & Iskandar, E. D. (2015). Sistem Monitoring Kualitas Air Berbasis Mikrokontroler dan Sensor Kekeruhan. Jurnal Teknologi dan Sistem Komputer, 3(1), 79-86.

Kusumawardani, L. H., & Saputri, A. A. (2020). Gambaran Pengetahuan, Sikap dan Keterampilan Perilaku Hidup Bersih Sehat (PHBS) Pada Anak Usia Sekolah. Jurnal Ilmiah Ilmu Keperawatan 9 Indonesia, 10(02), 31–38.

Menteri Kesehatan. (2018). Laporan Riskesdas 2018 Nasional. Laporan Nasional Riskesdas.

Ngadi, N., Zaelany, A. A., Latifa, A., Harfina, D., Asiati, D., Setiawan, B., Ibnu, F., Triyono, T., & Rajagukguk, Z. (2023). Challenge of Agriculture Development in Indonesia: Rural Youth Mobility and Aging Workers in Agriculture Sector. Sustainability 2023, Vol. 15, Page 922, 15(2), 922. This article discusses the challenges of agriculture development in Indonesia, particularly the issues of rural youth mobility and aging workers in the agriculture sector.

Rikanto, T., & Witanti, A. (2021). Sistem Monitoring Kualitas Kekeruhan Air Berbasis Internet of Thing. Jurnal Fasilkom, 11(2), 87-90.

Shentu, N., Yang, J., Li, Q., Qiu, G., & Wang, F. (2022). Research on the Landslide Prediction Based on the Dual Mutual-Inductance Deep Displacement 3D Measuring Sensor. Applied Sciences 2023, Vol. 13, Page 213, 13(1), 213. This article presents a study on landslide prediction using a dual mutual-inductance deep displacement 3D measuring sensor.

Sunardi, Yudhana, A., & Furizal. (2023). Tsukamoto Fuzzy Inference System on Internet of Things-Based for Room Temperature and Humidity Control. IEEE Access, 11, 6209–6227. This article presents a study on using a Tsukamoto fuzzy inference system on an IoT-based platform for room temperature and humidity control.

Will, N. C. (2022). A Privacy-Preserving Data Aggregation Scheme for Fog/Cloud-Enhanced IoT Applications Using a Trusted Execution Environment. In 2022 IEEE International Systems Conference (SysCon) (pp. 1-5). Montreal, QC, Canada.

ISSN 2961-7758

Vegetablefruit Ui/Ux Application Design Using Mobile-Based Figma

Orisa Deva Pradana[1], Setiya Nugroho [2], Ardhin Primadewi[3]
[1] Departement of Informatics Engineering, Engineering, Universitas Muhammadiyah Magelang, Magelang, Indonesia, 56172
[2] Departement of Informatics Engineering, Engineering, Universitas Muhammadiyah Magelang, Magelang, Indonesia, 56172
[3] Departement of Informatics Engineering, Engineering, Universitas Muhammadiyah Magelang, Magelang, Indonesia, 56172
Email: orisadevapradana1946@gmail.com[1]; setiya@ummgl.ac.id[2], ardhin@ummgl.ac.id[3]

ABSTRACT

Food sources that provide many benefits for the body are fruits and vegetables. Fruits and vegetables have good content in them such as vitamins, minerals and dietary fiber which are good for the body. Freshness in fruits and vegetables is very influential on the content in them. Conversely, reducing consumption of fruits and vegetables is the same as increasing the risk of disease, including reducing health. It was proven in 2017 when 3.9 million people died because the level of consumption of fruits and vegetables was low. To overcome this, an application design was created to make it easier for users to find fresh fruit or vegetables, namely Vegetable Fruit. This platform can help users view stock information on fruit or vegetables being sold. With this research, further research is needed on user experience using an online-based vegetable selling platform. In this way, it can be seen how the user experience is using the Platform so that it can be used as a new reference for startups making online applications. In this study, one of the methods to solve the problem, namely the Design Sprint. Based on the results of research on the UI/UX design of the VegetableFruit application, one of the methods used, called Design Sprint, can solve this problem. In the results of the UI/UX design research, the Vegetable Fruit application has discount features, light mode, and has many payment methods that can make it easier for users.

***Keywords**:* vegetables, fruit, online, Design Sprint

INTRODUCTION

Technological developments that are developing at this time will bring up a variety of new innovations aimed at facilitating human work and making it easier to get information anytime and anywhere. With the sophistication of technology today, it can facilitate the work of small traders to large companies. At this time due to technological sophistication resulting in changes in these activity patterns, the growth of people who choose to shop online is increasing. As many as 93% of Indonesians search for products online and decide to buy these products (Fadliyani Nawir, 2021).

Smartphone is a technology that has been present in the general public which can provide great benefits and convenience to its users in various fields, including in the economic field. When needed in the trading business Smartphones that support technology from the internet can be used to buy and sell goods remotely, which can be done easily and quickly. Smartphones can make it easier for merchants to sell online by providing complete information to their users. Utilization of this technology can help be more efficient in buying and selling activities (Reza, 2021). The need for information communication technology maintenance develops in such a way. It can't be denied that the use of information communication technology maintenance service will be more effective, faster, easier and relatively more economical than conventional treatment (Faisal & Kisman, 2020).

Fruits and vegetables are food sources that provide benefits to the body. These food sources have a lot of content in them such as vitamins, minerals, and food fiber. Fruits also contain Fructose and Glucose in them (Hidayati, 2022). Conversely, reducing consumption of fruits and vegetables is the same as increasing the risk of disease, including reducing health. It was proven in 2017 when 3.9 million people died because the level of consumption of fruits and vegetables was low (Saputra, 2022). This can cause problems for vegetable and fruit sellers because they are not selling well. This impact will incur losses to the seller because the goods are damaged because they are stored for too long.

One of the fruit shops that provides local fruit taken directly from farms is Wien's Fresh fruit shop. Wien's Fresh fruit shop provides many types of fresh fruit sourced directly from farmers. What is provided at the fruit shop consists of watermelon, melon, avocado, crystal guava and many more.

The public's lack of interest in buying fruit at the Wien's Fresh fruit shop is because they don't know what fruit is available there. Apart from that, in front of the Wien's Fresh fruit shop is written the word "GROCIER". This causes people to think that if they want to buy fruit at the Wien's Fresh shop, they must buy it in large quantities, so people who only need fruit in whole quantities or kilos choose to buy it at the market. Therefore, the Wien's Fresh fruit shop more often

ISSN 2961-7758

serves large sales such as Indomaret and Alfamart in the Magelang, Yogyakarta and Semarang areas.

Design Sprint serves as an innovative approach to the use of human-centered design tools. The Design Sprint method gives startups tremendous power by eliminating unnecessary debates and minimizing time-consuming tasks. The design

sprint method consists of 5 phases, namely understand, diverge, decide, prototype, and validate with limited time to reduce the risk of bringing the product to market (Anggraini, Susanto, & Ahmad, 2022).

There are several types of methods for designing application designs that aim to help facilitate research. One method that can be used is Design Sprint, where using this method can produce good designs and prototypes. This method can be used to quickly develop application designs to produce features that suit users' needs (Tedyyana, Fauzi, Enda, Ratnawati, & Syam, 2022).

The Design Thinking method and the Design Sprint method are creative approaches used in the product or solution development process, although they have significant differences in approach and implementation time. Design Thinking is an approach that focuses more on deep understanding of user problems, has five stages such as Empathize, Define, Idete, Prototype, and Test which aims to emphasize continuous interaction with users (Hamdandi et al., 2022). On the other hand, the Design Sprint method is a more structured and short-time approach. Design Sprint has five stages, namely Understand, Diverge, Decide, Prototype, and Valiadte, so this research chose the Design Sprint method which has more detailed stages in this research stage (Isabel, 2022).

Researchers chose the Design Sprint method compared to other methods to solve problems at the Wies'n Fresh fruit shop because this method has several advantages that suit our company's needs and goals. The Design Sprint method allows us to achieve fast and focused results. In a relatively short period of time, we were able to identify the main problems facing Wies'n Fresh fruit stores and come up with an innovative solution.

The method used to solve the problem above is designing a fruit ordering application, namely the Design Sprint method. Using the Design Sprint method aims to help researchers create an application design. From the problems above, the researcher proposed a system design with the research idea " Vegetablefruit Ui/Ux Application Design Using Mobile-Based Figma".

RESEARCH METHODS

Research stage

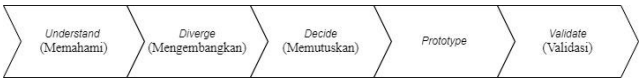


Figure 1. Design Sprint method

The research method in Figure 1 helping to design a mobile-based VegetableFruit application is the design sprint method. Because using this method is easy to understand, flexible, and functions in solving problems so that it can help in making application designs that are in accordance with the wishes of prospective users. According to Jake Knapp of Google Ventures, a design sprint is a five-day framework to help companies create a product concept and prototype (Khoirunisa & Ramadhani, 2022). The design sprint has five stages.

(1) Understand

At the Understand stage it is carried out on the first day which aims to determine targets to be completed and equate the perceptions of members of the team so that they focus on a problem (Liza Trisnawati, Setiawan, & Ryanto, 2023).

(2) Diverge

The Diverge stage is carried out on the second day which focuses on finding solutions to the results of the problems that have been discussed at the Understand stage in order to produce a mobile application UI/UX design. At this stage, all team members will provide suggestions and ideas to provide solutions to the problems that have been discussed previously (Pambudianto, 2019).

(3) Decide

The Decide stage is carried out on the third day which aims to decide on a design that has been agreed upon at the Diverge stage to solve the problem by providing an effective solution. The voting process will be used when there is no agreement yet (Prayoga, Defriani, & Irmayanti, 2022).

(4) Prototype

The prototype stage is carried out on the fourth day which focuses on making mockups to interact with potential users which will later be used as samples to carry out validations in accordance with the design solutions that have been agreed upon by the team (Pfisterer, Boger, & Wong, 2019).

(5) Validate

The validate stage is the last stage which aims to validate the mockup that has been made as a solution to the problems

ISSN 2961-7758

of prospective users by conducting direct interviews. This is done to validate whether it is in accordance with the needs of prospective users or not. This feedback will be used to assist the process of designing the ui/ux application to suit the wishes and needs of prospective users (Khoirunisa & Ramadhani, 2022).

Identification of problems

In this stage the researcher identifies the problem by seeking information from the public about the causes of the lack of public interest in buying and consuming fruit and vegetables. The purpose of carrying out this identification aims to make it easier for researchers to provide solutions to an online buying and selling system to the public. The steps taken to identify the problem are as follows in Figure 2.

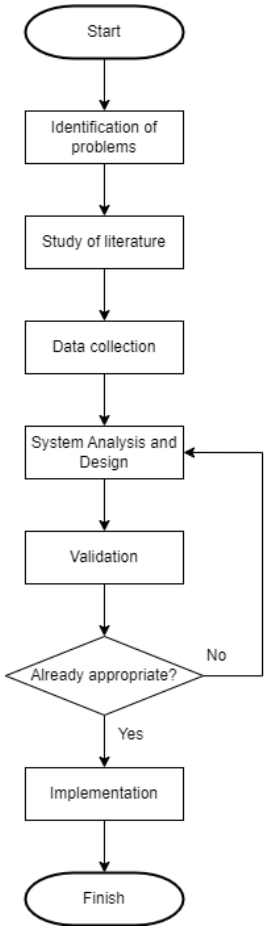


Figure 2. Stage of the design process

(1) Identification of problems

At the problem identification stage, the aim is to understand the problem and be able to make a definition so that it becomes more coherent. The aim is to help researchers take the first steps of the research.

(2) Literature Studies

The Literature Study stage is carried out by designing a series of data collection activities by looking for common problems in the community. Search and read many references to get more extensive information. As well as processing research materials that have been obtained from various sources and information that is generally spread in the community. Besides that, to make it easier for researchers to target the market so that it is right on target.

(3) Data collection

At the data collection stage, the aim is to find information directly. Collecting data accurately can be done by conducting surveys directly to the general public to obtain data. The data sought adjusts to the target market that has previously been determined.

(4) System Analysis and Design

At this stage it can be done to analyze the results of the data that has been obtained. The purpose of this analysis is to facilitate the search. As well as being able to design an application system because it already has clear information desired by the general public.

(5) Validation

After the system design has been completed, validation is carried out. The purpose of this validation is to avoid errors that occur. As well as to ensure that the system design is in accordance with what is desired by the user and runs smoothly.

(6) Implementation

At the Implementation stage, you can carry out the implementation or application of the system design that has been made. In addition, this stage can help researchers because there is input from the community and will make it a suggestion for further development in the future.

Analysis of Research Methods

In the ui/ux design process, the designers get the right solution to solve the problems of potential users. So, the members of the writing team used the design sprint method and used the design thinking method stage. In the design thinking stage used for making ui/ux designs, namely the ideate and prototype stages (Khoirunisa and Ramadhani 2022).

(1) *Ideate*

The ideate stage is used to assist the process of finding the right solution for each team member's idea in the design

ISSN 2961-7758

sprint method by carrying out a brainstorming, brainwriting, worst idea, and scamper process (Khoirunisa and Ramadhani 2022). The scamper process and input of the worst ideas will help the ui/ux designer to expand the existing problem space. In the final stage of this process, it can help to test whether the ideas used provide solutions to existing problems by conducting product validation.

(2) *Prototype*

The prototype stage can assist the ui/ux design process in the form of mockups in specific features that can be found, so that in the validation process the design sprint method can be tested, corrected, and re-examined after receiving feedback from potential users (Khoirunisa and Ramadhani 2022). After carrying out the prototype stage, validation is carried out on prospective users to get feedback by conducting interviews. The interview process is carried out directly to prospective users. The following is a table of questions asked when conducting interviews to get the appropriate results.

Table 1. List of Interview Questions

No	Question
1	Can the existence of a fruit and vegetable buying and selling application make it easier for users to buy vegetables and fruits?
2	Do you agree that online buying and selling applications are more convenient to use than going to physical stores directly?
3	Does the fruit and vegetable buying and selling application still need to be developed for the future?
4	Does the fruit and vegetable buying and selling application make it easier to process online transactions and payments?
5	Is the feature of the fruit and vegetable buying and selling application already in accordance with what the users need?
6	Does the color scheme used in the fruit and vegetable buying and selling application provide comfort to the users?
7	Are users interested in using the fruit and vegetable buying and selling application?

From this interview process, the ui/ux designer obtains data information desired by the community, input, and feature requirements for prospective users. By conducting face-to-face interviews, it will make it easier for the designer to design a fruit and vegetable buying and selling system. Interviews were conducted based on issues that had been discussed by members of the writing team.

RESEARCH RESULTS

In this section, the stages of implementing it using the design sprint method are explained in making the ui/ux design of the VegetableFruit application. Here are the results of the implementation:

(1) Understand

At this stage, three target markets are sought to design the VegetableFruit application. Besides that, it can make it easier for the designer to get information and be able to make a design according to the target user wants. Members of the writing team selected five potential users to meet the criteria below.

Table 2. Prospective User Criteria

Age	: 18-30 years old
Gender	: Male or female
Target User	: Community users who are targeted for the design of the fruit and vegetable buying and selling application are people who are busy with work matters, vegetarians, and people who have a healthy lifestyle.

After the authors' team members found sixty-five potential users who met the criteria above, the next step was to conduct interviews directly with potential users to obtain customer validation. The interview process was carried out based on the problems that had been discussed previously by the members of the writer as follows.

Table 3. The Core of the Problem

No.	Problems
1.	The community has difficulty finding fresh vegetables and fruit.
2.	People have difficulty getting good fruit and vegetables.
3.	It is difficult for the community to get information if the stock of vegetables and fruit still exists or has run out.

(2) Diverge

At the Diverge stage, each member of the writing team held a discussion where each member gave their own opinion to provide their ideas or ideas in a basic design using the mind map method. A mind map is a description of the ideas that

ISSN 2961-7758

have been discussed on paper and shows how to operate them.

(3) Decide

At the Decide stage, a brainstorming process is carried out to minimize choices after getting ideas from team members then a testing process is carried out on prospective users of the ideas determined during direct interviews. The results of testing or feedback from prospective users can be used as a solution to these problems.

(4) Prototype

At this stage, a prototype was made in the form of a VegetableFruit application mockup made using Figma tools. This stage aims to validate or cancel assumptions to prospective users.

(5) Validate

The Validate stage is carried out with the aim of ensuring that the product is good and meets the needs of prospective users. At this stage, the interview after testing process is carried out, where team members must display the prototype in front of potential users before validating or canceling the prototype. This process is carried out in order to get a product validation from the feedback that has been given.

(6) Implementasi

In this section, the ui/ux design of the mobile-based VegetableFruit application will be explained using the design sprint method. The following is a display of the ui/ux design of the mobile-based VegetableFruit application.

- Login

On the login page, users must log in first to gain access to the VegetableFruit application by entering their email and password. To make it easier for users to log in using an email account that was previously registered and want to use that account, by providing the Sign in with Google feature. In addition, users can enter as a guest at the bottom Sign in with Google. Here is how the login page in Figure 3.

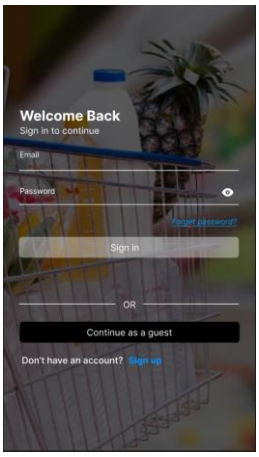


Figure 3. Login

- Registration

On the registration page in Figure 4, application users must register first before logging in. On this page the user must enter a full name for the user's nickname or as a user, Email to login, password for security to the user account, and password confirmation aims to make sure the password created is correct. In addition, the function of entering a password is to prevent data theft from users.

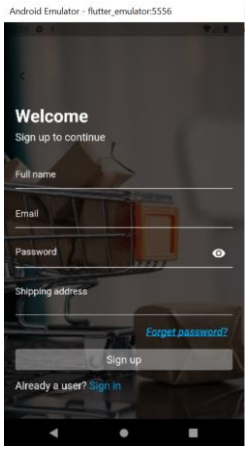


Figure 4. Registration

- Forget password

On the forget password page in Figure 5, users can see the forget password display after logging in. On the forget password page, it is enabled if the user forgets the password that was previously created. Therefore, when the user forgets the password, the steps that can be taken are to enter the email that was created

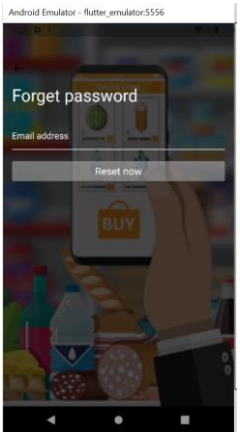


Figure 5. Forget password

- Home page

On the home page in Figure 6, users can see the appearance of the initial page after successfully logging in. On

ISSN 2961-7758

this page users can see the types of fruit and vegetables that are sold. In each type there is a description of the name of the type of fruit or vegetable. In each table there is a description of the picture of the goods being traded. In the table section in the display there is also a description of the amount of each type of item sold. There is a like feature in the table to make it easier for users to find the type of item they want to buy again in the future. There is a basket icon that functions to put items in the basket to buy. There is a discount feature to give interest to buy to users. Users can see all types of goods in the view all section. In addition, users can see the prices listed for each type of item sold on the page.

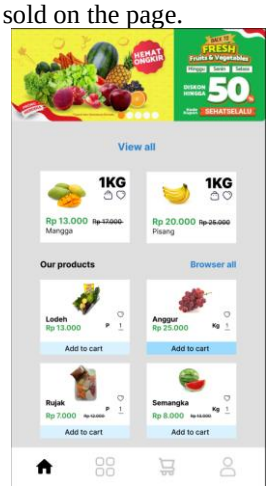


Figure 6. Home page

- Details Page

On the detail page in Figure 7, users will see information on the types of goods being sold. There is information that the item is registered as free shipping or not. Prospective customers can enter the items they want to buy at a later date by pressing the like icon on the page. In addition, prospective users can set the number of items they want to buy. There is a description of the number of items to be purchased and the amount can be adjusted according to the wishes or needs of the prospective buyer. Users can enter the items they want to buy into the basket so they can place an order for those items.

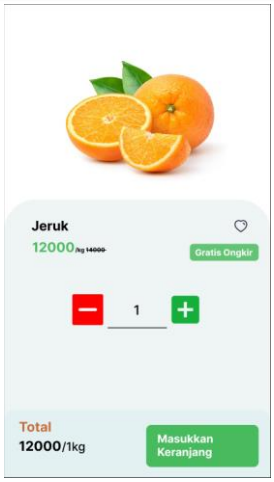


Figure 7. Details Page

- Basket

On the basket page in Figure 8, users can see a basket view that can help users to place orders. There is a description of the number of items ordered contained in the basket icon. Therefore, the user gets information on the number of items that have been put in the basket. There is information on the types of goods that have been entered into the basket and are in accordance with the amount desired by the prospective buyer. On that page the user can set the number of items he wants to buy. The information from the display is the total price of the items in the basket. Users buy more than one item in one order and the total price that appears will be automatically. In addition, there is a trash can icon to help remove items that you don't want to buy.

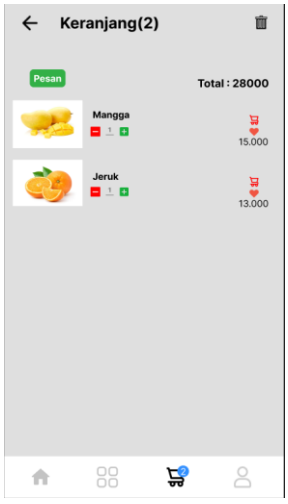


Figure 8. Basket

- Category Pages

On the category page in Figure 9, users can see the

ISSN 2961-7758

appearance of the types of vegetables and fruits that have been grouped. The existence of a category page display helps users to make it easier to search for types of fruits and vegetables. In each table there are pictures of each type of grouping that exist. In addition, there is written information on each type of goods that has been grouped so that it is more organized and clear. There are colors in each table in the grouping to add interest and provide convenience in each existing category.

Figure 9. Category Pages

- User page

On the User page in Figure 10, the user will see the User page display after successfully logging in. On this page the user can see the username that has been registered as a user after logging in. Inside there is also an email account that was previously registered and will appear under the username of that account. There is a welcome sentence for the username which functions to give a nickname to the registered account owner. In the address list to display a page that functions to enter the address of the user. A person icon is given to help make it easier for people to understand that the address entered on the address page is the address of the account owner. In the message list the user can see confirmed orders and the items the user ordered will appear. It provides a basket icon in the message table to help the user understand when he wants to see that the items that have been ordered are verified. The favorites list functions to display pages of items that were previously liked, so they will be stored on that page.

In the favorites table, an icon is given the same as the user entering the item they like on the favorites page to make it easier for users to find items they want to buy another day. In the table seen, users can see information from the history of items that have been purchased by account users. In the table seen using the eye icon to provide an explanation the user can view information from the history of purchases that have been made. The Forgot Password table functions to help users display passwords that have been entered but have forgotten. In the forgot password table, use an icon to provide information that in that table is the security section of the account that has been created. In the light mode table to help users use it at night to turn all features dark so they are not too bright when used. To help users, this feature is given a light icon. After the light mode feature is activated, the entire system in the application will turn dark. Besides that, it can help save battery on the smartphone because it uses dark light. On this page, an exit feature is provided to help users after using the application. To make it easier for users to eat, an exit icon is given. Besides being enabled to leave the application, namely to avoid stealing user data from irresponsible parties. With the features on the user page, users can change data according to what the user wants.

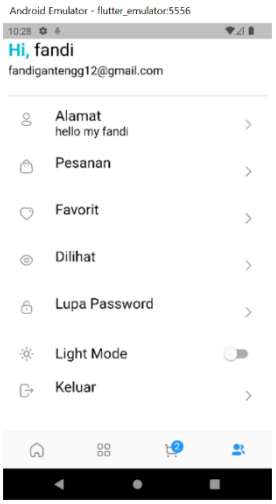


Figure 10. User page

- Address Page

On the address page in Figure 11, users can see a page that functions to enter the full address of the account owner. Users can enter the full address to update the account owner. After successfully updating, the full address that was previously entered will be automatically saved by the user's account. The feature of entering an address will make it easier for users to get recommendations for the closest seller when looking for fruit or vegetables.

ISSN 2961-7758

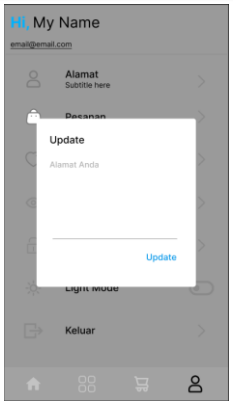


Figure 11. Address Page

- Sign Out

On the sign out page in Figure 12, the user can exit this application by using the exit feature. Users can view information about questions to users. There is a question asked to the user "Do you want to Sign Out?" to convince the user whether the user wants to exit this application or not. There is a person icon with an exclamation mark which serves to provide attention information to the account owner. On that page there are two choices for the owner of the user whether the user is sure to exit or not. The word NO written in blue enables the user account to remain logged in. The word that says OK in red enables it to exit the application.

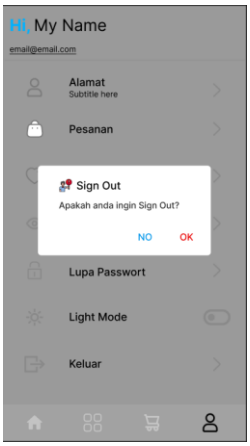


Figure 12. Sign Out

- Favorite page

On the favorites page in Figure 13, users can see the appearance of items that have been entered into favorites. Each table contains a description of the type of each item that has been preferred. The function of this favorites page is to make it easier for users to find fruits or vegetables that have previously been liked by buyers. There is information on pictures of goods to make it easier for users to see the types of goods being sold. There is information on the name of the fruit or vegetable being sold to assist the user in clarifying the description of the item being sold. In each table on the goods listed the total price for each type of goods displayed. There is a feature to add to the basket so that you can order the desired item. There is a red love icon which functions as a marker that the preferred item has entered the favorites page. There is a trash can icon which is used to delete the fruit list on the favorites page if the user no longer wants to buy it. There is the word Wishlist which provides information that this page is a page for items you like and often buy them. There is an arrow icon that helps enabled users to return to the user page to make it easier to use after entering into the basket.

Figure 13. Favorite page

- History page

On the history page in Figure 14, the user can see a view of the history of the fruit or vegetable that has previously been purchased. On this page, users can see information on the types of vegetables or vegetables they have previously purchased. There are pictures on each list to make it easier for users to view information from history after buying. Each image has information on the name of the type of each make or vegetable that the user has purchased. There is also price information on each item purchased according to the history of prices that have been purchased. There is a tick feature to help the user as a marker that the item has been purchased has been taken by the customer. There is a feature to delete history on the history list when it is no longer used by the user. The feature used to delete user history can put it in the trash icon. There is a description of the word History to inform users that this page is a page for viewing purchase history information from users. There is an arrow icon on that page which is enabled to return to the user page after viewing the history page. With this feature users have no trouble returning to the user page.

ISSN 2961-7758

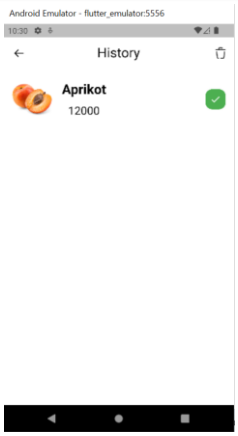


Figure 14. History page

- Admin Dashboard page

On the Admin Dashboard page in Figure 15, users can see the appearance of the Admin Dashboard page which is used as the admin of a store that sells fruit or vegetables in this fruit shop application. On the start page there are fruit and vegetable icons to make it feel comfortable on the eyes when used. Apart from that, it provides an easy-to-understand display. On the main page, the user immediately enters Gabian Main as the home page in that view. There is information from the display to make it easier for the user, so the description of the word Main is given on the page to indicate that the page functions as a home. In addition, a house icon is given to make it easier for users to understand so they can know that this page is the seller's home page. In this view the user can see the many features that have been provided. Apart from that, this feature helps admins sell their wares in the application. On that page there is the word Dashboard which provides information to users that the page displays all products sold on the online store application.

On this page there is a see all feature which functions to display all the products that have been sold in this application. There is the word Last Product on the display of the page which is used as a marker that the last product has been updated by the user. The display on this page provides a Search feature which can be enabled to search for old products and want to update these products. In addition, the Search feature can be used to search for products so that it is quicker when you have to read them one by one. The Search feature is given a blue color to help make it easier for users to see and provide comfort when used. A list of products that have previously been entered will appear on that page. In the product list there are pictures to provide information on each type of item sold by the seller. There is information on the total price displayed on the display to help the seller know that this is the price of the item being sold at the moment. There is a description of the name of the type of product being sold which provides information to the seller on each item being promoted. In addition, there is information on the amount of goods sold for prospective buyers to make it easier for users to calculate and determine the price of each product. At each product price displayed it is the amount of each product sold by the seller. There is a three-dot icon which is used to change the product that was previously displayed on the Admin Dashboard page. Users can change the contents as well as the information on the list of products being sold because the selling price of fruit and vegetables will change every day following the prices from the farmers. Admins from sellers can enter new products that they want to sell by going to the Add Product page. With this feature, it can help sellers to add new products that are ready to be traded.

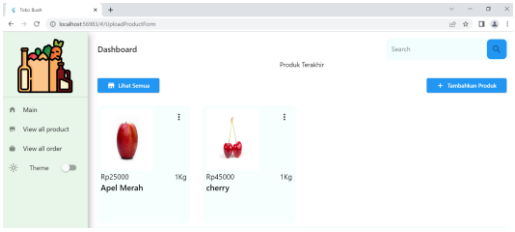


Figure 15. Admin Dashboard page

- Display Page of All Updated Products

On the display page of all products that are updated in Figure 16, the user can see that all products that have been updated by the seller will appear on that page. Users can enter the display page for all products after successfully entering View All Products on the start page. The View All Products list uses a shop icon to make it easier for users to provide information that this feature displays all products in the seller's online store. By providing a description of a sentence that reads View All Products, it provides a clearer understanding to the user. The page feature is provided to make it easier for users to find out which data has been updated by the seller or not yet updated by the seller. On that page there is information that reads All Products to the user.

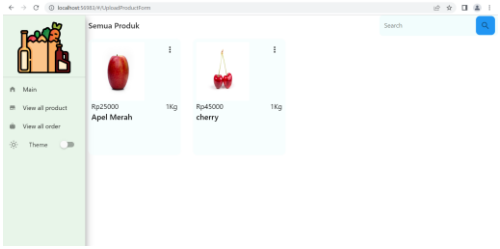


Figure 16. Display Page of All Updated Products

- Product Input Page

On the product input page in Figure 17, users can see all the features that work to enter new products on that page. Users can enter a new product name in the Product Name section that has been provided so that it helps buyers to find out the type of product being sold. Users can enter the price

ISSN 2961-7758

of the product they want to sell by adjusting it in the Price table. Users can choose a category for the product to make it easier to search for the products that have been provided. In addition, users can select these products to be included in the type of unit of measure to make calculations easier for sellers and buyers. In the select image feature, users can choose an image that matches the product name that has been entered. Users are required to fill in all existing data to add new products.

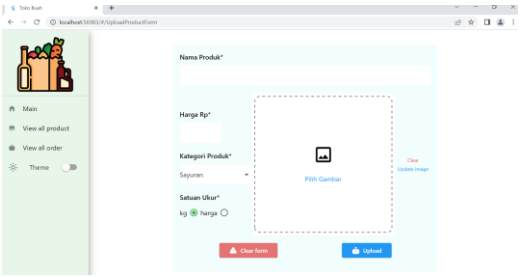


Figure 17. Product Input Page

- Product Edit Page

On the product edit page in Figure 18, users can see the existing features to change products that have not previously been entered after successfully entering through the three dots on the Admin Dashboard page. Users can see the sentence Edit This Product which functions to provide information that the admin can change all contents that have previously been entered. Users can update after filling in all the features on the page. Users can even delete data previously entered into the page. To make it easier for users to use the feature to save data after updating, a gear icon is used to make it easier for users to understand it. With the Update Image feature, users can take new photos to update old photos. In addition to giving a warning to the user that the data has been deleted, the data that has been entered will be deleted. Therefore, an exclamation point icon is given to help users understand the delete feature provided.

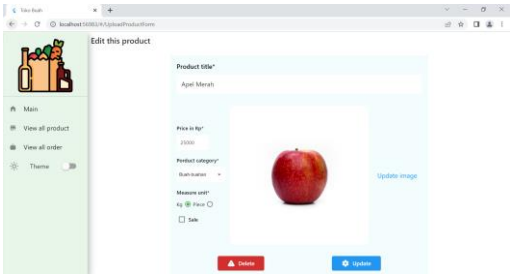


Figure 18. Product Edit Page

- Order Page

On the order page in Figure 19, users can see the appearance of the products that have been ordered by the buyer. With this feature the user can see information from the buyer that an order has been entered. Users can see the order page after successfully entering View all orders. To make it easier for users to understand, the basket bag icon is used to provide information that this feature is for viewing incoming orders. On that page the user can see the word All Orders which provides information that all incoming orders will appear on this page. At each order has information adjusting the order of the buyer. There are pictures in each order to make it easier for users of each type of item ordered. Has a description of the number of products ordered by the buyer. There is a price for each order to provide information so that later there are no errors when making payment transactions by buying. And can be used to check if an error occurs when making a transaction. There is information on behalf of the buyer to help users so that there are no errors in product packaging and when making transactions later. There is a description of the date, month and year on each order to help the seller so he can see information when the buyer places an order for the product being sold.

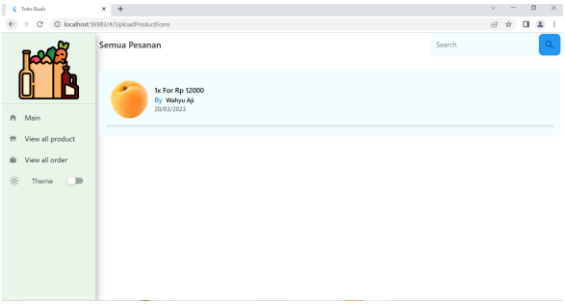


Figure 19. Order Page

With adequate features, such as designing an online buying and selling application, it aims to help users who have difficulty finding fresh fruits and vegetables. With this design, the researcher hopes that it can be used by the general public. In addition, this design can help promote Toko Buah Wien's Fresh.

Table 4. Question

No	Question	Index
1	Can the existence of a fruit and vegetable buying and selling application make it easier for users to buy vegetables and fruits?	84%
2	Do you agree that online buying and selling applications are more convenient to use than going to physical stores directly?	75%
3	Does the fruit and vegetable buying and selling application	88%

ISSN 2961-7758

	still need to be developed for the future?	
4	Does the fruit and vegetable buying and selling application make it easier to process online transactions and payments?	82%
5	Is the feature of the fruit and vegetable buying and selling application already in accordance with what the users need?	75%
6	Does the color scheme used in the fruit and vegetable buying and selling application provide comfort to the users?	80%
7	Are users interested in using the fruit and vegetable buying and selling application?	79%

In table 4 the respondents' answers are in the form of Strongly Agree(SS), Agree(S), Less Agree(KS), Disagree(TS), Strongly Disagree(STS). The results of these respondents were given a score to perform calculations through a Likert scale measurement. The scores are SS=5, S=4, KS=3, TS=2, STS=1. In ideal election circumstances, SS will be chosen with the ideal score of 5 highest score multiplied by the number of respondents x 66 = 330. So the result is (30x5)+(24x4)+(8x3)+(2x2)+(2x1)/330 x 100 % = 84%. The results of the second question are 20 respondents(5), 19 respondents(4), 19 respondents(3), 6 respondents(2), 2 respondents(1) so the result is (20x5)+(19x4)+(19x3)+(6x2) +(2x1)/330 x 100% = 75%. The results of the third question are 38 respondents(5), 19 respondents(4), 7 respondents(3), 0 respondents(2), 2 respondents(1) so the result is (38x5)+(19x4)+(7x3)+(0x2) +(2x1)/330 x 100% = 88%. The results of the fourth question are 25 respondents(5), 28 respondents(4), 10 respondents(3), 2 respondents(2), 1 respondent(1) so the result is (25x5)+(28x4)+(10x3)+(2x2) +(1x1)/330 x 100% = 82%. The results of the fifth question are 17 respondents(5), 22 respondents(4), 21 respondents(3), 5 respondents(2), 1 respondent(1) so the result is (17x5)+(22x4)+(21x3)+(5x2) +(1x1)/330 x 100% = 75%. The results of the sixth question are 20 respondents(5), 28 respondents(4), 15 respondents(3), 3 respondents(2), 0 respondents(1) so the result is (20x5)+(28x4)+(15x3)+(3x2) +(0x1)/330 x 100% = 80%. The results of the seventh question are 25 respondents(5), 21 respondents(4), 14 respondents(3), 5 respondents(2), 1 respondent(1) so the result is (25x5)+(21x4)+(14x3)+(5x2) +(1x1)/330 x 100% = 79%.

CONCLUSION AND RECOMMENDATION

Based on the results of research on the UI/UX design of the VegetableFruit application, it can be concluded that using the Sprint Design method can solve existing problems. With the VegetableFruit application, it can help people to meet their needs and the existence of this application makes it very easy for people to carry out a healthy lifestyle without being complicated because there is an application that is easy to understand for all people. Apart from that, this application can solve problems that arise in people who want to live a healthy lifestyle, but it is very difficult to find the fruit they need. Therefore, the existence of this application that uses the Design Sprint method is the most appropriate method in UI/UX design which will be used as the final result in this study.

Suggestions for Researchers are expected in the future to read more reference sources related to solving problems using the Design Sprint method so that research results will be even better in the future.

REFERENCE

Anggraini, W. F., Susanto, T., & Ahmad, I. (2022). Sistem Informasi Pemasaran Hasil Kelompok Wanita Tani Desa Sungai Langka Menggunakan Metode Design Sprint. *Jurnal Teknologi Dan Sistem Informasi (JTSI)*, *3*(1), 34–40. Retrieved from http://jim.teknokrat.ac.id/index.php/JTSI

Fadliyani Nawir, B. K. (2021). USABILITY TESTING PLATFORM PENJUALAN SAYUR ONLINE DI KOTA MAKASSAR DI MASA COVID 19. *Paper Knowledge . Toward a Media History of Documents*, *6*(1), 12–26. Retrieved from https://www.jurnal.syntaxliterate.co.id/index.php/syntax-literate/article/view/4703/2677

Faisal, P., & Kisman, Z. (2020). Information and communication technology utilization effectiveness in distance education systems. *International Journal of Engineering Business Management*, *12*, 1–9. https://doi.org/10.1177/1847979020911872

Hamdandi, M., Chandra, R., Bachtiar, F., Lais, N., Apriyanti, D., & Pribadi, M. R. (2022). Perancangan UI / UX Pada Aplikasi Bapakkost Dengan Metode Design Thinking. *MDP Student Conference 2022*, *7*(2021), 392–397.

Hidayati, N. L. (2022). Banyak makan makan sayur dan cukup buah-buahan. Retrieved February 17, 2023, from rsnas.kulonprogokab.go.id website: https://rsnas.kulonprogokab.go.id/detil/204/banyak-makan-sayuran-dan-cukup-buah-buahan

Isabel, M. (2022). *Design Sprint : Enhancing STEAM and*

ISSN 2961-7758

engineering education through agile prototyping and testing ideas es Su a e Antonio L o. *44*(September 2021). https://doi.org/10.1016/j.tsc.2022.101039

Khoirunisa, N. I., & Ramadhani, E. (2022). Implementasi Metode Design Sprint dalam Perancangan UI/UX Aplikasi Golek Kost Berbasis Mobile. *Jurnal Sistem Komputer Dan Informatika (JSON)*, *3*(4), 464. https://doi.org/10.30865/json.v3i4.4262

Liza Trisnawati, Setiawan, D., & Ryanto, S. (2023). ANTIDERM Dermatitis Consultation Application User Interface Design Model Using Design Sprint Method. *Journal International Multidisciplinary*, *1*(1), 1–17. https://doi.org/10.58794/jim.v1i1.193

Pambudianto, F. N. (2019). *Analisis dan Perancangan Desain Antarmuka Aplikasi Penjualan Makanan Sehat pada RSI Jemursari Surabaya dengan Metode Design Sprint*. 178.

Pfisterer, K. J., Boger, J., & Wong, A. (2019). *Prototyping the Automated Food Imaging and Nutrient Intake Tracking System : Modified Participatory Iterative Design Sprint Corresponding Author :* *6*, 1–15. https://doi.org/10.2196/13017

Prayoga, R., Defriani, M., & Irmayanti, D. (2022). Perancangan ui/ux pada aplikasi mobile penjualan di 3r stationary menggunakan metode design sprint 1,2,3. *SmartAI: Buletin Artificial …*, *1*(4), 207–218. Retrieved from https://ejournal.abivasi.id/index.php/SmartAI/article/view/40

Reza, P. C. F. (2021). BERBASIS ANDROID (Studi kasus : RW 03 Kampung Makasar Jakarta Timur). *Jurnal Sistem Informasi Dan Sains Teknologi*, *3*(1), 1–8.

Saputra, A. (2022). Potensi Ekspor Buah dan Sayur Segar. Retrieved February 18, 2023, from ukmindonesia.id website: https://www.ukmindonesia.id/baca-deskripsi-posts/potensi-ekspor-buah-dan-sayur-segar/

Tedyyana, A., Fauzi, M., Enda, D., Ratnawati, F., & Syam, E. (2022). Perancangan Aplikasi Tanggap Api Berbasis Android Menggunakan Metode Design Sprint. *Jurnal Teknologi Informasi Dan Ilmu Komputer*, *9*(2), 215. https://doi.org/10.25126/jtiik.2022914022

ISSN 2961-7758

Transfer Learning VGG16 For Image Classification of Tomato Leaf Disease

Elsa Dwi Nur Iffaty [1], Maimunah [2], Pristi Sukmasetya [3], Muhammad Resa Arif Yudianto [4]
[1,2,3,4] Informatics Engineering, Engineering, Universitas Muhammadiyah Magelang, Magelang, Indonesia, 56172
Email: elsadniffaty27@gmail.com[1]; maimunah@unimma.ac.id[2], pristi.sukmasetya@ummgl.ac.id[3], resamuhammad96@unimma.ac.id[4]

ABSTRACT

Tomatoes (*Solanum lycopersicum*) are one of Indonesia's mainstay horticultural commodities that are exported throughout Southeast Asia. However, the export value of tomatoes in 2021 recorded a decrease of 34.07% from 2020. The decline in the quality and quantity of tomatoes is generally caused by bacteria, fungi, viruses, and mite outbreaks that mostly attack the leaves such as late blight and two-spotted spider mite. This research utilizes one of the image processing methods to classify tomato leaf diseases in 3 labels, namely tomato healthy, tomato late blight, and tomato two-spotted spider mite. The image processing algorithm used in this research is Convolutional Neural Network (CNN) which can extract leaf image features in depth through its layer architecture. The VGG16 transfer learning architecture is used in this study because of its simple structure and can be modified by adding a fully connected layer, namely dropout with a value of 0.5 to adjust the model and improve its performance. Green Channel + CLAHE is also applied at the preprocessing stage with an epoch parameter of 30. The dataset used consists of 1,591 images of healthy tomato leaves, 1,909 images of late blight tomato leaves, and 1,676 images of two-spotted spider mite leaves. Two scenarios were conducted on the model, namely the model with callback function and the model without callback function. Based on the training and evaluation of the model that has been carried out, the model with the callback function is able to produce an accuracy value of 99.03% with precision for the labels tomato healthy 0.99, tomato late blight 1.00, and tomato two-spotted spider mite 0.98, and the number of incorrectly predicted images is only 15. This shows a higher value than the model without the callback function. Against 21 test images from other datasets, the model with callback function was able to produce accurate classification with high prediction values.

Keywords: leaf disease, tomato, late blight, two-spotted spider mite, transfer learning, vgg16

INTRODUCTION

Indonesia is known as one of the producers of horticultural commodities that are exported to the Southeast Asia region. One of the commodities that are widely cultivated and become a mainstay is tomato (*Solanum lycopersicum*) (L. Sahrani, 2021). This plant from the Solanaceae family in 2021 recorded an increase of 2.71% from 2020 with the largest production coming from West Java, North Sumatra, and West Sumatra. However, the export value in 2021 decreased by 34.07% (US$ 538.97 thousand) from 2020 (BPS RI/BPS-Statistics Indonesia, 2021). This is due to a decrease in the quality and quantity of tomato plants that are susceptible to diseases by bacteria, fungi, viruses, and mite outbreaks (Apriyadi et al., 2019).

A common tomato disease is late blight, caused by the fungus *Phytophthora infestans (Mont.) de Bary*, which thrives in cool, moist places. The initial symptoms of this disease are characterized by the appearance of black or brownish lesions on the edges and middle of the leaves as shown in Figure 1 (a) which then continues to spread until it damages the plant (H. Semangun, 1994). The two-spotted spider mite disease originates from *Tetranychus urticae* spider mite outbreaks as a result of excessive insecticide use. The bites of this spider mite cause pale yellow, reddish-brown spots ranging from small to large areas on the upper and lower leaf surfaces as shown in Figure 1 (Kemble et al., 2022).

(a) (b)

Source: Research Result (2023)

Figure 1. Tomato leaf disease (a) late blight (b) two-spotted spider mite

The characteristics of infected leaves tend to be similar, making it difficult for ordinary farmers to identify them. Astiningrum et al., 2020, in their research wrote that plant identification can be done through detecting the shape and texture of leaves through image processing. One of the image processing methods that can handle image classification well with significant results and is very suitable for large amounts of data is the Convolutional Neural Network (CNN) (Wahid et al., 2021). To maximize the performance of the CNN model without training the

ISSN 2961-7758

model from scratch, a transfer learning model is used (Kandel & Castelli, 2020). One of the transfer learning models that can be used is VGG16 with excellent model performance, and has a simple network structure that is relatively easy to modify (Jiang, 2019).

This research classifies tomato leaf diseases with the CNN method where the VGG16 architecture is used to maximize the performance of the classification model and over 5,176 tomato leaf images. So that the classification accuracy obtained is maximum and accurate. This research is expected to be a reference for learning the CNN method with a transfer learning model in future research. It can also help farmers in identifying tomato plant diseases so that later farmers are expected to carry out prevention and further treatment of tomato plants.

LITERATURE REVIEW

Image processing research with the VGG16 transfer learning architecture has been carried out on various datasets. In research conducted by Rismiyati & Luthfiarta, 2021, the VGG16 model was able to classify the quality of salak fruit in 370 salak images in good and bad classes with an accuracy of 95,83%. In a study conducted by Krishnaswamy Rangarajan & Purushothaman, 2020, 1,088 eggplant leaf images were classified with VGG16 into 4 leaf disease classes with an accuracy of 99.4%.

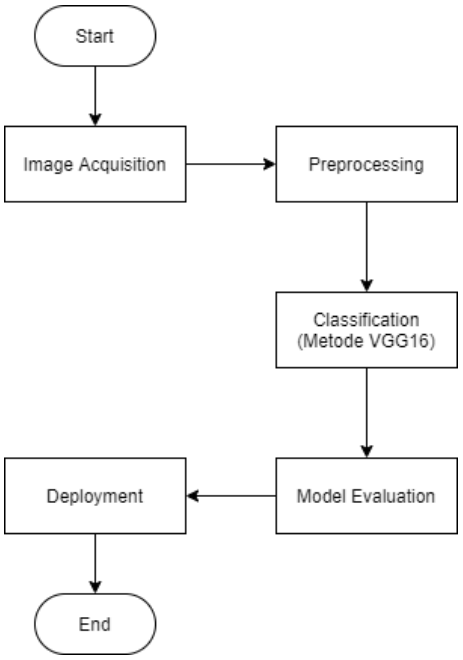
Meanwhile, Tan et al., 2021, have compared the classification of tomato leaf diseases with 10 classes of leaf diseases using machine learning and deep learning resulting in better accuracy of deep learning models than machine learning with an accuracy result for VGG16 of 98.9%. Wahid et al., 2022, have also classified tomato leaf diseases into 10 classes of tomato leaf diseases using InceptionV4 architecture and callback functions for 100 epochs resulting in a model accuracy of only 90%. The tomato leaf disease classification research conducted by Al-gaashani et al., 2022, on 5 classes of tomato leaf diseases with MobileNetV2 and NASNetMobile architecture resulted in model accuracy of 97%.

1. Convolutional Neural Network
   Convolutional Neural Network (CNN) was first introduced by Yann LeCun pada 1988. This method is a development of the multilayer perceptron with neurons connected to each other in different layers. Its ability to find hierarchical patterns in data and assemble more complex pixels from smaller, simpler pixels makes CNNs perform very well in handling the connectedness and complexity of image pixels. (Rasywir et al., 2020).

2. Transfer Learning VGG16
   Transfer learning is a method of knowledge transfer by utilizing models that have been extensively trained before. The existence of this technique makes training time shorter with increased model accuracy (Deep & Zheng, 2019). There are various transfer learning architectures commonly used in image processing, one of which is VGG16. Deng et al., 2009, in their research stated that this architecture has been trained with ImageNet images consisting of millions of images from 1000 classes which can then be used to train other datasets. The earliest architecture that successfully classifies ImageNet images with high accuracy is the Visual Geometric Group (VGG) developed by Oxford University with a total number of 16 layers in it and is known as VGG16.

METHOD

There are several stages in this research to classify tomato leaf diseases with the VGG16 transfer learning model as shown in Figure 2.



Source: Research Result (2023)

Figure 2. Research stages

The initial stage is taking the dataset to be used, then preprocessing the data by changing the color and noise reduction, resizing the image, and dividing the dataset into training data and testing data. The next stage is the classification process with transfer learning where the training data is trained using VGG16 and the final model results are evaluated with the testing data. Furthermore, deployment is carried out on the model that has been evaluated. Each stage is explained as follows.

1. Image Acquisition
   The acquisition of the dataset that will be used in the research is known as image acquisition (Lumute

ISSN 2961-7758

Unihehu & Suharjo, 2021). The dataset used for the classification of tomato leaf diseases in this study is secondary data of tomato leaf images obtained from Mahesh Babu's Kaggle which has been updated in June 2022 under the name Tomato Leaf Disease (K. Mahesh Babu, 2022). The image dataset used is a color or RGB (Red, Green, Blue) image with a size of 256x256 pixels and has a .jpg format and is labeled tomato healthy, tomato late blight, and tomato two spotted spider mite with details in Table 1.

Table 1. Tomato Leaf Image Details

Sample	Amount
Tomato Healthy	1.591
Tomato Late blight	1.909
Tomato Two spotted spider mite	1.676
Total	5.176

Source: Research Result (2023)

Tomato leaves are usually oval in shape with jagged leaf edges and form pinnate leaf slits (A. Ulfa Martyas, 2021). Healthy leaves have a dark green color and are fluffy (Mugiyanto & Nugroho, 2000). While leaves that have been infected with late blight will appear small spots like wounds that become pale green to brown and quickly expand to cover the leaf area. In humid weather, gray to white pathogens will appear on the lower surface of leaf lesions (Melanson, 2020). Even with two-spotted spider mite leaves, yellow spots will appear on the leaf base to the main leaf bone and can cause reddish leaves like rust when the mites spread. Worse, the lower and middle leaves will fall off, causing the buds to shrink in size. It is common to see white webs covering the leaves in the upper third of the plant causing the plant to die (Fasulo & Denmark, 2016).

2. Preprocessing

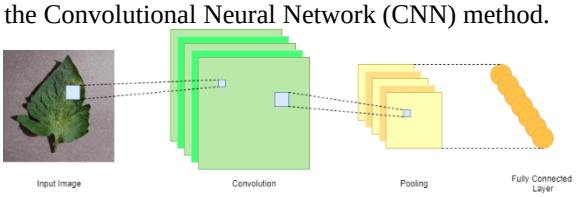
The dataset obtained is reduced to remove unnecessary information so that the image conditions are uniform so that the dataset can be used in the classification process is the purpose of the preprocessing stage (Yustika et al., 2019). In this study, the first stage of preprocessing was carried out by resizing the image (resize) from 256x256 pixels to a fixed size of 224x224 pixels. Image sizes that are neither too small nor too large can speed up the training process and use less memory without reducing the resolution (Ekananda & Riminarsih, 2022).

The resized image is extracted to the green channel to get a clearer image of healthy leaves, late blight, and two-spotted spider mite. Green channel is able to produce the best image of the red channel and blue channel (Desiani et al., 2021). Local contrast enhancement in the image is also done to bring out hidden features with the Contrast Limited Adaptive Histogram Equalization (CLAHE) (Kanditami et al., 2014). The resulting image is converted into an array as input to the model.

Next, the dataset is split and labeled with x features and y features. The last stage is to augment the image dataset. This stage aims to overcome overfitting that may occur because CNN memorizes detailed features from training data that cannot be generalized, so that the image dataset will increase without losing the characteristics of each image.

3. Classification with VGG16

The next stage is to classify tomato leaf images with the Convolutional Neural Network (CNN) method.



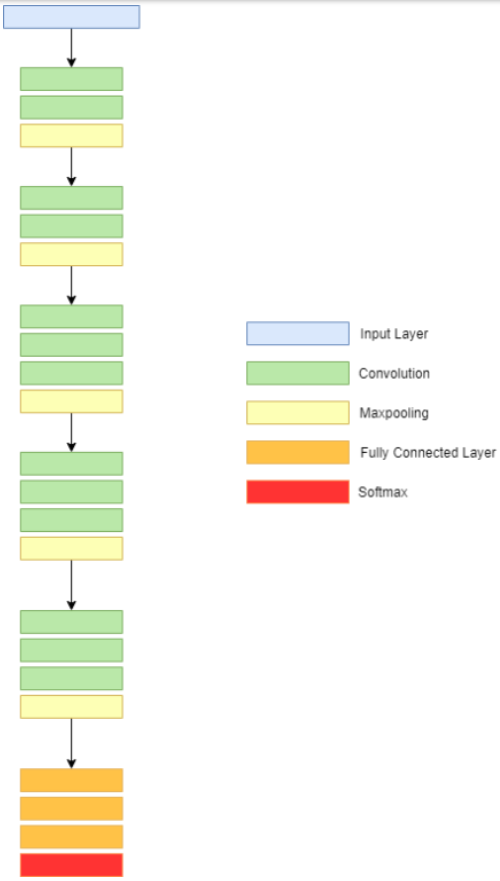
Source: Research Result (2023)

Figure 3. Convolutional Neural Network (CNN) Architecture

Figure 3 is a simple CNN architecture with the first stage layer in the identification process called the convolution layer. This layer will extract the texture from the leaf image and the results will be pooled. The final stage in this method is the fully connected layer which will make decisions based on the features that have been collected by convolution and pooling (Rozaqi et al., 2021).

This research uses the transfer learning model VGG16 to improve the accuracy of the model without its training time. The convolution and pooling layer architecture in VGG16 is deeper than the simple CNN architecture as shown in Figure 4.

ISSN 2961-7758



Source: Research Result (2023)

Figure 4. VGG16 Architecture

4. Model Evaluation

The model that has been trained is then evaluated with a confusion matrix based on criteria (Tharwat, 2018) dan equations (Lu et al., 2021):

a. Precision: indicates the ratio of correct positive predictions to total positive predictions with the formula as shown in equation (1). A high precision value means fewer wrong prediction errors.

$$Precision = \frac{TP}{TP + FP} \quad (1)$$

b. Recall: the ratio of correct positive predictions to all observations in the actual class with the formula as shown as in equation (2). A high recall value means that the model correctly identifies more actual positive observations.

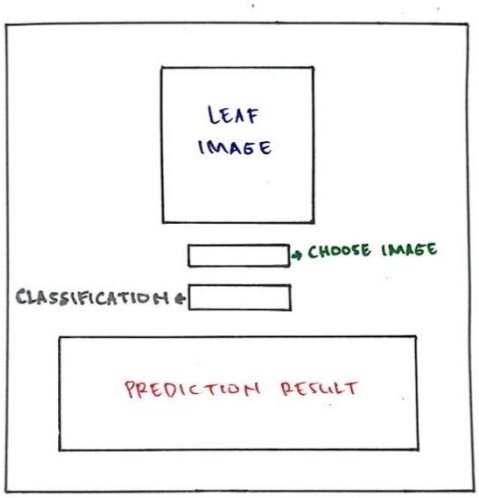
$$Recall = \frac{TP}{TP + FN} \quad (2)$$

c. F1-score: harmonious average of precision and recall with the function of providing a balance between precision and recall with the formula as shown in equation (3).

$$F1 = \frac{2 \cdot precision \cdot recall}{precision + recall} \quad (3)$$

5. Deployment

The classification model that has been trained is then stored and deployed. Deployment is intended to make it easier for users to understand the process of identifying healthy tomato leaves, late blight, and two-spotted spider mite by utilizing tomato leaf images. Deployment in python is done by creating a Graphical User Interface (GUI) application using QtDesigner, so that the application design is more flexible (Utami, 2021) including image input and accuracy results on images such as Figure 5.



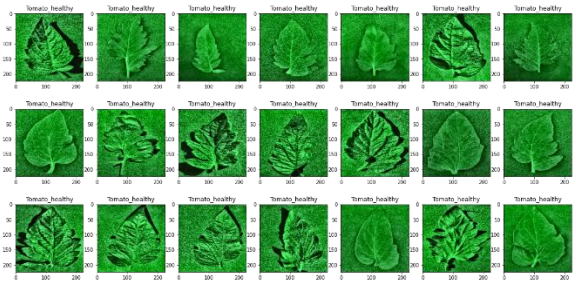
Source: Research Result (2023)

Figure 5. Classification Page Design

RESULT AND DISCUSSION

1. Preprocessing Result

In the preprocessing stage, the image size is changed to 224x224 pixels and then extracted to the green channel and CLAHE to bring up the hidden features with the results as shown in Figure 6.



Source: Research Result (2023)

Figure 6. Green Channel dan CLAHE Result Image

Hidden features aim to detect lesions, spots, or blotches in the leaf image. A clip boundary value of

ISSN 2961-7758

3.0 and a grid size of 8.8 are given to control contrast enhancement and control the size of the square region where histogram equalization is applied.

In this study, color spots and lesions on leaves can be detected. Thus, the model can distinguish between healthy leaves and leaves with late blight or two-spotted spider mite. The location and size of spots and lesions on the leaf image also appear more clearly.

Table 2. Split Dataset

Split Data	Data Percentage	Number of Data
Training	70%	3.623
Testing	30%	1.553
Total		5.176

Source: Research Result (2023)

Table 2 shows the percentage split of the dataset that has been labeled with feature x and label y. The data type of the x feature is converted to float32, while the y label is converted to categorical format. The split with the percentages in Table 2 gives the best results according to the empirical analysis (Gholamy et al., 2018).

The next stage in the preprocessing process in this research is augmentation with the aim of avoiding overfitting that may occur. Overfitting is a situation where the accuracy of training data increases until the last epoch, while the accuracy and loss of validation data does not increase due to the small amount of training data in the model (Fadli Gunardi, 2022). There is no specific rule for the amount of augmentation, so this research uses the amount of augmentation shown in Figure 7.

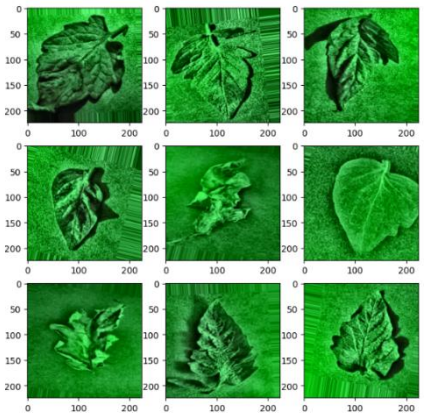
```
datagen = ImageDataGenerator(
    rescale=1./255,
    rotation_range=15,
    shear_range=0.1,
    zoom_range=0.2,
    width_shift_range = 0.1,
    height_shift_range = 0.1,
    horizontal_flip=True,
    vertical_flip=True,
    fill_mode='nearest'
    )
datagen.fit(X_train)
```

Source: Research Result (2023)

Figure 7. Data Augmentation

In this study, the rescale parameter used is 1./255 to change the pixel value from 0-255 to 0-1. This is done so that the range of pixel values becomes smaller to facilitate the model training process. Furthermore, the image rotation degree range is set at 15, which means that at each iteration in each epoch, the image will be randomly rotated in the degree range of -15 to 15 degrees. Furthermore, the shear transformation (shear range) in the image is determined with a range of 0.1 and to zoom in the image is determined with a range of 0.2. To perform horizontal and vertical image shifts, the width shift range and height shift range are set to 0.1.

Furthermore, horizontal flip and vertical flip are set to 'True', which means the image will be randomly flipped horizontally (mirror) or vertically at each iteration in each epoch. With 'nearest' fill mode, pixels in the image that are not covered by the image after transformation will be filled with the nearest pixel value from the original image. Thus, the leaf images for training the model will be more varied. The 9 augmented images are shown in Figure 8.



Source: Research Result (2023)

Figure 8. Augmented Image

2. Classification Result

The training process in this study uses 30 epoch parameters, SGD optimizer, learning rate 0.001, and loss function with category cross entropy. A large number of epochs does not guarantee a better model, so the number of epochs can be reduced to shorten the training process (Valentina et al., 2020). In this study, 2 scenarios were used, namely scenario A without a callback function and scenario B with a callback function which is a function of FastAI to stop the model when it reaches the best accuracy of the model (Uppari, 2020).

Table 3. Function Usage Scenario

Alias	Scenario
SA	Non-callback
SB	Callback

Source: Research Result (2023)

ISSN 2961-7758

Based on the SA model training process and SB experiments at 30 epochs, the accuracy and loss plots are obtained with the results in Table 4.

Table 4. Accuracy Results with Scenarios

Scenario	Action	Validation Accuracy	Validation Loss	Epoch
A	Without callback function	96.27%	13.35%	30
B	With callback function	99.03%	2.83%	19

Source: Research Result (2023)

Table 4 shows the SA training process where the model stopped at the 30th epoch. This shows that the model is updated 30 times after going through all the training data, until the validation accuracy is 0.9627 and the validation loss is 13.35%, so the model accuracy is 96.27%. Whereas in SB, the callback function is given a provision if the validation accuracy value is greater than 0.9850 then the message "ACCURACY FULFILLED" will be printed, so that the validation and loss plots are stopped at the 19th epoch with a validation accuracy of 0.9903 and a validation loss of 2.83%, so that the model accuracy is 99.03%. This is because the callback function in PB sets the stop_training attribute of the model object to True. Thus, the training process will stop when the desired accuracy has been achieved. Thus, the callback function affects the accuracy value of the resulting model.

The validation accuracy value in SA and SB appears to be lower than the validation loss value. This means they both perform well and predict labels with a high degree of accuracy. However, there is still a possibility of overfitting or underfitting (Ghojogh & Crowley, 2019), so it is necessary to test on testing data that is not involved in the training process to ensure that the model performs well on new data.

3. Model Evaluation

Model evaluation with precision, recall, and f1-sore metrics can be seen in Table 5 and Table 6.

Table 5. Classification Report SA

Label	Precision	Recall	F1-score
Tomato Healthy	0,97	0,99	0,98
Tomato Late Blight	1,00	0,91	0,95
Tomato Two-spotted Spider Mite	0,92	1,00	0,96

Source: Research Result (2023)

Table 5 shows the SA classification report with precision, recall, and f1-score values for healthy tomato, late blight tomato, and spider mite tomato labels close to 1.

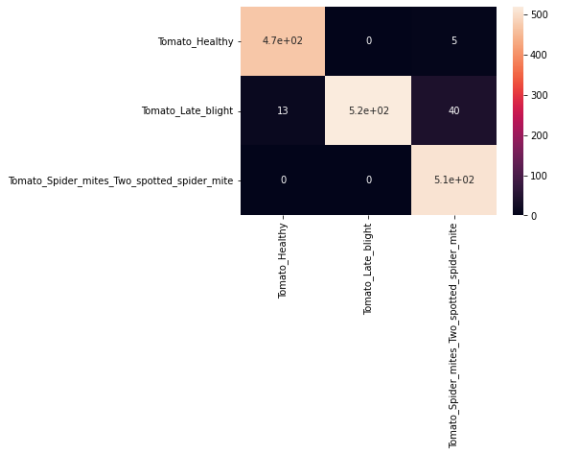
Table 6. Classification Report SB

Label	Precision	Recall	F1-score
Tomato Healthy	0,99	1,00	0,99
Tomato Late Blight	1,00	0,98	0,99
Tomato Two-spotted Spider Mite	0,98	0,99	0,99

Source: Research Result (2023)

Table 6 shows the classification report of SB with precision, recall, and f1-score values for tomato healthy, tomato late blight, and tomato two-spotted spider mite labels close to 1.

Evaluation of the model is also visualized with a confusion matrix to compare the predicted label with the actual label and as an illustration of how well the model works and can be used to calculate its performance measures.



Source: Research Result (2023)

Figure 9. Confusion Matrix SA

Confusion matrix in Figure 9 shows some prediction errors on SA testing data, without callback function. Of the 3 tomato leaf image labels with 1,553 images, 1,495 images were predicted correctly and 58 images were predicted incorrectly which can be seen in Table 7.

Table 7. Prediction Error on Testing Data SA

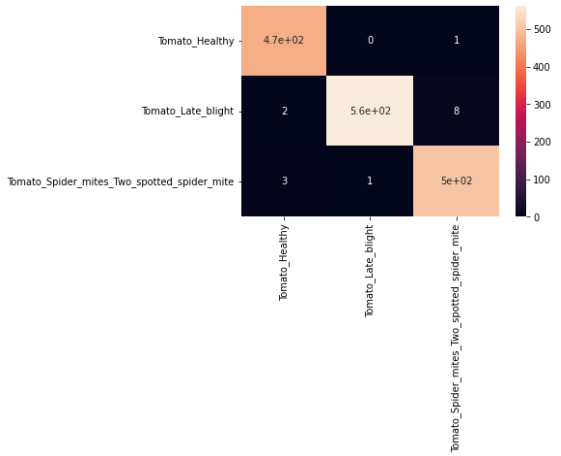
Label	Correct Prediction	Wrong Prediction

ISSN 2961-7758

Healthy	469	5
Late blight	519	53
Two-spotted spider mite	507	0
Total	1.495	58

Source: Research Result (2023)

Furthermore, the confusion matrix for the SB model can be seen in Figure 10.



Source: Research Result (2023)

Figure 10. Confusion Matrix SB

Confusion matrix in Figure 10 shows some prediction errors on SB testing data, with the callback function. Of the 3 tomato leaf image labels with 1,553 images, 1,538 images were predicted correctly and 15 images were predicted incorrectly which can be seen in Table 8.

Table 8. Prediction Error on Testing Data SB

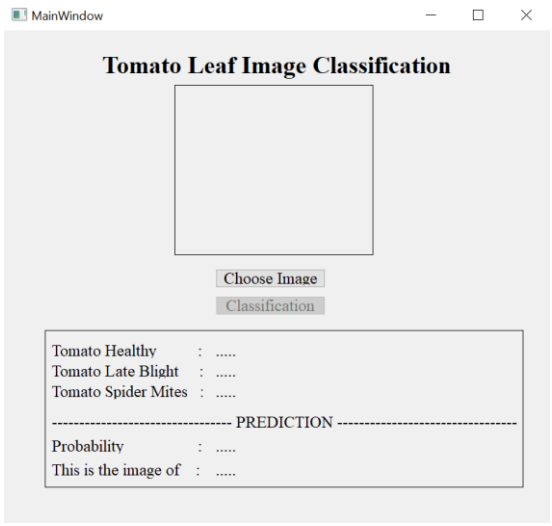
Label	Correct Prediction	Wrong Prediction
Healthy	473	1
Late blight	562	10
Two-spotted spider mite	503	4
Total	1.538	15

Source: Research Result (2023)

Classification reports of SA and SB show the precision, recall, and f1-score values of the three labels are almost close to 1, which means that both models have good performance (Chicco et al., 2021). However, the precision, recall, and f1-score values of SB with callback function are higher than SA without callback function. Also, the prediction error of SB is only 15 images while SA reaches 58 images. Thus, SB is a better classification model than SA.

4. Deployment

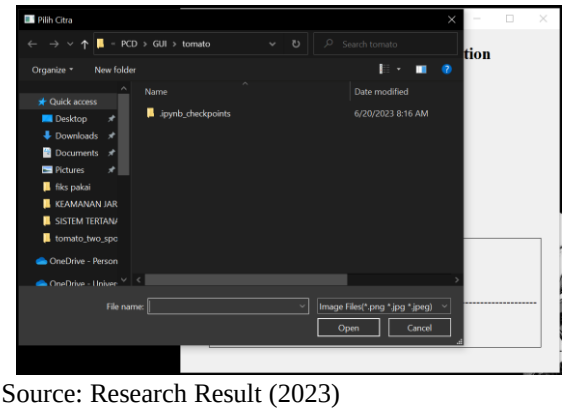
In this study, deployment was carried out to facilitate users in classifying late blight and two-spotted spider mite leaf diseases. The model stored and deployed is the scenario B (SB) classification model, which is a model with a callback function that produces better accuracy than the scenario A (SA) classification model without a callback function. The deployment view of tomato leaf disease classification can be seen in Figure 11.



Source: Research Result (2023)

Figure 11. GUI Interface

Next, the image is selected by pressing the 'Choose Image' button and will be directed to the 'File Explorer' for the location of the leaf image to be input. After the image is selected, the user can press the 'Open' button. The display looks like in Figure 12.

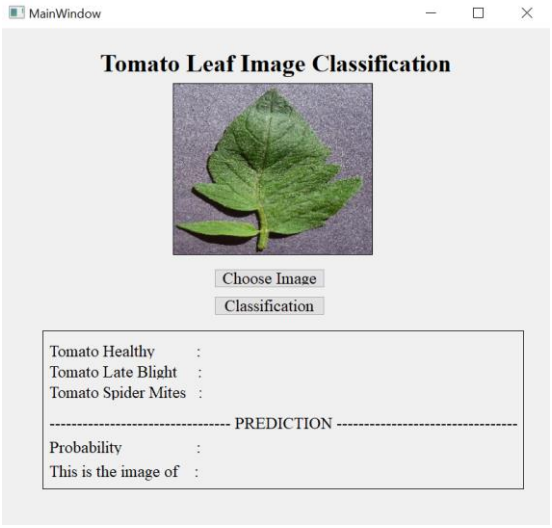


Source: Research Result (2023)

Figure 12. 'Choose Image' Menu Interface

ISSN 2961-7758

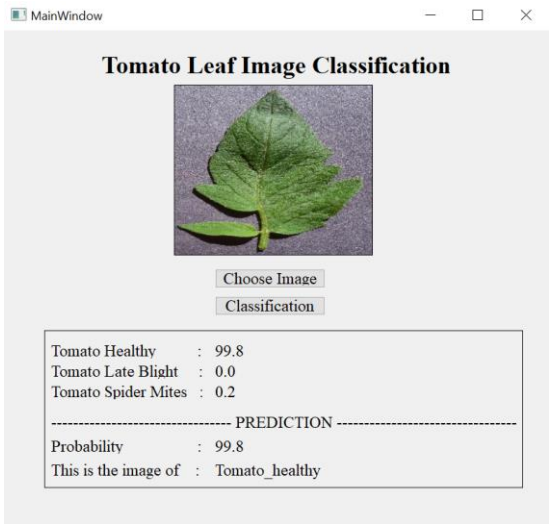
The successfully inputted image is shown in Figure 13. The user can then press the 'Classification' button and the model will identify and predict the image.



Source: Research Result (2023)

Figure 13. Input Image Interface

The prediction results on the input leaf image as shown in Figure 14. There is a description of the percentage of the 3 detected leaf labels. The percentage of tomato healthy shows a greater value than tomato late blight and tomato spider mite, so the leaf image is identified as a healthy leaf.



Source: Research Result (2023)

Figure 14. Prediction Result Interface

Furthermore, testing experiments on the model were carried out by inputting 21 images of tomato leaves from 3 labels, namely tomato healthy, tomato late blight, and tomato two-spotted spider mite which were different from the dataset used for model training. The dataset was taken from Romir Mehta's Kaggle and updated April 3, 2023 under the name potato-tomato-strawberry (Romir Mehta, 2023). The results of testing 21 tomato leaf images can be seen in Table 9, Table 10, and Table 11 with probability values for tomato healthy (H), tomato late blight (LB), and tomato two-spotted spider mite (TSM).

Table 9. Tomato Healthy Test Result

Image	Scenario	H	LB	TSM	Prediction
	SA	99.9	0.0	0.1	Tomato_healthy
	SB	97.0	0.1	3.0	Tomato_healthy
	SA	100.0	0.0	0.0	Tomato_healthy
	SB	99.6	0.0	0.4	Tomato_healthy
	SA	100.0	0.0	0.0	Tomato_healthy
	SB	98.3	1.3	0.4	Tomato_healthy
	SA	99.9	0.0	0.1	Tomato_healthy
	SB	99.6	0.1	0.3	Tomato_healthy
	SA	98.6	0.0	1.3	Tomato_healthy
	SB	6.8	0.1	93.1	Tomato_Spider_mites
	SA	100.0	0.0	0.0	Tomato_healthy
	SB	100.0	0.0	0.0	Tomato_healthy
	SA	98.7	0.0	1.3	Tomato_healthy
	SB	65.6	1.9	32.5	Tomato_healthy

Source: Research Result (2023)

Table 9 shows the test results for 7 images of healthy tomato leaves with SA and SB. Based on the test results, SB produces 1 prediction error, where the healthy tomato leaf is detected as a tomato two-spotted spider mite with a fairly high probability value.

ISSN 2961-7758

Table 10. Tomato Late Blight Test Result

Citra	Scenario	H	LB	TSM	Prediction
	SA	7.2	17.3	75.5	Tomato_Spider_mites
	SB	0.0	99.9	0.0	Tomato_Late_blight
	SA	45.6	53.7	0.7	Tomato_Late_blight
	SB	0.0	100.0	0.0	Tomato_Late_blight
	SA	0.5	91.4	8.1	Tomato_Late_blight
	SB	0.0	100.0	0.0	Tomato_Late_blight
	SA	99.9	0.1	0.0	Tomato_healthy
	SB	1.5	98.5	0.0	Tomato_Late_blight
	SA	0.1	99.6	0.3	Tomato_Late_blight
	SB	0.0	100.0	0.0	Tomato_Late_blight
	SA	92.5	7.5	0.0	Tomato_healthy
	SB	0.0	100.0	0.0	Tomato_Late_blight
	SA	97.2	2.8	0.0	Tomato_healthy
	SB	0.2	99.7	0.0	Tomato_Late_blight

Source: Research Result (2023)

Table 10 shows the test results of 7 images of tomato late blight leaves with SA and SB. Based on the test results, SA produced 4 mispredictions, where 1 image was detected as tomato two-spotted spider mite and 3 images were detected as tomato healthy with a high probability value.

Table 11. Tomato Two-spotted Spider Mite Test Result

Citra	Skenario	H	LB	TSM	Prediction
	SA	0.0	0.0	100.0	Tomato_Spider_mites
	SB	0.0	0.1	99.9	Tomato_Spider_mites
	SA	0.0	0.0	100.0	Tomato_Spider_mites
	SB	0.0	0.0	100.0	Tomato_Spider_mites
	SA	0.5	0.0	99.5	Tomato_Spider_mites
	SB	0.1	10.7	89.2	Tomato_Spider_mites
	SA	0.5	0.0	99.5	Tomato_Spider_mites
	SB	0.0	0.2	99.7	Tomato_Spider_mites
	SA	0.1	0.0	99.9	Tomato_Spider_mites
	SB	0.0	0.0	100.0	Tomato_Spider_mites
	SA	0.1	0.0	99.9	Tomato_Spider_mites

ISSN 2961-7758

	SB	0.0	3.8	96.2	Tomato_ Spider_ mites
	SA	0.0	0.0	100. 0	Tomato_ Spider_ mites
	SB	0.0	0.1	99.9	Tomato_ Spider_ mites

Source: Research Result (2023)

Table 11 shows the test results of 7 tomato two-spotted spider mite leaf images with SA and SB. Based on the test results, both SA and SB successfully predicted the image as tomato two-spotted spider mite.

The results of testing 21 tomato leaf images from 3 labels, both SA and SB models are able to provide predictions of tomato healthy, tomato late blight, and tomato two-spotted spider mite with a fairly high accuracy. However, SA, a model with a non-callback scenario, made 4 errors in the tomato late blight test, while SB, a model with callback, only made 1 prediction error in the tomato healthy test. The magnitude of the probability value produced in the SB model is more specific than that of SA. Thus, the SB model is better at predicting both tomato healthy leaves and tomato late blight and tomato two-spotted spider mite.

CONCLUSION AND RECOMMENDATION

Based on the results of research on the classification model of 5,176 tomato leaf images from 3 labels, namely tomato healthy, tomato late blight, and tomato two-spotted spider mite with epoch parameters of 30, SGD optimizer, learning rate 0.001, and loss function with category cross entropy using Convolutional Neural Network (CNN) architecture and VGG16 transfer learning implementation, it can be concluded that the model is able to provide excellent results with an accuracy rate of 99.03%. The use of green channel + CLAHE, and augmentation in preprocessing can provide a variety of datasets in the model training process and make the image clearer. The model modifications made in this study also improved the performance of the model. The use of non-callback model scenarios and callback models also affects the accuracy value or the resulting probability value. In testing 21 images from 3 labels, it shows that the model scenario with the callback function provides more accurate and specific prediction results compared to the non-callback model. The use of CNN method with VGG16 transfer learning is certainly very effective in image processing. The simple and modifiable architecture of VGG16 can improve the performance of the model to adapt to different datasets and produce a more accurate model in predicting image labels.

REFERENCE

A. Ulfa Martyas. (2021). Pengaruh Pemberian Pupuk Kotoran Kambing Terhadap Pertumbuhan Tanaman Tomat (Solanum lycopersicum). *Repository UIN Sultan Thaha Saifuddin*. http://repository.uinjambi.ac.id/id/eprint/10632

Al-gaashani, M. S. A. M., Shang, F., Muthanna, M. S. A., Khayyat, M., & Abd El-Latif, A. A. (2022). Tomato leaf disease classification by exploiting transfer learning and feature concatenation. *IET Image Processing*, *16*(3), 913–925. https://doi.org/10.1049/ipr2.12397

Apriyadi, Z., Liestiany, E., & Rodinah. (2019). Proteksi Tanaman Tropika 2(02):1 Juni 2019 Pengendalian Biologi Penyakit Layu Bakteri (Ralstonia solanacearum) Pada Tanaman Tomat (Lycopersicon esculentum). *Jurnal Proteksi Tanaman Tropika*, *2*(02), 108–114. http://103.81.100.242/index.php/jpt/article/view/149

Astiningrum, M., Prima Arhandi, P., Aqmarina Ariditya, N., Teknologi Informasi, J., & Negeri Malang, P. (2020). *JIP (Jurnal Informatika Polinema) Identifikasi Penyakit Pada Daun Tomat Berdasarkan Fitur Warna Dan Tekstur*. *6*(2), 47–50. http://jurnalti.polinema.ac.id/index.php/SIAP/article/view/496

BPS RI/BPS-Statistics Indonesia. (2021). *Statistik Hortikultura 2021* (Direktorat Statistik Tanaman Pangan Hortikultura dan Perkebunan, Ed.). BPS RI/BPS-Statistics Indonesia. https://www.bps.go.id/publication/2022/06/08/44e935e8c141bcb37569aed3/statistik-hortikultura-2021.html

Chicco, D., Tötsch, N., & Jurman, G. (2021). The matthews correlation coefficient (Mcc) is more reliable than balanced accuracy, bookmaker informedness, and markedness in two-class confusion matrix evaluation. *BioData Mining*, *14*, 1–22. https://doi.org/10.1186/s13040-021-00244-z

Deep, S., & Zheng, X. (2019). Leveraging CNN and Transfer Learning for Vision-based Human Activity Recognition. *2019 29th International Telecommunication Networks and Applications Conference (ITNAC)*, 1–4. 10.1109/ITNAC46935.2019.9078016

Deng, J., Dong, W., Socher, R., Li, L.-J., Li, K., & Fei-Fei, L. (2009). ImageNet: A Large-Scale Hierarchical Image Database. *2009 IEEE Conference on Computer*

ISSN 2961-7758

Vision and Pattern Recognition, 248–255. 10.1109/CVPR.2009.5206848.

Desiani, A., Alwine, D., #2, Z., Primartha, R., #4, F. E., Avisa, N., Andriani, C., Masjid, J., Gazali, A., Lama, B., Palembang, K., & Selatan, S. (2021). Variasi Thresholding untuk Segmentasi Pembuluh Darah Citra Retina. *JEPIN (Jurnal Edukasi Dan Penelitian Nasional)*, *7*(2), 255–262. http://dx.doi.org/10.26418/jp.v7i2.47205

Ekananda, N. P., & Riminarsih, D. (2022). Identifikasi Penyakit Pneumonia Berdasarkan Citra Chest X-Ray Menggunakan Convolutional Neural Network. *Jurnal Ilmiah Informatika Komputer*, *27*(1), 79–94. https://doi.org/10.35760/ik.2022.v27i1.6487

Fadli Gunardi, M. (2022). *Implementasi Augmentasi Citra pada Suatu Dataset*. https://informatika.stei.itb.ac.id/~rinaldi.munir/Citra/2022-2023/Makalah/Makalah-IF4073-Citra-Sem1-2022%20(24).pdf

Fasulo, T. R., & Denmark, H. A. (2016). *Twospotted Spider Mite, Tetranychus urticae Koch (Arachnida: Acari: Tetranychidae)* *1*. https://journals.flvc.org/edis/article/download/109059/104197

Ghojogh, B., & Crowley, M. (2019). *The Theory Behind Overfitting, Cross Validation, Regularization, Bagging, and Boosting: Tutorial*. http://arxiv.org/abs/1905.12787

Gholamy, A., Kreinovich, V., & Kosheleva, O. (2018). *A Pedagogical Explanation A Pedagogical Explanation Part of the Computer Sciences Commons*. https://scholarworks.utep.edu/cs_techrephttps://scholarworks.utep.edu/cs_techrep/1209

H. Semangun. (1994). *Penyakit Penyakit Tanaman Hortikultura*. Gadjah Mada University Press. https://www.academia.edu/40830883/Penyakit_Penyakit_Tanaman_Hortikultura_Di_Indonesia_Haryono_Semangun_.

Jiang, Z. (2019). A Novel Crop Weed Recognition Method Based on Transfer Learning from VGG16 Implemented by Keras. *IOP Conference Series: Materials Science and Engineering*, *677*(3). https://doi.org/10.1088/1757-899X/677/3/032073

K. Mahesh Babu. (2022). *Tomato Leaf Disease*. Kaggle.Com. https://www.kaggle.com/datasets/kmaheshbabu/tomato-leaf-diseases

Kandel, I., & Castelli, M. (2020). Transfer learning with convolutional neural networks for diabetic retinopathy image classification. A review. *Applied Sciences (Switzerland)*, *10*(6). https://doi.org/10.3390/app10062021

Kanditami, F., Saipudin, D., & Rizal, A. (2014). Analisis Contrast Limited Adaptive Histogram Equalization (CLAHE) Dan Region Growing Dalam Deteksi Gejala Kanker Payudara Pada Citra Mammogram. *Jurnal Elektro*, *11*(2). https://staff.telkomuniversity.ac.id/wp-content/uploads/sites/11/2013/12/jurnal235_Freysenita_elektro_2014_akhir.pdf

Kemble, J., Bertucci, M., Jennings, K., Rodrigues, C., Walgenbach, J., Wszelaki, A., Sebel Associate Publisher, G., Olwell Western Account Manager, C., & Kloosterman Associate Editor, S. (2022). *2022 Vegetable Crop Handbook for Southeastern United States Great American Media Services*. www.vegcrophandbook.com

Krishnaswamy Rangarajan, A., & Purushothaman, R. (2020). Disease Classification in Eggplant Using Pre-trained VGG16 and MSVM. *Scientific Reports*, *10*(1). https://doi.org/10.1038/s41598-020-59108-x

L. Sahrani. (2021). *Klasifikasi Penyakit Daun Tomat Berdasarkan Ekstraksi Tekstur Daun Menggunakan Gabor Filter Dan Algoritma Support Vector Machine*. http://repository.uinsu.ac.id/13431/

Lu, J., Tan, L., & Jiang, H. (2021). Review on convolutional neural network (CNN) applied to plant leaf disease classification. In *Agriculture (Switzerland)* (Vol. 11, Issue 8). MDPI AG. https://doi.org/10.3390/agriculture11080707

Lumute Unihehu, A., & Suharjo, I. (2021). Klasifikasi Jenis Ikan Berbasis Jaringan Saraf Tiruan Menggunakan Algoritma Principal Component Analysis (PCA). *Jurnal Ilmiah Ilmu Komputer*, *7*(2). https://doi.org/10.35329/jiik.v7i2.200

Melanson, R. (2020). *Common Diseases of Tomatoes*. http://extension.msstate.edu/publications/common-diseases-tomatoes

Mugiyanto, & Nugroho, H. (2000). *Budidaya Tomat*. Badan Penelitian dan Pengembangan Pertanian Instalasi Penelitian dan Pengkajian Teknologi Pertanian Kota Baru Jambi. http://repository.pertanian.go.id/handle/123456789/14374

Rasywir, E., Sinaga, R., Pratama, Y., Dinamika, U., & Jambi, B. (2020). *Analisis dan Implementasi Diagnosis Penyakit Sawit dengan Metode Convolutional Neural Network (CNN)*. *22*(2). https://doi.org/10.31294/p.v21i2

ISSN 2961-7758

Rismiyati, & Luthfiarta, A. (2021). VGG16 Transfer Learning Architecture for Salak Fruit Quality Classification. *Jurnal Informatika Dan Teknologi Informasi*, *18*(1), 37–48. https://doi.org/10.31515/telematika.v18i1.4025

Romir Mehta. (2023). *Potato-tomato-strawberry*. Kaggle.Com. https://www.kaggle.com/datasets/romirmehta07/potato-tomato-strawberry

Rozaqi, A. J., Sunyoto, A., & Arief, M. R. (2021). Seminar Nasional & Call Paper Fakultas Sains dan Teknologi (SENASAINS 1 st). *Procedia of Engineering and Life Science*, *1*(1). https://doi.org/10.21070/pels.v1i1.820

Tan, L., Lu, J., & Jiang, H. (2021). Tomato Leaf Diseases Classification Based on Leaf Images: A Comparison between Classical Machine Learning and Deep Learning Methods. *AgriEngineering*, *3*(3), 542–558. https://doi.org/10.3390/agriengineering3030035

Tharwat, A. (2018). Classification assessment methods. *Applied Computing and Informatics*, *17*(1), 168–192. https://doi.org/10.1016/j.aci.2018.08.003

Uppari, R. R. (2020). *Comparison Between KERAS Library and FAST.AI Library using Convolution Neural Network (Image Classification) Model* [Dublin Business School]. https://esource.dbs.ie/handle/10788/4249

Utami, D. A. B. (2021). *Perancangan Sistem Login Pada Aplikasi Berbasis GUI Menggunakan QTDesigner Python* (Vol. 4, Issue 2). https://jurnal.darmajaya.ac.id/index.php/SIMADA/article/view/2961/1382

Valentina, R., Rostianingsih, S., & Tjondrowiguno, A. N. (2020). *Pengenalan Gambar Botol Plastik dan Kaleng Minuman Menggunakan Metode Convolutional Neural Network*.

Wahid, M. I., Lawi, A., Muh, D. A., & Siddik, A. (2022). Perbandingan Kinerja Model Ensembled Transfer Learning Pada Klasifikasi Penyakit Daun Tomat. *Prosiding Seminar Nasional Teknik Elektro Dan Informatika (SNTEI) 2022-Teknik Informatika*, *8*(1), 286–291. http://118.98.121.208/index.php/sntei/article/view/3630

Wahid, M. I., Mustamin, S. A., & Lawi, D. A. (2021). Identifikasi Dan Klasifikasi Citra Penyakit Daun Tomat Menggunakan Arsitektur Inception V4. *Konferensi Nasional Ilmu Komputer (KONIK) 2021*, *2019*, 257–264. https://prosiding.konik.id/index.php/konik/article/view/61

Yustika, A. A., Suhartono, E., Rahmania, R., S1, P., & Telekomunikasi, T. (2019). Deteksi Anemia Melalui Citra Sel Darah Menggunakan Metode Discrete Wavelet Transform (DWT) dan Klasifikasi Support Vector Machine (SVM) Anemia Detection By Means Of Blood Cells Image Using Discrete Wavelet Transform (DWT) And Support Vector Machine (SVM). *E-Proceedings of Engineering*, *6*(2), 3760–3767. https://openlibrarypublications.telkomuniversity.ac.id/index.php/engineering/article/view/10123

ISSN 2961-7758

The Design of User Interface and User Experience in Rodanya Masbagia's Information System: using Design Thinking Methodology

Ibal Afib Maulana[1], Ardhin Primadewi [2*], Mukhtar Hanafi [3], Eny Boedi Orbawati[4]
[1,2] Informatics Engineering,Universitas Muhammadiyah Magelang, Magelang, Indonesia, 56172
[3]Information Technology, Universitas Muhammadiyah Magelang, Magelang, Indonesia, 56172
[4]Public Administration Department, Faculty of Social and Political Sciences, Universitas Tidar, Magelang, Indonesia, 56116
Email: ibalafib57@gmail.com[1]; ardhin@ummgl.ac.id[2*], hanafi@ummgl.ac.id[3] , enyorbawati@untidar.ac.id[4]

ABSTRACT

Magelang City has become an administrative city and MSMEs (Micro, Small, and Medium Enterprises) as the backbone of the economy in the city. In several regions MSMEs are utilizing digital technology, which has great potential for large-scale sales. The Government of Magelang City has implemented a community empowerment system called the Program for Empowering Community that Advanced, Healthy, and Happy Society (Rodanya Masbagia). This program aims to enhance the empowerment of the community through the local government's budget (APBD) provided by the Magelang City Development Planning Agency (Bappeda). The main challenge faced by MSMEs entrepreneurs is the limitation in selling their products widely, resulting in low demand for their merchandise. There is a sales platform for MSMEs in Rodanya Masbagia's system especially terms of product marketing. It has a feature implemented where we are not able to reach a wide market. Therefore, there is a need to develop additional features to facilitate widespread product sales. This system is created and designed using the Design Thinking Methodology, which consists of several stages: empathize, define, ideate, prototype, and test. The results of this study underwent testing using the Maze platform to facilitate the system's trial. There were 25 respondents involved in testing the prototype in Figma. The average success rate of the testing was 80% based on predefined metrics. Task 1 achieved a success rate of 90%, task 2 had a success rate of 75%, task 3 had a success rate of 80%, task 4 achieved a success rate of 100%, and task 5 had a success rate of 80%. During the testing phase, users were able to complete the tasks, but some tasks posed difficulties. The results of this study with an average of satisfied user feedback (85%) related to the recommended UI/UX design. It can be concluded that there is a need to improve the performance of the design to prevent users from feeling confused or encountering difficulties when using the product.

Keywords: Design Thinking, Magelang City, MSMEs, User Interface, User Experience

INTRODUCTION

In the world of technology, internet users in Indonesia have experienced a significant surge from year to year. Based on data from a survey conducted by the Association of Indonesian Internet Service Providers (APJII) in 2017, internet users reached 54.68%, equivalent to 143.26 million people (Ferry Anggiawan, 2021). Developments in today's smartphone hardware continue to feast the eyes and hands to add social and work use. Along with the development of social networking, social media, and with the development of mobile device technology, applications are also growing rapidly (Setiawan et al., 2019). This surge has been utilized in the field of information and communication technology, allowing Micro, Small, and Medium Enterprises (MSMEs) to enter the global market for trade (Basry & Sari, 2018). The presence of technology has had a significant influence, extending to other sectors of life, such as the economy, politics, socio-cultural aspects, security, and others (Permana, 2019).

According to (Primadewi et al., 2021) the increasing need for data and information in the functioning of a business in MSMEs is the foundation for assisting MSMEs actors, especially for ease of expansion. With accurate data and information, MSMEs can find out a market trend in certain areas.The government becomes the holder of control which is very important in providing a forum and budget to meet the needs of the community. In the government of Magelang City has implemented a community empowerment system called the Program for Empowering Community that Advanced, Healthy, and Happy Society (Rodanya Masbagia) which is aimed at increasing community empowerment through the local government's budget (APBD) funds from the Magelang City Development Planning Agency (Bappeda). Rodanya Masbagia encourages community participation in development at the sub-district level based on neighborhood Association (RT). One of the efforts to increase the role of the community is by developing potential in the field of MSMEs (Magelang, 2021).

ISSN 2961-7758

MSMEs are a driving factor in the creation of national economic development. So that it attracts the attention of various groups, both from the government and the general public (Azis Fathoni, 2019). MSMEs with this sharp increase demand that they be able to innovate their products and carry out broader and easier sales strategies. With this strategy they can survive and be able to compete with similar products in an era of rapid technological development (Soedewi, 2022).

The number of MSMEs in Magelang City is 86.4% in 2021 or reaching 727 MSMEs (Magelang, 2021). With a large percentage of MSMEs, it is necessary to do mapping in each region. Currently, the community can monitor the Rodanya Masbagia on the http://simasbagia.dp4kb.magelangkota.go.id/ website. This web-based system serves as: (1) a data repository for RT profiles, (2) plans for community needs, (3) results of plans for community needs, (4) monitors the implementation of Rodanya Masbagia self-management, (5) the number of Rodanya Masbagia self-supporting communities, (6) galleries and news, regulations, (7) frequently questions and answers, overall budget Rodanya Masbagia.

After analyzing Rodanya Masbagia's information system, it can be seen that there is no system to manage or record data related to MSMEs. So that the impact on the marketing and data collection process up to the dissemination of information is delayed. In addition, the system seems not to be categorized as an effective information system to use. There needs to be an innovation or new feature to introduce, record, and disseminate information in the City of Magelang. Especially in every RT so that the data can be stored and used as promotional media for MSMEs to improve the economy in each RT in Magelang City. With the addition of new features to Rodanya Masbagia, an understanding of the User Interface (UI) and User Experience (UX) is needed to support a more user-friendly system. This feature is to design a product that can be seen and used properly, thereby increasing user comfort and convenience in using the product (Nasution & Nusa, 2021).

In a web-based system as a population data repository, users or customers can use marketing and data collection to disseminate information. In designing the User Interface (UI) and User Experience (UX) in this public service system, design thinking is applied in its design. This will be based on new patterns of creation because in the process it focuses more on perception, possibility, and practice (Surachman et al., 2022). Design Thinking Methodology has several stages, namely empathize, define, ideate, prototype, test to support Rodanya Masbagia's information system in marketing.
The results of this study will focus on designing a prototype using Figma as a design tool used to create user interface designs as a tool, especially on adding marketing and data collection features on Rodanya Masbagia using the design thinking methodology. consumer. This research can produce strategic planning that is more user-friendly in mapping MSMEs in Magelang City.

LITERATURE REVIEW

a creative approach used in product and service development to solve user problems by focusing on their needs. In the context of user interface (UI) and user experience (UX) design, design thinking can help designers understand users, identify existing problems, and design effective solutions. In this study, the design thinking methodology is used as an approach used for innovation from designers to solve problems with a human-oriented approach (Nadhif et al., 2021). To provide answers to user problems, if the design process uses a methodological structure and follows the rules, then it is capable of producing quality research that can be accounted for from all aspects (Subarjah & Ari Purno Wahyu, 2022). One of the advantages of using design thinking from start to finish is to produce a good level of user experience in the future (Nadhif et al., 2021). According to (Almaghaslah & Alsayari, 2022) Design thinking is a problem-solving approach that is gaining popularity in various fields, a systematic approach prioritizing deep empathy for the desires, needs, challenges of users to fully understand the problem, with the aim of developing comprehensive and effective solutions.

Design thinking has several stages, namely: Empathize, Ideate, Prototype, and Test (Larysa & Marta, 2019). Empathize to be able to understand user needs, the way to know empathy is to observe, engage with users, and participate in understanding what users feel. Ideate to rearrange based on solutions and innovations that can be used to solve the problems previously described. Define aims to see the problem to be solved and find out what the user needs. The next step is a prototype to realize the idea in the form of a model with a reduced version to get a response. This stage can be called the primary process of the design thinking methodology because the analysis of the results and ideas has been compiled, outlined, and combined into a design product. The final step with testing aims to rigorously test the complete product using the best solutions identified during the prototyping phase. According to (Syahrul & Palcomtech, 2019) design thinking is a tool used in a problem-solving, problem-design, to problem-forming. Not only can solve a problem but can also form and design an existing problem. In the process, design thinking can be human-centered or human-centered. Every design thinking process originates and is directed at humans.

User Interface (UI) is a technological development that is able to utilize digital or internet facilities, in order to design a product that can be seen and used properly in order to

ISSN 2961-7758

increase comfort and convenience for users in using products or services (Haryuda et al., 2021). User Interface (UI) design is made with convenience in mind for the user to have an important role because he is the direct link between the system and the user (E. Susilo et al., 2017). The user interface is the most important element of a computer-based system or product, the user interface is very important because in application systems almost all applications have a user interface, a bad interface creates confusion and frustration for ordinary users, so it will affect productivity (A. T. Susilo et al., 2021). According to (A et al., 2019) The user interface is the way a program and users interact with each other. The user interface is a part of the computer and software that can be felt by the user, touched, and understood by the user, in the form of making a design display in a computer or software device, several user interface indicators include (1) connectivity, (2) simplicity, (3) directional, (4) informative, (5) user friendliness, (6) personalization, and (7) continuity. The function of the UI in making websites for Facilitate user interaction: The main function of the UI is to facilitate interaction between the user and the website. A good UI is designed to provide an intuitive, efficient and comfortable user experience. Through elements such as buttons, navigation menus, forms and icons, UI helps users interact with content and features on the website. Improve readability and navigation: A good UI helps improve content readability and makes it easier for users to navigate within the website. Improves visual alignment: UI helps create visual alignment within the website. Increases responsiveness: UI also plays a role in increasing website responsiveness to user actions. Increase conversions and business goals: A good UI can help increase conversions and achieve desired business goals. Increase user satisfaction: A good UI can increase overall user satisfaction.

User Experience (UX) or UX designers are able to visualize user flow that has been tested (Haryuda et al., 2021), according to (Subarjah & Ari Purno Wahyu, 2022) User Experience (UX) is a term for user experience (emotions, attitudes, behavior , etc.) while interacting with each other. Based on (Shirvanadi & Idris, 2021) UX design will provide comfort and convenience with the user's approach while interacting with the system. To run the product, the level of product quality must be balanced with the capabilities of a product, not all users who use an application feel comfortable, the thing that affects the website is the user-friendly aspect. UX will be a liaison between a business goal and user goals, with the intervention of UX design that involves users will have a high level of success in conveying business goals and goals by users. According to (A. T. Susilo et al., 2021) user experience is the attitude, behavior and emotions of the user when using a product, system or service, can involve individual perceptions related to benefits that can be felt easily after being obtained. The user interface is very important in the process of creating websites and applications, because in the end, after the website or application is finished, what will interact continuously in everyday life is the user himself, to improve usability and UX. There is also the use of UX in making websites for, understanding user needs: UX helps in understanding user needs and preferences. Through user research, interviews, observation, and data analysis, UX helps identify who the target users are, what they are looking for, and how they interact with the website. With a deep understanding of users, it is possible to design experiences that meet their needs. Designing intuitive layouts: UX helps to design website layouts that are intuitive and easy for users to understand. Improve usability and accessibility: UX focuses on improving the usability and accessibility of websites. Creating a smooth user flow: UX helps in creating a smooth and intuitive user flow in the website. Maintain consistency and alignment: UX contributes to maintaining consistency and alignment of the design across the website. Increase user engagement: UX helps increase user engagement with the website. Through the use of interactive elements, eye-catching animations and engaging user experiences, UX creates an engaging environment for users. By increasing user engagement, UX can increase user retention rates, reduce bounce rates, and drive higher conversions.

Usability is part of the Human Interaction science, this usability can study interface design and interactions between humans and hardware, namely computers (Sukmasetya et al., 2020). Usability data has various solutions to solve problems, namely testing efficiency, ease of learning, and the ability to remember how to do interactive tasks without difficulty or making mistakes. (Jumiati et al., 2021). According to (Sauer et al., 2019) studies in usability will discuss the experience by a user in learning and using a technology, application or website. According to (Fahmi et al., 2018) usability is part of the user experience, usability is taken from the word usable in the sense that it means the level of quality of a product that can be used easily, can be learned easily and can be encouraged to use it as a tool in completing tasks. Usability can also be used to measure the quality of experience by users when interacting with a product such as a website or application. function of usability in testing to Gather user feedback: Usability testing allows designers to gather direct feedback from users testing prototypes. Users can provide their perspective on the user experience, the difficulties encountered, and the things that worked or didn't work in using the product. This feedback is invaluable in identifying deficiencies and potential improvements to prototype designs. Identify user problems and challenges, validate design assumptions, Determine design strengths and weaknesses, Gain insight into user preferences.

ISSN 2961-7758

METHOD

In this study, the Design Thinking Methodology has 5 stages (Figure 1) which will be explained in the following paragraphs.

Figure 1. Stages of the Design Thinking Methodology

The first stage is Empathize. This stage uses interviews and observations at the Magelang City Bappeda office to obtain data. In the empathize process, a list of questions is also prepared so that results are obtained which will then be processed to the next stage. What criteria will be determined as respondents in the study.

Proceed to the next stage define, after obtaining data on needs and problems in the empathize process, at this stage a list of needs is made from the Magelang City Bappeda office and grouping all the material that has been obtained, then monitoring to get problems as a point of view from the list of questions.

After understanding from the empathize and define stages the author understands the problems experienced at the Magelang City Bappeda office with the help of a list of questions and a list of needs that have been made before. The next stage is ideated, after studying the problems experienced by users and reviewing the information and all ideas collected, the next step is for the author to hold a meeting with the Magelang City Bappeda team to rearrange the ideas that have been created and filtered based on solutions and innovations that can be used to solve the problems that have been previously presented.

In the prototyping and testing stages, ideas and solutions that have been made in the previous stage are prototyped and will be tested on users. Some of the steps include making prototypes with userflow, wireframes, mockup. In this last stage the results of the prototype are tested using the maze platform. Solution design testing is carried out by giving several tasks related to the features of using the prototype, at this stage the writer can find out how the experience is by the user. Whether the user has difficulties or not, at this stage can determine whether the design needs to be improved or not, according to the user's ease in completing the tasks given.

RESULT AND DISCUSSION

Based on the method described earlier, the research stages implemented are as follows.

Empathize

At the empathize stage, knowing various information about Rodanya Masbagia is done by interviewing Bappeda. The list of interview questions related to the public service system is as follows:

Table 1. List of Questions

No	A list of questions
1	How do you sell products on Rodanya Masbagia?
2	How long will it take to trade?
3	Has the marketing of MSMEs products on Masbagia Wheels been maximized?
4	Is the marketing of MSMEs products on Rodanya Masbagia maximized?
5	Is there data collection for MSMEs products on Rodanya Masbagia?
6	How to collect data on MSMEs products on Rodanya Masbagia?
7	How is the distribution of promotional media on Rodanya Masbagia?
8	What is the strategy for disseminating MSMEs product information so that it can be recognized by consumers?

From these questions the aim is to collect information that will be processed to carry out the observation step to the next stage.

Define

At the define stage to get error information from previous data. Data obtained from interviews with Bappeda members to obtain user opinion and to understand user needs. The results of this study there are problems with the sales method that has not been maximized and the dissemination of information that is less relevant. The solutions are

ISSN 2961-7758

designed according to the target user. The following Table 2. are a list of user needs from the empathize process.

From the data in Table 2. It can be concluded that the needs of the users are arranged based on the problems to provide the solutions and solutions needed. Next, hold deliberations to discuss the features that will be developed in the Rodanya Masbagia Wheel system.

Ideate

From the core of the problem that has been found, the next step is to provide the right solution. The proposed solution to facilitate the sale of goods and data collection of each citizen for sales. At this stage it needs to be done to get new perspectives and innovative ideas in marketing their wares safely and making it easier for users to trade. The following is an ideate process to evaluate data from the define process to provide the right solution. The following is the solution to be designed in Figure 2.

Table 2. List of Needs

No	List of Needs
1	A website system that is easy to use on smartphones, laptops, and other devices.
2	Merchandise products that can be purchased from various marketplaces.
3	Easy to understand menu.
4	There is a location feature to make it easier for merchants to expand buyers.
5	Discussion feature for users and buyers.
6	Buyer review feature that can communicate with merchants.
7	There is a menu of the latest information.
8	Create an account with an email and strengthen it with a password.

Figure 2. Solution Results

Prototype

In the prototyping stage, ideas and solutions that have been made will be made into a prototype that can be sensed or a concrete representation. With this stage where the design for the appearance of a Rodanya Masbagia website is carried out. With this prototype design the author can visualize the target user needs of the Magelang City Bappeda office. The prototype stage has several steps, namely, userflow, wireframe, and mockup. The following is the prototype stage:

a) Userflow

In the userflow stage the steps taken by users to achieve references in designing features on a website, it will be easier to design products and optimize products to improve user experience and increase conversions, target users on Rodanya Masbagia are MSMEs customers, userflow designs are made from the following existing solutions are the designs in Figure 3.

b) Wireframe

The stages of designing the Rodanya Masbagia website UI design start with making a wireframe design. This design is the first step that describes the shape of the website UI before heading to the mockup design stage. Following are some of the wireframes that have been made which can be seen in Figure 4 (Left).

c) Mockup

The next stage of designing the Rodanya Masbagia website UI is creating a mockup. The prototype design stage was made using the Figma supporting application. Some of the prototypes that have been made are as follows. There is a display of the Rodanya Masbagia main logo in the middle of the on boarding page and is equipped with a login and

ISSN 2961-7758

register menu below it as shown in Figure 4 (Right). The Roda Masbagia logo is on the left of the register menu. Users can login to the website using a username and password if they already have an account. This is the first time the user has entered, so they must register for an account first and can complete their personal data by filling in their name, email, username, and password then clicking the submit menu.

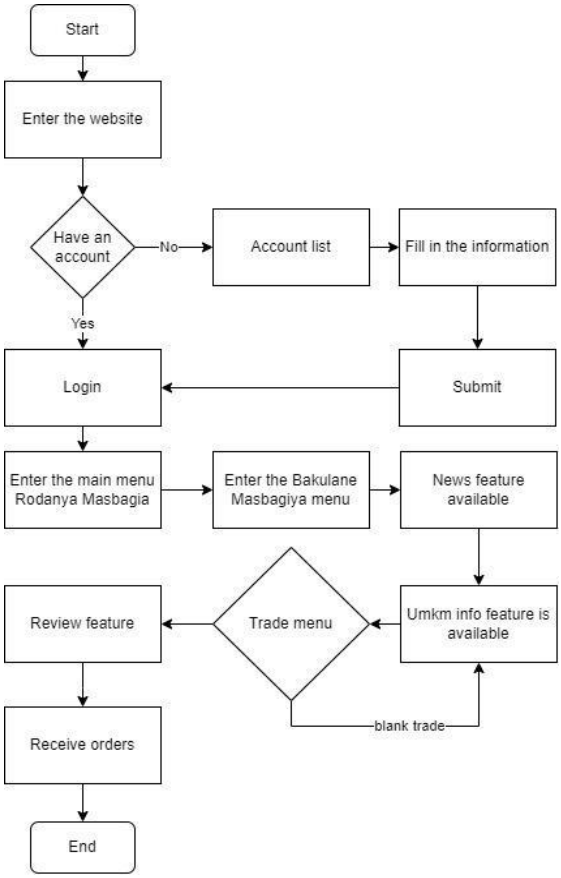
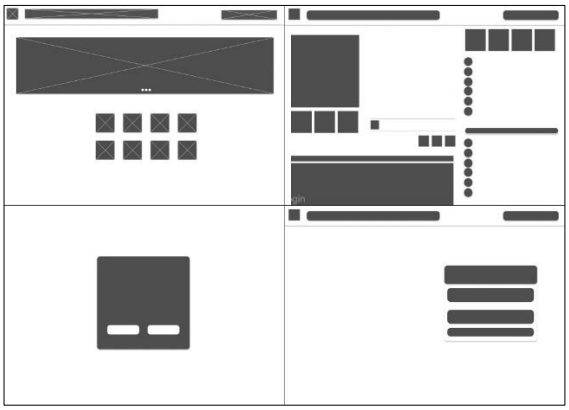
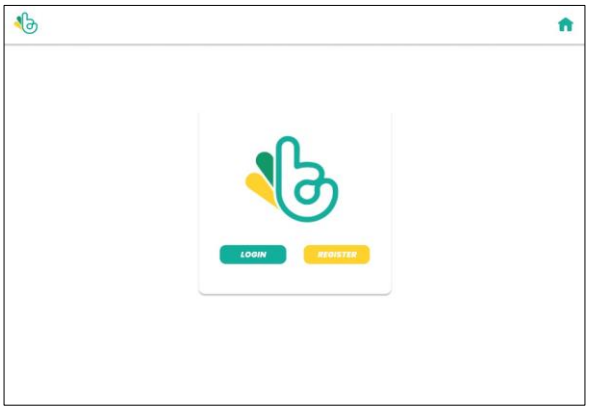


Figure 3. Website Userflow



(a)



(b)

ISSN 2961-7758

Figure 4 Public Service System Wireframe Design (a) and Community Service System Website Interface on the Onboarding Page (b)

After the user has successfully logged in by registering a new account. Then the Rodanya Masbagia website homepage is displayed. There is a product search menu, user profile email name information, the latest news on the Rodanya Masbagia and Konco Masbagia menus, Bakulane Masbagia, Masbagia Satset, SIMEs Masbagia, Regulations. Can be seen in Figure 5 (Left). On the settings page the user can change personal data, on the personal profile the user can change the full name, username, date of birth with day, month, year. In account info user can change email and password.

After the user enters the home page and selects the Bakulane Masbagia feature, on the Bakulane Masbagia menu there are two features, namely news and umkm info, the news feature displays the latest news about SMEs as shown in Figure 5 (Right)

(a) **(b)**

Figure 5 Home Page (a) and Settings Page (b)

After the user enters the home page and selects the Bakulane Masbagia menu, the Bakulane Masbagia menu contains news and info features for MSMEs, as shown in Figure 6.

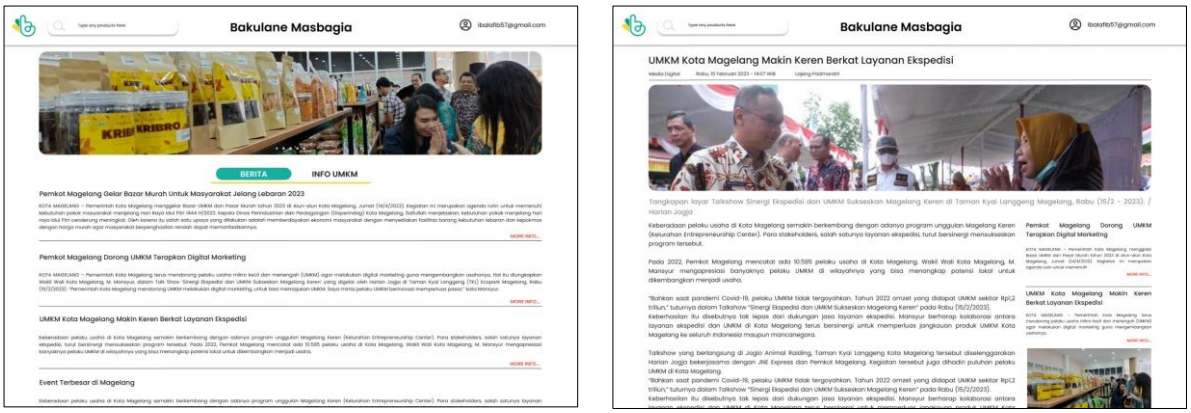
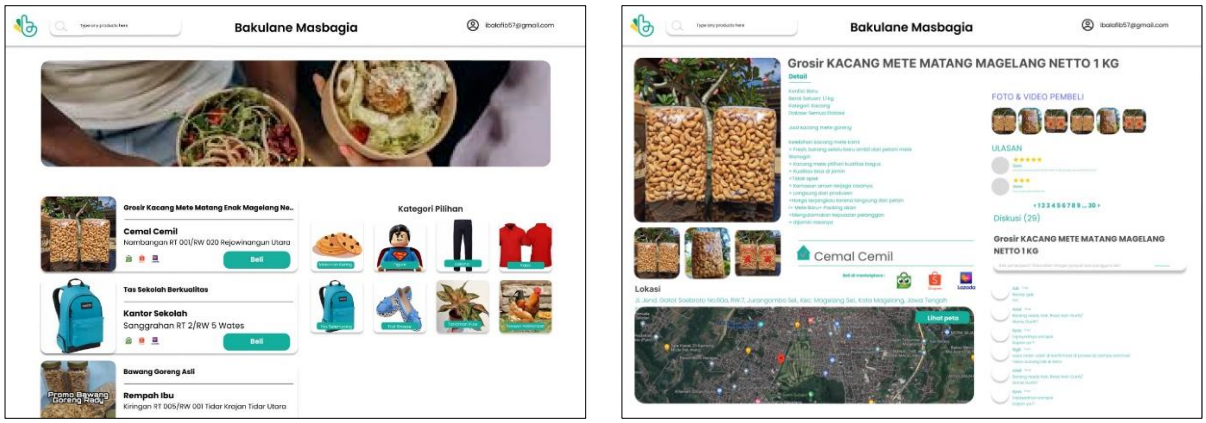


Figure 6 Bakulane Masbagia News Menu Page

In the MSMEs info feature there are several categories, in the menu there are merchant location features, discussions, reviews, links to other marketplaces, item price information, item description information, photos of reviews from buyers, locations, and discussions between traders and buyers. The MSMEs info feature can be seen in Figure 7.

ISSN 2961-7758



(a) **(b)**

Figure 7 MSMEs Info Menu Page (a) and MSMEs Product Detail Page (b)

Test

The fifth or final stage of design thinking is testing potential users. In testing using Maze. Maze can test quickly which allows to collect qualitative and quantitative data in one platform. The Usability Testing technique is used at this testing stage, during Usability testing there are 5 respondents who are similar or close to the target user criteria. At this stage the prototype that has been made is tested. The test includes variable task 1 login account, variable 2 create account, task 3 edit account, task 4 view news, task 5 buy goods. The success of the prototype is measured using the time parameter. The measurements in Table 3 are based on time indicators.

Tasks are carried out by users and get feedback. If the features have deficiencies, then the prototype needs to be made. The results of participant data can be seen in Table 4.

Table 3 Time Indicators

Task	Succed	Confused	Difficulty
Task 1 (Login Account)	<30 second	30 second – 50 second	>50 second
Task 2 (Create Account)	<20 second	20 second – 40 second	>40 second
Task 3 (Edit Account)	<15 second	20 second – 40 second	>40 second
Task 4 (View News)	<15 second	15 second – 30 second	>30 second
Task 5 (Buy Goods)	<20 second	20 second – 40 second	>40 second

After the user can complete the task that has been given, the next step is that the user can provide feedback on the application scenario that has been created previously. If features experience deficiencies in design or flow, they need to be changed and republished so they can be developed and published again. The data results of participants who have completed the assignment can be seen in Table 4.

Table 4 Test Results on The User

ISSN 2961-7758

User	Task 1	Task 2	Task 3	Task 4	Task 5
User 1	10 second	13 second	20 second	5 second	10 second
User 2	17 second	8 second	19 second	6 second	5 second
User 3	19 second	12 second	33 second	11 second	6 second
User 4	35 second	64 second	82 second	22 second	27 second
User 5	7 second	13 second	20 second	13 second	13 second

After testing the user prototype, the following data is based on predetermined metrics in the form of task 1 90% success rate, task 2 75% success rate, task 3 80% success rate, task 4 100% success rate, task 5 80% success rate. In the ongoing testing phase, users can complete the task successfully, but there are several factors in the task that are difficult to complete. It can be concluded that there is a need to improve the performance of the designs that have been created so that users do not feel confused or difficult when using the product.

CONCLUSION AND RECOMMENDATION

Product design can solve trading problems for the people of Magelang City. The final design of the product is in the form of a prototype, which is tested using usability testing techniques to produce a good prototype according to the test of getting a score with an average score of 85%. Which can be interpreted that the product results are developed with a user-friendly design method approach.

Based on the conclusions that have been made, the authors provide several suggestions, namely, by expanding research so that it continues to develop additional features in the public service system prototype design and can also be integrated with other systems by making it multiplatform.

REFERENCE

A, S. A. U., Isyawati, R., & Ganggi, P. (2019). *EVALUASI DESAIN USER INTERFACE BERDASARKAN USER EXPERIENCE PADA iJATENG*.

Almaghaslah, D., & Alsayari, A. (2022). *Using Design Thinking Method in Academic Advising : A Case Study in a College of Pharmacy in Saudi Arabia*. 1–10.

Azis Fathoni, W. S. H. M. D. (2019). Analysis of Empowerment of Human Resources in Efforts To Optimize the. *Journal of Management*, *5*(5), 1–8.

Basry, A., & Sari, E. M. (2018). Penggunaan Teknologi Informasi dan Komunikasi (TIK) pada Usaha Mikro, Kecil dan Menengah (UMKM). *IKRA-ITH INFORMATIKA : Jurnal Komputer Dan Informatika*, *2*(3), 53–60. http://journals.upi-yai.ac.id/index.php/ikraith-informatika/article/view/266

Fahmi, M. D., Az-zahra, H. M., & Dewi, R. K. (2018). *Perbaikan Usability Aplikasi Pemesanan Tiket Bioskop Menggunakan Metode Usability Testing dan USE Questionnaire*. *2*(12), 6653–6660.

Ferry Anggiawan, N. : (2021). Pemanfaatan Digital Marketing Pt.Buka lapak Dalam Mengembangkan UMKM melalui Marketplace. *Jurnal of Reflectionof*, *1*(marketplace), 18. http://repository.untag-sby.ac.id/id/eprint/7394

Haryuda, D., Asfi, M., & Fahrudin, R. (2021). Perancangan UI/UX Menggunakan Metode Design Thinking Berbasis Web Pada Laportea Company. *Jurnal Ilmiah Teknologi Infomasi Terapan*, *8*(1), 111–117. https://doi.org/10.33197/jitter.vol8.iss1.2021.730

Jumiati, E., Jumiati, E., Informatika, T., & Testing, U. (2021). *MENGOPTIMALKAN METODE USABILITY TESTING DENGAN*. *6*(1), 10–20.

Larysa, N., & Marta, S. (2019). Design thinking approaches in it projects. *CEUR Workshop Proceedings*, *2856*, 45–47.

Magelang, W. (2021). *Pedoman Teknis Pelaksanaan Program Pemberdayaan Masyarakat Maju Sehat Bahagia* (p. 6).

Nadhif, A. K., Jati, D. T. W., Hussein, M. F., & Widiati, I. S. (2021). Perancangan UI/UX Aplikasi Penjualan Dengan Pendekatan Design Thinking. *Jurnal Ilmiah IT CIDA*, *7*(1), 44–55. https://doi.org/10.55635/jic.v7i1.146

Nasution, W. S. L., & Nusa, P. (2021). UI/UX Design Web-Based Learning Application Using Design Thinking Method. *ARRUS Journal of Engineering and Technology*, *1*(1), 18–27. https://doi.org/10.35877/jetech532

ISSN 2961-7758

Permana, I. P. H. (2019). PEMANFAATAN TEKNOLOGI INFORMASI Untuk Bisnis UMKM. *STMIK STIKOM Indonesia Denpasar-Bali-Indonesia*, 183.

Primadewi, A., Purnomo, T. A., & Sasongko, D. (2021). Analisa Perancangan Sistem Pengelolaan Data UMKM berdasarkan Business Intelligence Development Model Framework. *Jurnal Sistem Komputer Dan Informatika (JSON)*, *3*(2), 209. https://doi.org/10.30865/json.v3i2.3587

Sauer, J., Sonderegger, A., Heyden, K., Biller, J., Klotz, J., & Uebelbacher, A. (2019). Extra-laboratorial usability tests: An empirical comparison of remote and classical field testing with lab testing. *Applied Ergonomics*, *74*(February), 85–96. https://doi.org/10.1016/j.apergo.2018.08.011

Setiawan, A., Artha, E. U., Arumi, E. R., Sunarni, Primadewi, A., & Nugroho, S. (2019). Task Analysis of Facebook users on Frequently used Menus. *Journal of Physics: Conference Series*, *1179*(1). https://doi.org/10.1088/1742-6596/1179/1/012019

Shirvanadi, E. C., & Idris, M. (2021). Perancangan ulang UI/UX situs e-learning aminkom center metode design thinking (studi kasus: amikom center). *Automata*, *2*, 1–8. https://journal.uii.ac.id/AUTOMATA/article/view/19438/11541

Soedewi, S. (2022). Penerapan Metode Design Thinking Pada Perancangan Website Umkm Kirihuci. *Visualita Jurnal Online Desain Komunikasi Visual*, *10*(02), 17. https://doi.org/10.34010/visualita.v10i02.5378

Subarjah, V. A., & Ari Purno Wahyu. (2022). Analysis and Design of User Interface and User Experience of Regional Tax Enterprise Resources Planning System with Design Thinking Method. *Inform : Jurnal Ilmiah Bidang Teknologi Informasi Dan Komunikasi*, *7*(2), 96–106. https://doi.org/10.25139/inform.v7i2.4729

Sukmasetya, P., Setiawan, A., & Arumi, E. R. (2020). Penggunaan Usability Testing Sebagai Metode Evaluasi Website Krs Online Pada Perguruan Tinggi. *JST (Jurnal Sains Dan Teknologi)*, *9*(1), 58–67. https://doi.org/10.23887/jstundiksha.v9i1.24691

Surachman, C. S., Andriyanto, M. R., Rahmawati, C., & Sukmasetya, P. (2022). Implementasi Metode Design Thinking Pada Perancangan UI/UX Design Aplikasi Dagang.in. *TeIKa*, *12*(02), 157–169. https://doi.org/10.36342/teika.v12i02.2922

Susilo, A. T., Maharani, A., & Susilo, A. T. (2021). *ANALISIS USER EXPERIENCE PADA WEBSITE SMK NEGERI TUGUMULYO BERBASIS USER EXPERIENCE QUESTIONAIRE (UEQ)*. *6*(2), 169–177.

Susilo, E., Soedijono WA, B., & Al Fatta, H. (2017). Evaluasi Aplikasi Mobile SSP (Secure System Of Payment) Menggunakan Prinsip Usability (Studi Kasus: PT Sydeco). *Seminar Nasional Teknologi Informasi Dan Multimedia 2017*, *2.6*, 7–12.

Syahrul, Y., & Palcomtech, P. (2019). *PENERAPAN DESIGN THINKING PADA MEDIA KOMUNIKASI VISUAL PENGENALAN KEHIDUPAN KAMPUS BAGI MAHASISWA BARU*. *2*(2), 109–117.

ISSN 2961-7758

RKM Planning and Management System in the Regional Government of Magelang City: Proposed Concept

Alfira Nisa Fadhilah[1], Ardhin Primadewi[2*]
[1,2] Informatics Engineering, Faculty of Engineering, Muhammadiyah university of Magelang, Magelang, Indonesia, 56172
Email: alfiranisa120617@gmail.com[1], ardhin@ummgl.ac.id[2*]

ABSTRACT
Magelang City is one of the cities in Central Java province which has many community needs that must be managed properly. The problem of community needs plan (RKM) is important to consider, because it will affect the quality of life of the community. The Regional Development Planning Agency (Bappeda) is the government agency at the regional level responsible for formulating regional development plans and strategies. In Magelang City, Bappeda of Magelang City has a very important role in taking care of the community needs of each Neighborhood Association (RT). Bappeda of Magelang City has a role in taking care of the community needs of each RT in the city of Magelang such as regional development plans that cover the needs of the people of each RT, facilitating development planning meetings and so on. The current system is still an online repository in managing the budget. Inappropriate budget planning can be the cause of an imbalance between needs and budget allocations in community empowerment. Overcoming these difficulties, Bappeda of Magelang City needs to carry out good budget planning and management. In accordance with applicable regulations and standards, and equipped with strict monitoring and evaluation. Therefore, a community needs planning system is needed that can identify and meet community needs properly. This system is intended for the Bappeda of Magelang City in activity management, and RT in planning activities according to the needs of the community. This system will be delivered to each of the neighbourhoods in the city of Magelang every year. This will ensure effective and efficient activity management, which in turn can provide benefits for regional development and the people of Magelang City. This research was conducted using the Ward and Peppard method with Value Chain Analysis and Critical Success Factors (CSFs). The output generated from this research is in the form of strategy recommendations from the results of Bappeda internal and external environmental analysis, as well as proposed information systems that can improve the quality of a more optimal system.
Keywords : Community Needs Plan, Community Empowerment, Regional Government, Bappeda, Ward and Peppard.

INTRODUCTION

The development of information technology in the last few decades has been very rapid so that technology has become an important asset for the progress and development of a company or any institution (Cahyo et al., 2021; Primadewi et al., 2017). The development of information technology is not only used to access information, but is also used in creating a well-integrated system (Khoirunnisa et al., 2020). Utilization of information technology can help and facilitate all groups of people, companies and government agencies in making decisions and improving the quality of an organization's performance (Primadewi & Hanafi, 2021; Ramadiyanti & Purwani, 2021).

The government has an important role in managing the budget to optimize sub-district, in accordance with Law number 6 of 2014 concerning sub-district, the government allocates sub-district, through a transfer mechanism to districts or cities. Magelang City is one of the cities in Central Java province which has many community needs that must be managed properly. Community empowerment in Magelang City is a development process in which the community takes the initiative to start an activity process to improve the situation and condition of themselves and their environment.

In meeting community needs, the Office for Community Empowerment, Women, Child Protection, Population Control and Family Planning (DP4KB) introduced Advanced, Healthy and Happy Communities Empowerment Program (Rodanya Masbagia) which has been implemented since 2021, based on the Magelang mayor's regulation number 24 of 2021 concerning guidelines for the implementation of Rodanya Masbagia(Peraturan Walikota Magelang Nomor 24 Tahun 2021 Tentang Pedoman Pelaksanaan Program Pemberdayaan Masyarakat Maju Sehat Bahagia, 2021). Rodanya Masbagia is a program to increase empowerment and encourage the active role of the community through the allocation of the Regional Revenue and Expenditure Budget (APBD) to 1032 neighborhood associations (RT) in 3 sub-districts in Magelang city amounting to Rp. 30 million each year for each RT, so that the total funds spent by Bappeda are Rp. 30,960,000,000 each year.

ISSN 2961-7758

The Community Needs Plan (RKM) is a forum for the Magelang city government to find out the unfulfilled needs of the community. Regional Development Planning Agency (Bappeda) is the government agency at the regional level responsible for formulating regional development plans and strategies. Bappeda of Magelang City has a very important role in managing community needs per RT. This role is in the form of regional development plans that cover community needs per RT, facilitating deliberations on development planning and so on.

Planning for community needs is important to note, because it will affect the quality of life of the community. However, so far SIMASBAGIA is still an online repository, where only a link is connected to Google Drive, there is no system at all. In recording it is still manual using Ms. excel as a tool for calculating the budget for needs and recording community activities, so the process of calculating the length of time and recapping activities is not effective. This allows the data to appear in general in the city of Magelang, so that each RT cannot monitor the results of contracts submitted and agreed upon by the Bappeda sub-district village with implemented values in each area. Apart from that, the main matters in planning are becoming increasingly difficult, because one cannot know the data selected from each RT, it is not certain that RTs choose based on a budget ceiling or in accordance with the agreed points. With digitalized planning, it is hoped that there will be no more manual input, so what is in the budget ceiling cannot be changed at will.

Bappeda of Magelang City needs to carry out good planning and activity management to overcome these difficulties, in accordance with applicable regulations and standards and equipped with strict monitoring and evaluation. The purpose of this research is to improve the progress of society in Magelang City by developing a better and optimal planning system. To achieve the research objectives, some questions from this research are:

1. How to design an automated RKM information system that is easier for users?
2. What are the business processes in developing an automated RKM information system using the Ward and Peppard method? These questions will help to achieve the research objectives.

In solving the problems above, researchers used qualitative methods, through interviews, observations, literature reviews and system analysis, so that it would be easier to identify and form a system design. The information system to be developed will use the Ward and Peppard method of analysis, the method includes strategic analysis, system analysis and information system planning. The results of this research are expected to make it easier for the community to determine needs, as well as assist the government in managing plans for community needs in an effective and efficient manner.

LITERATURE REVIEW

In this study using the ward and peppard method. The SI/TI strategic planning method based on the Ward and Peppard Model has 2 stages, namely the input and output stages. The input stages are internal business environment analysis, external business environment analysis, internal SI/TI environment analysis and external SI/TI environment analysis. For the output stage, namely business SI strategy, SI/TI strategy and SI/TI management strategy (Septiana, 2017). The Ward and Peppard method approach starts from the condition of SI/TI that is less useful in the past in an organisation and continues to capture business opportunities and increase competitive advantage in an organisation because it is able to make the most of SI/TI (Rissanti et al., 2021). In this study using 2 analysis methods, namely Value Chain Analysis and Critical Success Factors (CSF) Analysis.

Value Chain Analysis is a Ward and Peppard analysis method that is carried out to find out the business work processes of an organisation. This Value Chain analysis identifies activities that focus on main activities and supporting activities (Kurniawati, 2018). Critical Success Factors (CSF) analysis is a collection of analyses of many processes that determine success. CSF is needed to achieve the mission of an agency, the results of the CFS analysis can later be used in determining the business strategy of an agency or company in the future (Hayati, 2016). By paying attention to each activity and the relationship between each, it is expected that a company or institution can improve the performance of each activity and create synergies in order to create corporate excellence (Rinaldy, 2022).

Community Empowerment is the process of increasing the ability and potential of the community as an effort to prosper the community, and develop themselves optimally in the fields of econimo, social, religion and culture (Maison et al., 2022). Empowerment can be carried out by the community and the government in an effort to improve the quality of community welfare including family welfare, empowering the poor, raising the dignity of the community (Dianti & Effendi, 2019). Every organisation or institution in its activities wants to achieve goals. The objectives of an institution will be achieved all its activities by running effectively will be implemented if supported by factors supporting effectiveness (Fitri Lubis & Zubaidah, 2019). In the implementation to achieve a quality society, especially by increasing the needs of the community through information system strategy planning.

An information system is a collection of sub-systems that are integrated and collaborate to solve certain problems by processing data so that it has added value and is useful for

ISSN 2961-7758

users (Taufiq et al., 2021). The use of information technology has been widely used as a performance of quality improvement for its users (Ramadiyanti & Purwani, 2021). Especially for government organisations that want to improve the quality of public services based on information and communication technology (e-Government), the need for strategic planning of information systems and information technology is increasingly felt as a strategic direction and policy framework for using information systems to support tasks for government organisations towards the effectiveness of public services and services between government agencies (Widagdo et al., 2018; Yudhistyra & Nugroho, 2014).

In previous researchers using the ward and peppard method, the output obtained was a description of information needs, solutions, and recommendations for information system strategies that could be implemented in the future (Destyarini & Tanaamah, 2021). Other researchers who apply the Ward and Peppard method produce outputs in the form of strategy recommendations from the results of the analysis of the internal and external environment of the company's information system, as well as proposed Information Systems that will be mapped using the McFarlan Strategic Grid to be implemented for the company in the next two years (Cahyo et al., 2021), the output produced is a portfolio document of information system applications and information technology which can later be used as a basis for developing educational services through the help of technological resources. This proves that with a structured information strategy, it will be easier for organisations to develop effective and efficient information systems.

METHOD

Research is a systematic investigation of a problem to find answers to the problems that have been raised. This research was conducted using a qualitative approach. The following stages in the research can be seen in Figure 1 below. The first stage is problem identification. This stage is carried out to find out the problems that exist in Bappeda of Magelang City and identify these problems. The second is literature study. This stage is carried out by finding reference sources related to research, in order to be able to organize research properly based on knowledge obtained from several references. The third stage is conducting interviews and observations at Bappeda of Magelang City. This stage is expected to find out more in-depth information about the problems experienced and the observations made aim to find out the situation directly.

The fourth stage is data mapping. Data taken from the SIMASBAGIA will later be analyzed using several methods to make it easier for researchers to compile more structured data. The fifth stage is data processing. This continues the research to process the data that has been mapped. In this process, the researcher will at least process the data needed in the community activity plan. The final stage of this research is to analyse the data that has been processed using value chain analysis and Analysis of Critical Success Factors (CSFs).

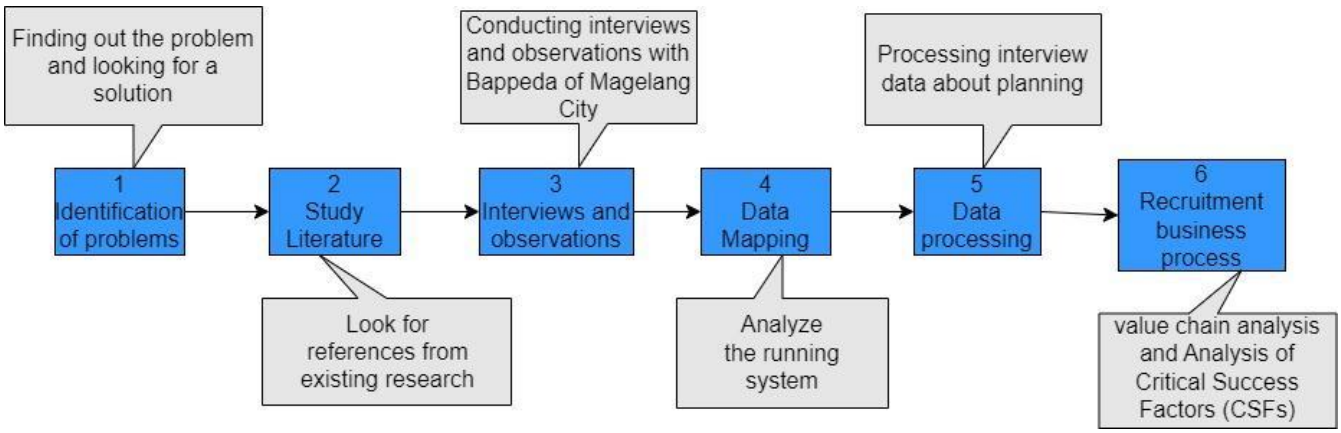


Figure 1. Stages in Research

ISSN 2961-7758

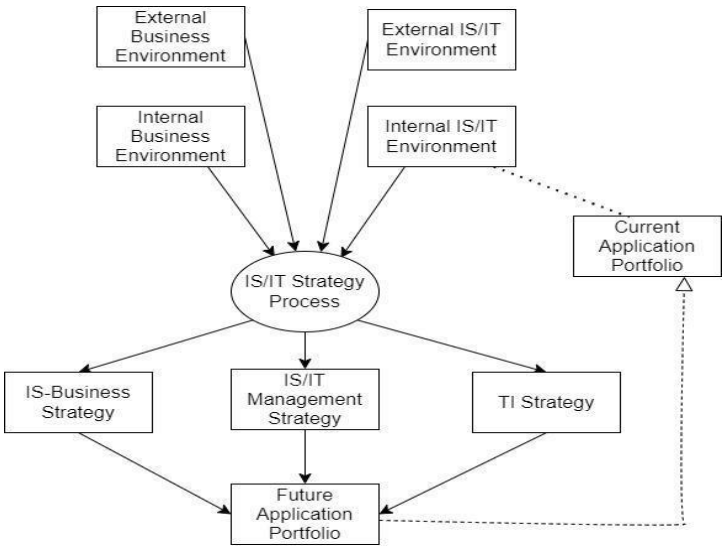


Figure 2. Ward and Peppard Method

An organization that wants to update or optimize the benefits of information systems and information technology (IS/IT) should carry out strategic planning (Yudhistyra & Nugroho, 2014). Information system strategic planning is a portfolio identification process that is reviewed to become a final report in order to achieve the business objectives of an organization (Ervina et al., 2019). One of the strategic planning methods that can be used is the Ward and Peppard Method. Ward and Peppard is a framework for developing an information system strategy that begins with an understanding of the current situation, namely the external and internal environment, both in the business environment and the Information Technology and Information Systems environment (Yudhistyra & Nugroho, 2014). The purpose of using this method is to ensure that all parties involved get a solution, and helps in emphasizing the process and goals that are determined.

The Ward and Peppard method contained in Figure 2 (below) includes several analyzes, such as : strategic analysis, system analysis, information system plan.
Strategic analysis involves identifying organizational goals and understanding how information systems can help achieve those goals. This analysis includes, analysis of the external and internal environment of the organization, identification of information needs, and identification of strategies that can be implemented.

System analysis involves developing an information system model based on the information needs that have been identified in the strategic analysis stage. This information system model includes analysis of business processes, data structures, information technology architecture, and organizational infrastructure.

Information system plan involves developing an information system implementation plan. This plan includes selection of information technology solutions, project plans, training plans, testing plans, and change management plans.

RESULT AND DISCUSSION

This research will analyze the system available at Bappeda of Magelang City through several stages, the following will be presented a strategic plan using the ward and peppard method.

A. Vision, mission and problem identification

Vision of the city of Magelang is “The developed city of Magelang is healthy and happy”. Magelang city mission are (1) Creating a society that is religious, cultured, civilized, tolerant and based on IMTAQ, (2) Fulfill the basic service needs of the community to improve the quality of human resources, (3) Realizing good and innovative governance, (4) Improving the community's economy by increasing the role of MSMEs based on the people's economy.

With the target of increasing community participation in development using a community empowerment assistance strategy, the Magelang city government created a work program to achieve the vision and mission of the city of Magelang which is referred to as Rodanya Masbagia. In carrying out its goal of providing convenience in serving community needs, DP4KB implements a system commonly called SIMASBAGIA, this system can be accessed at the address http://simasbagia.dp4kb.magelangkota.go.id/. SIMASBAGIA has helped the people of Magelang city enough, several regions have benefited from the program. However, this system is still ineffective in managing community needs, especially in planning community activities. The Masbagia information system still needs development to create an advanced, healthy and happy society.

ISSN 2961-7758

B. Literature Study, Interviews and Observations

SIMASBAGIA is an information system of the Magelang city government to create a quality society and realize good and innovative governance. By conducting interviews and observing parties at Bappeda, it can be seen that the SIMASBAGIA, which is expected to assist in community empowerment, is still not optimal. The way the system works is still an online repository, because it's only a link on Google Drive that connects directly to the system. From this repository it is very possible that the data that appears is general in nature in the city of Magelang, this makes the community in each RT unable to monitor the results of the contracts that they submit and agree on with the subdistrict head of the Bappeda of Magelang City sub-district with the value being implemented in their area.

The current SIMASBAGIA can be accessed at the address http://simasbagia.dp4kb.magelangkota.go.id/. This system does not provide a place for users to enter data into the system. It is also slower and less efficient to manage RKM because it is only an online repository. Apart from that, the main matters of planning became even more difficult, because one could not know the voting data from each RT, it was not certain that the RTs voted based on the budget ceiling or in accordance with the agreed points. This needs to be improved by developing a digitalized SIMSBAGIA, which is expected to help improve the system to be more precise and efficient so that there is no need to manually input data.

After the process of interviews, observations and literature studies that have been carried out, the data obtained will be used for the implementation of SIMASBAGIA Automation. An automated system can help to facilitate users in obtaining information needs and make the system of community activity plans in each RT systematized so that it can be more effective and efficient in every planning. The application of automation is more helpful in creating a database of RT profiles and RKM. SIMASBAGIA will be very facilitated in determining the activity plan that is in accordance with each profile, thus the user experience will be maximized to decide the activity plan in the area.

C. Data Mapping and Processing

The features contained in SIMASBAGIA can be seen in Figure 3.

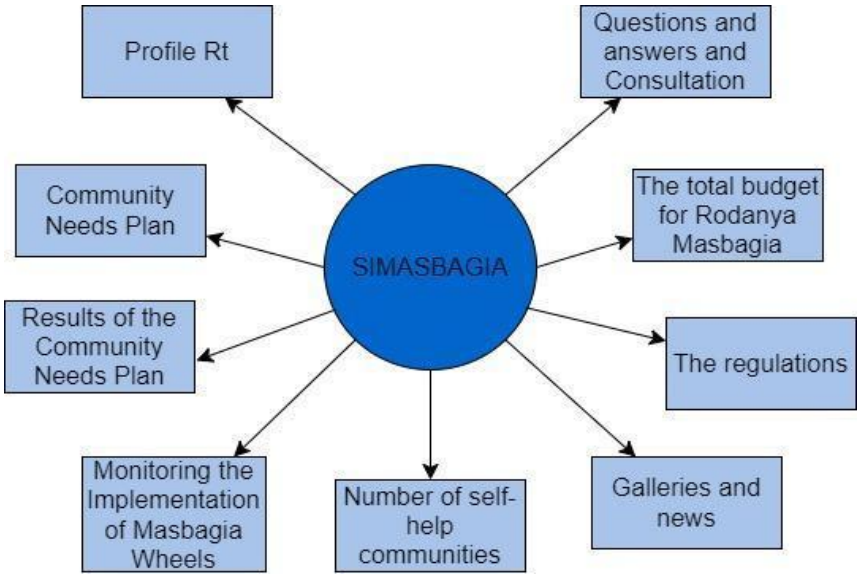


Figure 3. Current SIMASBAGIA Features

The following are description of the above system.

First, RT Profile is displays real data on regional and population conditions in detail. The data includes 1,032 RTs, 17 Villages and 3 Districts in Magelang City.

In the previous system, the RT profile contained real data on the condition of each RT, which totaled 1032 RTs. The recorded data will be the determinant of making a plan for the needs of an RT. Based on the analysis conducted on the RT Profile system, it can be concluded that the system has not been effective. In planning community needs, the RT must go through 2 validators, namely the sub-district and sub-district. In the process of planning activities, the RT submits an activity plan to the sub-district using excel, then if there is a discrepancy with the RT's profile in completing the plan, the plan that has been filled in needs to be revised again, if the sub-district approves it, it will be continued and given to the sub-district, the last process is if from the district agrees, then it is handed over to the government to process the budget for community needs in accordance with what has been planned.

ISSN 2961-7758

This was taken into consideration because the process was long and ineffective, making the planning process longer. In fact, basically submitting plans for next year, starting from the previous year, namely in January-June. The mistake that often occurs is that each RT fills out a needs plan that does not match what is needed, this wastes the budget. In overcoming this, RKM automation is carried out, where the needs of each RT will not be missed. The RT profile will explain in more detail the population starting from the number of families, occupation, economy, gender, age and so on. These small things will help to better specify the needs of the community. The contents of the RT profile regarding the number of residents and the quality of the population in terms of education can be seen in Table 1.

Table 1. Age profile of population

No	Regarding	<20	20-40	>40
1.	**Total population (male and female)**	0-1	25-30	40-45
		1-5	30-35	45-50
		5-10	35-39	50-55
		10-15		60
		15-19		
2.	**Education (male and female) :**			
	Attended school age (years)	3-6	20-25	40-45
		7-15	25-30	50-55
		15-19	30-35	55-60
			35-39	60
	Dropout at age (years)	7-15	20-25	40-45
		15-19	30-35	50-55
			35-39	55-60
				60
3.	**Labor :**			
	With population of working age	15-19	20-25	40-45
			25-30	50-55
			30-35	55-60
			35-39	60
	Population not yet / not working	15-19	20-25	40-45
			25-30	50-55
			30-35	55-60
			35-39	60
4.	**Quality of population in terms of education :**			
	Elementary school graduates with ages	15-19	20-25	40-45
			25-30	50-55
			30-35	55-60
			35-39	60
	Middle school graduates with ages	15-19	20-25	40-45
			25-30	50-55
			30-35	55-60
			35-39	60
	High school graduates with ages	15-19	20-25	40-45
			25-30	50-55
			30-35	55-60
			35-39	60
	PT graduates with ages	15-19	20-25	40-45
			25-30	50-55
			30-35	55-60
			35-39	60
	And did not finish school from the age of.	7-15	20-25	40-45
		15-19	25-30	50-55
			30-35	55-60
			35-39	60

Other data comes from several potential resources, such as:

- Basic livelihoods (male and female) : Housewives, students, not yet/not working, traders, entrepreneurs, BUMN, BUMN employees,

ISSN 2961-7758

farmers/breeders, farm labourers, mechanics, lawyers, domestic workers, THL, civil servants, military, police, midwives, retirees and others.

- Religion / beliefs :

Islam, Christianity, Catholicism, Hinduism, Buddhism, Confucianism.

- Citizenship which includes 2 types, namely

Indonesian citizens and foreigners.

- Disabilities :

Speech impaired, paralyzed, cleft lip, quadriplegic and mentally retarded.

- Health

Health with conditions: malnutrition/stunting, do not have jamkes, people with mental disorders, residents have not been vaccinated and residents have not been immunized.

- Economics

Economy with conditions: KK (poor population), DTKS registered KK, DTKS registered residents, vulnerable KK (Women as heads of families), poor elderly 60, neglected elderly (living alone, without income and decent housing).

- UMKM

Types include: UMKM and KUBE.

- Community activity groups

Type of Activity : Cultural Arts Group, Person in Charge of Cultural Arts Group, Number of Members of Arts and Culture, Group/Sports Club, Person in Charge of Sports Group/Club, Number of Members of Sports Group/Club, Religious Activities Group, Person in Charge of Religious Activities, Number of Members of Religious Activities .

- Tourism potential

This section lists the types of tourism potential that exist in the area. It also lists the extent to which each potential has been developed.

- Public/social facilities :

(1) Data on household residence, starting from the status of home ownership consisting of own house, rented house, boarding and service.
(2) Data on the condition of the house which includes: the condition of the roof, floor, access to sanitation, walls and access to drinking water.
(3) The public facilities in the household such as : Households Occupying Uninhabitable Houses, Neighborhood Roads, Data on environmental scale public space points that have not been serviced by Public Lighting, Environmental Drainage, Fire Protection Number of Light Fire Extinguishers, Need for Light Fire Extinguishers, Environmental Security Post, Need for Security Post Facilities Neighborhoods, Community Residents' Meeting Buildings, Meeting Building Infrastructure Needs, Households Implementing Urban Farming.
(4) Fields undertaken: Business experience, name of business location group, land area, land form, land status, community self-help data (donations).

Other data on the total population and the quality of the population in terms of education can be seen in Table 1.

Second, plan for community needs is displays a recapitulation of the types of activities and the amount of proposed RKM (Plan for Community Needs) for each proposed sub-district.

Activity plan / community needs, contains a summary of activities that have been proposed and approved for sure. The needs plan contained in the system is in the form of recaps per village, per sub-district, percentage of activities and city-level RKM recap. After being analyzed, the system is still ineffective, because the activity plan per RT is difficult to know. While the community wants to be able to monitor the results of the RKM that has been approved to facilitate implementation. In addition, this recap also displays the total costs incurred, let's say the list of community activities at SIMASBAGIA that has been determined includes several indicators, namely:

- Development of infrastructure facilities

These indicators include several activities, namely:

1) Procurement, construction, development and maintenance of settlement environment facilities and infrastructure. In its activities there are several aspects, such as : (a) Road; (b) Drinking Water Network and access to clean water; (c) drainage and sewers; (d) loud; (e) waste collection facilities and waste processing facilities; (f) infiltration/biopore wells; (g) settlement-scale domestic wastewater management network; (h) light fire extinguisher; (i) Gapura RW; (j) Park; (k) Family medicinal plants, fruits, vegetables, tubers, hydroponics, mushrooms, fisheries, small-scale livestock; (l) environmental security facilities and infrastructure; (m) esidential neighborhood lighting; (n)facilities and infrastructure supporting thematic villages.
2) Procurement, construction, development and maintenance of health facilities and infrastructure. In its activities there are several aspects, such as : (a) bathing, washing, public/communal toilets; (b) facilities and infrastructure for the elderly, toddlers, and pregnant women; (c) integrated service post for the elderly and/or toddlers; (d) other health infrastructure.
3) Procurement, construction, development and maintenance of educational and cultural facilities and infrastructure. In its activities there are several aspects, such as : (a) Community reading garden; (b) early childhood education building; (c) sports facilities and infrastructure; (d) rides for children's games in early childhood education; (e) cultural arts facilities and infrastructure.
4) Procurement, construction, development and maintenance of social institution facilities and infrastructure. In its activities there are several aspects, such as : (a) RT facilities and infrastructure; (b)

ISSN 2961-7758

facilities and infrastructure for Empowerment of Family Welfare (PKK) and Dasawisma.

- Community empowerment

These indicators include several activities, namely:

1) Management of community health service activities. In its activities there are several aspects, such as : (a) Clean and healthy lifestyle services; (b) services for providing additional food and vitamins at the Integrated Service Post (Posyandu) for the elderly and/or toddlers; (c) Family planning; (d) Food assistance for the elderly who have not been registered in integrated social welfare data; (e) Training of other community health cadres; (f) Stunting Prevention (BADUTA) .
2) Management of educational and cultural service activities, such as : (a) No Tool Help : Sewing Training, Culinary Training, Motorcycle servicing training, Cosmetology training, Computer/graphic design training; (b) With the help of tools: Barbershop training, SPA training, Barista Training, HP Service Training, Online marketing training, Organization of cultural arts course, Other educational and cultural service management activities (Including Wifi maintenance and procurement) .
3) Management of micro, small and medium enterprise development activities. In its activities there are several aspects, such as : (a) Organizing business training; (b) Management activities for the development of micro, small and medium enterprises
4) Management of social institution activities. In its activities there are several aspects, such as : (a) Village community development training. (b) Community organization management activities.
5) Management of peace, public order and community protection activities. In its activities there are several aspects, such as : (a) Procurement/organization of security posts; (b) strengthening and increasing the capacity of RT security / orderliness personnel; (c)Activities to manage peace, public order, and other public protection.
6) Strengthening community preparedness in dealing with disasters and other extraordinary events. In its activities there are several aspects, such as : (a) Provision of information services about disasters; (b) Community preparedness training in dealing with disasters. (c) Volunteer training for disaster management; (d) Fire protection management education; (e) Strengthening community preparedness.

- Operational costs 3%

General costs to support the administration of Rodanya Masbagia implementation at the RT level are at most 3% (three per cent) of the Rodanya Masbagia fund ceiling. Operational costs for supporting activities include operational costs for Rodanya Masbagia facilitation, costs for the Rodanya Masbagia coordination team, costs for the Rodanya Masbagia control team, the proposal and planning verification team and other verification teams. This has been stated in the regulation of the mayor of Magelang in the budgeting chapter articles 27 and 28.(Peraturan Walikota Magelang Nomor 24 Tahun 2021 Tentang Pedoman Pelaksanaan Program Pemberdayaan Masyarakat Maju Sehat Bahagia, 2021).

Third, results of the Community Needs Plan is displays details of the RKM results that have been realized for each RT in Magelang City. The results of this RKM come from the regional apparatus or OPD Pengpu Rodanya Mas Bagia so that the public can find out the benefits and the magnitude of the realization of the RKM. **Fourth**, Monitoring of the implementation of Rodanya Masbagia Swakelola Type 4 is displays the progress of the implementation of Rodanya Mas Bagia in urban villages throughout the city of Magelang in a type 4 self-management manner. Percentage of financial realization achievements and financial accountability achievements carried out by each community group (Pokmas).

Fifth, Number of Community Self-Help is displays information about the amount of community self-help in Rodanya Mas Bagia for each village. Recapitulation of community self-help at the sub-district level up to the city level. **Sixth**, Galleries and News is displays links from online mass media and news publications written by community empowerment companions or facilitators in each kelurahan. So that the public can find out the publications or results of Rodanya Mas Bagia which have been carried out.

Seventh, Regulations is displays laws and regulations related to Rodanya Masbagia and socialization materials for the Magelang city government to the community as well as training materials for facilitators for Rodanya Masbagia assistants. **Eighth,** Total Budget for Rodanya Masbagia is displays the total budget for Rodanya Masbagia. Through this feature, the public can find out the amount of Rodanya Masbagia's budget every year in the Magelang City APBD starting in 2021 and 2022. **Ninth**, Questions and answers and consultations is the function of this system is used as a means of interaction for community consultation with the Rodanya Masbagia control team, which is directly connected to the WhatsApp contact of the official concerned.

D. Recruitment Business Process

(1) Value Chain Analysis

This study uses value chain analysis to divide the entire work process that takes place in Bappeda of Magelang City into two categories of activities, namely main activities and support activities. This analysis aims to identify and classify the activities that occur in an organization into two major parts, namely main activities and supporting activities

ISSN 2961-7758

(Wedhasmara, 2009). The following presents the results of the analysis in Figure 4 using the value chain analysis.

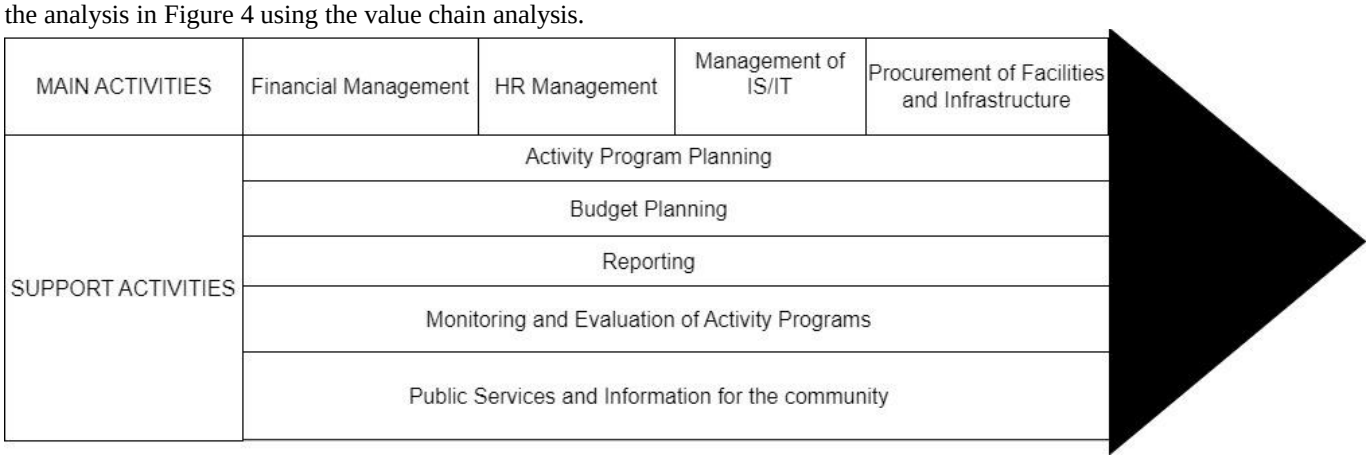


Figure 4. Value Chain Analysis

Based on the picture above, the value chain analysis contains:

- The main activities consist of Financial management, HR Management, Management of IS/IT, Procurement of Facilities and Infrastructure.
- Supporting activities consist of Activity program planning, Budget planning, Reporting, Monitoring and evaluation of program activities, Public services and information for the community.

(2) Analysis of Critical Success Factors (CSFs)
To know the needs of the organization and its environment which greatly influence the success or failure. Analysis of Critical Success Factors (CSFs) is carried out with the aim of interpreting objectives more clearly to determine the activities that must be carried out and what information is needed.Based on the SIMASBAGIA, in managing community activity plans, system development is still needed. The thing that is done by the community in determining their needs plan, can be by carrying out the planning sequence, before the activity plan is determined to be submitted, an RT meeting can be held first, this aims so that the community's needs are recorded according to their needs. So that it can be seen whether the required planning is appropriate or not, thus it will help in recapitulating needs. The next step is to determine success based on the IT Balanced Scorecard, as shown in the following table 2.

Table 2. Determining CSFs Based on IT Balanced Scorecard

Objectives(CSFs)	Key Decisions	system solution
Realization of a system to manage plans for effective community needs	Build a system to be able to manage plans according to budget ceilings	IS planning
Realization of a system for displaying plans for community needs per RT	Building a community needs assessment system for each region.	SI recapitulation
Build a system to make it easier to achieve a mature plan for future needs	A mature plan for long and short term needs.	IS planning
Realization of a system to display the contents of the RT profile more effectively.	Build a system so that you can easily manage data to determine activity plans.	IS planning

ISSN 2961-7758

Based on the perspective of the IT balanced Scorecard, it illustrates that the focus on planning and recapitulation systems is to build and develop systems to provide convenience in presenting detailed and comprehensive plan requirements in each Region. In addition, it will be easier for the community to monitor the activity plans that have been agreed upon by the Magelang city government. With this is expected to create an advanced and quality society.

In developing a community needs planning system. Based on the mapping results above, the system that will be developed is a system that can make decisions into an option based on the RT's profile, to be able to facilitate and fill community needs appropriately and well. The next feature is a RKM recap where the recap display shows the plans submitted by RTs and it is easy to monitor their implementation. because the current system is still not effective and efficient, and makes it difficult for the RT community to carry out monitoring. In addition, if the proposed plan is not in accordance with the budget ceiling, the risk that the budget will occur will be wasted by things that should not be needed, then by The existence of this system strategy is expected to assist in information system planning, facilitating RTs in monitoring the results of the needs plan they propose.
System suggestion:

- Activity planning features per RT

This feature will display data on community activity plans that have been adapted to each condition in each RT. This will make it easier for RTs to fill the needs of their communities without having to find out the needs of other RTs to serve as their reference material. this will also minimize excessive budget output.

- RKM recap feature for each RT

In this feature, it is hoped that each RT that has submitted an activity plan can be displayed in detail the type of activity selected, as well as the amount of the budget that has been spent, so that it is more effective to carry out these activities.

- RT profile features

This feature will help store all data on the condition of each RT in a more structured and organized manner. so that finding or checking RT condition data will be easier, besides that over time if conditions change, the RT can update it through this feature.

CONCLUSION AND RECOMMENDATION

Based on the results of research using the Ward and Peppard method, it can be concluded that the community needs planning process on SIMASBAGIA can be developed to be more effective and optimal. The data obtained from the interviews were analysed through the Value Chain Analysis method and Critical Success Factors (CSFs) Analysis. From this analysis, it produces an overview in the form of a system proposal that can be developed on the system to make it more optimal and facilitate the parties concerned in planning needs and ensuring activities in accordance with needs.
Suggestions for the future are expected that researchers can use different methods to get better results than the previous method. This research is only centred on information system strategy planning and researchers can implement and develop this research.

REFERENCE

Cahyo, A., Waskito, S., & Manuputty, A. D. (2021). Perencanaan Strategi Sistem Informasi Dengan Metode Ward And Peppard di Perusahaan Toko Surabaya cabang Surakarta. *Journal of Information Systems and Informatics*, *3*(2), 365–377.

Destyarini, S. A., & Tanaamah, A. R. (2021). Pendekatan Metode Ward And Peppard Untuk Perencanaan Strategis Sistem Informasi DISPERINNAKER Kota Salatiga. *Jurnal Teknik Informatika Dan Sistem Informasi*, *8*(2), 480–493.

Dianti, F., & Effendi, N. (2019). *Analisis Pemberdayaan Masyarakat Desa Sri Tajung Kecamatan Rupat Kabupaten Bengkalis*. *5*(3), 319–332.

Ervina, M., Rudianto, C., & Chernovita, H. P. (2019). Perencanaan Strategis Sistem Informasi Menggunakan Metode Ward And Peppard (Studi Kasus : Dinas Kependudukan dan Pencatatan Sipil Kota Tomohon). *SEBATIK*, *23*(2), 604–610.

Fitri Lubis, E., & Zubaidah, E. (2019). Efektivitas Program Pemberdayaan Masyarakat Berbasis Rukun Warga (PMB-RW) Dalam Mewujudkan Prinsip Tridaya Di Kota Pekanbaru. *PUBLIKA: Jurnal Ilmu Administrasi Publik*, *5*(2), 156–163. http://journal.uir.ac.id/index.php/JIAP

Hayati, N. (2016). Analisis Bisnis Internal Dengan Metode Critical Success Factors (Csf) Dan Value Chain (Studi Kasus Pt. Farmasi X). *MIND Journal (Multimedia Artifikal Intelligence Networking Database)*, *1*(1), 36–40.

Khoirunnisa, F., Roifah, S., & Setiawan, S. (2020). *Strategi Pengembangan Sistem Informasi Pelayanan Kantor Kelurahan Menggunakan Analisis Swot (Studi Kasus Kelurahan Sukabungah Kota Bandung)*. *3*(1), 44–59.

Kurniawati, R. (2018). Perencanaan Strategis Sistem Informasi di Dinas Perhubungan Dengan Menggunakan Metode Ward and Peppard. *Jurnal Algoritma Sekolah Tinggi Teknologi Garut*, *15*(1), 7–13.

Peraturan Walikota Magelang Nomor 24 Tahun 2021 Tentang Pedoman Pelaksanaan Program Pemberdayaan Masyarakat Maju Sehat Bahagia, (2021).

Maison, W., Sugestio, I. N., Defitri, S. Y., & Mursalini, W. I. (2022). Faktor Yang Mempengaruhi Pemberdayaan Masyarakat. *Journal of Innovation Research and Knowledge*, *2*(1), 49–56.

ISSN 2961-7758

Primadewi, A., & Hanafi, M. (2021). Pengelolaan Data Terintegrasi Berdasarkan Instrumen Akreditasi Perguruan Tinggi 3.0 Menggunakan Zachman Framework. *JURNAL RESTI (Rekayasa Sistem Dan Teknologi Informasi)*, *1*(10), 5–10.

Primadewi, A., Yudatama, U., & Nugroho, S. (2017). Pengukuran Tingkat Kematangan Pengembangan Business Intelligence Teknologi Informasi dan Komunikasi (TIK) pada Perguruan Tinggi. *Junal RESTI (Rekayasa Sistem Dan Teknologi Informatika)*, *1*(1), 34–42.

Ramadiyanti, S., & Purwani, F. (2021). Sistem Informasi Rencana Anggaran Biaya Berbasis Web Pada Dinas Perhubungan Kota Palembang. *Prosiding Seminar Nasional Sains Dan Teknologi Terapan*, *4*(1), 383–394.

Rinaldy, R. (2022). Bisnis Internal Menggunakan Metode Critical Success Factors. *JurnalEkonomiTeknologi&Bisnis(JETBIS)*, *1*(3), 146–151.

Rissanti, D. S., Rahardja, Y., Tanaem, P. F., & Kom, S. (2021). Perencanaan Strategi Sistem Informasi Pada BKDIKLATDA Kota Salatiga Metode Ward And Peppart. *Jurnal Teknik Informatika Dan Sistem Informasi*, *8*(4), 1723–1732.

Septiana, Y. (2017). Perencanaan Strategis Sistem Informasi Dengan Pendekatan Ward And Peppard Model (Studi Kasus : Klinik INTI Garut). *Jurnal Wawasan Ilmiah*, *8*(1), 8–24.

Taufiq, R., Alfarizi, M. S., & Liesnaningsih. (2021). Analisis dan Desain Sistem Informasi Keuangan Desa Di Desa Sukadamai Kabupaten Tangerang. *Simposium Nasional Multidisiplin (Sinamu)*, *3*.

Wedhasmara, A. (2009). Langkah-Langkah Perencanaan Strategis Sistem Informasi Dengan Menggunakan Metode Ward And Peppard. *Junal Sistem Informasi*, *1*(1), 14–22.

Widagdo, S. V., Prastiwi, Alamsyah, & Kamisutara, M. (2018). Perencanaan Strategis Sistem Informasi Untuk Meningkatkan Layanan Pendidikan Menggunakan Metode Ward And Peppard. *Seminar Nasional Aplikasi Teknologi Informasi (SNATi)*, 18–25.

Yudhistyra, W. I., & Nugroho, E. (2014). Lima Metode Perencanaan Strategis Sistem Informasi Dan Teknologi Informasi Untuk Pengembangan E-Goverment. *Seminar Nasional Teknologi Informasi Dan Komunikasi (SENTIKA)*, *2014*(Sentika), 236–244.

ISSN 2961-7758

Development of Village Digitization through the "Kaline X Mbangun Desa(in)" in Srihardono Village Bantul Yogyakarta

Dendy Dio Damar[1], Audrey Vania Zahrani Kinasih [2], Rizka Aprilia Nur Khasanah[3], Sandra Ramadhani Wicaksono [4], Fajar Junaedi [5]

[1] Department of Agrotechnology, Faculty of Agriculture, Universitas Muhammadiyah Yogyakarta, Bantul, Yogyakarta, Indonesia, 55183
[2] Department of Communication Sciences, Faculty of Social and Political Sciences, Universitas Muhammadiyah Yogyakarta, Bantul, Yogyakarta, Indonesia, 55183
[3] Department of Communication Sciences, Faculty of Social and Political Sciences, Universitas Muhammadiyah Yogyakarta, Bantul, Yogyakarta, Indonesia, 55183
[4]Department of International Relations, Faculty of Social and Political Sciences, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia, 55183
[5] Department of Communication Sciences, Faculty of Social and Political Sciences, Universitas Muhammadiyah Yogyakarta, Bantul, Yogyakarta, Indonesia, 55183
Email: dendy.dio.fp19@mail.umy.ac.id[1]; vania.kinasih.isip19@mail.umy.ac.id[2]; rizka.aprilia.isip19@mail.umy.ac.id[3]; sandra.r.isip19@mail.umy.ac.id[4]; fajarjun@umy.ac.id[5]

ABSTRACT
The village information system implementation should continue to be optimized by every village in Indonesia. However, to make it happen, it is necessary to develop the village information system in every village, one of which is the Online Kalurahan Program (Kaline). The method used is by digitizing and branding the Kalurahan located in Srihardono Village Bantul Yogyakarta. This program can be realized in approximately two months by conducting research and focus group discussion with Srihardono Village staff and local community representatives. Then, we conducted digital content production. The results of this service are the creation of village design assets, profile books, website homepages, social media templates, and village profile videos.

Keyword: Development, Village, Digitization, digitizing, branding

INTRODUCTION

Law No. 6 of 2014 concerning villages that application of Village Information System (SID) must be optimized. However, this was not successful because of problems such as a lack of information about the village being conveyed to the community. Based on the existing problems, a solution was created in the form of a program called Kalurahan Online (Kaline) which provides solutions to increase SID while simultaneously digitizing villages in the Special Region of Yogyakarta and strengthening the management of Village-Owned Enterprises (BUMDes).

Increasing using SID is the government's effort to implement e-government in accordance with the instructions of the President of the Republic of Indonesia Number 3 of 2003 concerning National Policy and Strategy for e-government Development. in the current era, it is important to use technology that facilitates SID management so that Kalurahan information can be properly distributed to the public.

Within this the most accurate data source for population data needs. Therefore, the presentation of population information data to the public must be carried out effectively and efficiently so that the information is presented in an interesting, fast, and accurate manner so that in the future there will be the digitization of population information (Ardhana, 2019).

Kaline program focuses on solving these problems, managing village profiles, and BUMDes profiles, including village profile videos, templates for village websites, village social media concepts, and BUMDes which are all digital based. This program involves Universitas Muhammadiyah Yogyakarta students collaborating with Institut Seni Indonesia students in the Mbangun Desa(In) program. The aim is to provide opportunities for students to serve the community and be able to develop their potential.

The Kaline program implemented by Community Service Program (KKN) team in Srihardono Village are one of the 17 sub-districts that are partners in the Kaline program. Srihardono is one of the sub-districts located in Kapanewon Pundong, Bantul Regency, Special Region of Yogyakarta.

It is like any other kelurahan in the Special Region of Yogyakarta, Srihardono has problems related to SID management and BUMDes management. but BUMDes in the Kalurahan Srihardono has not yet been formed so activities are focused on the Village Headquarters Srihardono is an update of the Village Profile Srihardono digitally. Kalurahan Online (Kaline) together with Mbangun Desa(in) involved students of Universitas Muhammadiyah Yogyakarta and Institut Seni Indonesia in creating an Independent Learning Campus Merdeka (MBKM) ecosystem in the form of community service that

ISSN 2961-7758

focuses on digitizing urban villages and strengthening governance BUMDes.

LITERATURE REVIEW

In (Tamrin et al., 2022) research, the research method uses a qualitative method that is described by collecting and analyzing a lot of data. Such as through online media articles, academic journals, and proceedings. To get another perspective, an interview was conducted with the head of The Kertayasa Tourism Village Management. Questionnaires in the form of Google Forms were also distributed by researchers to the digital team of Kertayasa Village and Selasari Tourist Village who participated in the digitalization training of tourist village management to get different perspectives on the digitalization process in their respective villages.
The results obtained by this research are that digitization in the management of tourist villages is an absolute thing and should not be ignored. Many tourism actors already understand the importance of digitization, but the limited knowledge possessed by tourism village managers limits their development.

The novelty of this research can be seen from the research methods used. If previous research used qualitative methods that described and analyzed with a lot of data. Interviews were conducted and questionnaires were distributed to get other perspectives, but this research uses a participatory approach by carrying out community service and observation by going directly to the field by having discussion group focused with village staff and local communities representatives.

This paper is community service research that has been completed. The aim of this research is to digitize villages in Srihardono, Bantul through the Kaline X Mbangun Desa(in). The components of digitizing this village includes making village design assets, making a profile book, making website homepage, making social media templates, and making video profile.

METHOD

The steps taken by researchers in carrying out community service through the Kaline X Mbangun Desai(in) starts with observing the service location, to get the information and data needed during the activity.

After the required information and data is sufficient, then the researcher begins to work on the work program that has been prepared previously is do digitization and branding village through the official website and social media accounts village. After all work programs are done, then researchers submit the output that has been done to the village for done implementation and evaluation. During study ongoing, data and information collection were done with a method discussion group focused together with staff Village and local community representatives.

After the data is obtained, proceed with the production of digital content as well as in-form photos and videos. Production done with involve the community. Engagement This aimed at society not only becomes object but also to be subject in this program.

RESULT AND DISCUSSION

According to Kaline 's tagline that is move together with the village; it is hoped that after this activity ends the village can continue any activities that have been exemplified first by the Community Service Program (KKN) Kaline team. So that after the KKN ends, the village can continue to progress and continue to develop village digitization. Assistance already carried out by the KKN Kaline team can keep going become guidelines villages to continue existing programs and can be implementing independently and sustainably by working with other village officials and related parties.

(1) Making Village Design Assets

Design assets in the form of logos and mascots village works as symbolism from picture village regularly symbolic. The logo made by KKN members is made to look newer, more modern and keep up with the times. This thing is done so that the symbol from village no looks outdated. Meanwhile mascot, made for forming symbolism from potential village in a way that is not too formal. Design assets in the form of logos and mascots Kalurahan Srihardono is also registered as Rights above Intellectual Property Right (IPR) at the Indonesian Ministry of Law and Human Rights.

Figure 1. Main Logo Srihardono Horizontal

Figure 2. Srihardono village mascot

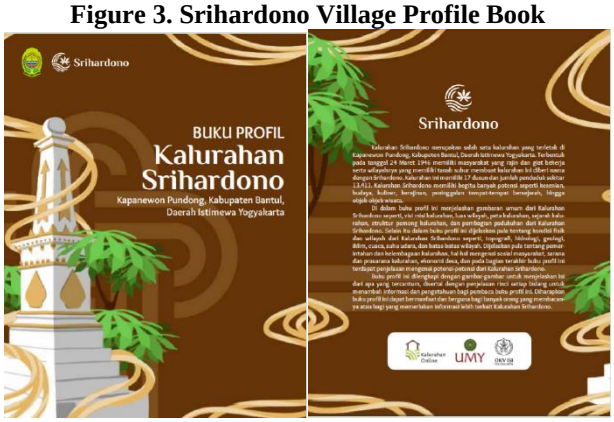
(2) Making a Profile Book

The output from this program is a profile book from the village of Srihardono. In addition profile book serving information, is also packaged for promoting potency tourism owned by the Village Srihardono profile villages

ISSN 2961-7758

and sub-districts is a description complete about character villages and sub-districts within them is basic data family, potential resource nature, resources human, institutional, infrastructure, and facilities as well as development progress and problems encountered (Achsin et al., 2015). Book-aligned profile with need village is matter important prioritized (Lail, 2015).

Figure 3. Srihardono Village Profile Book

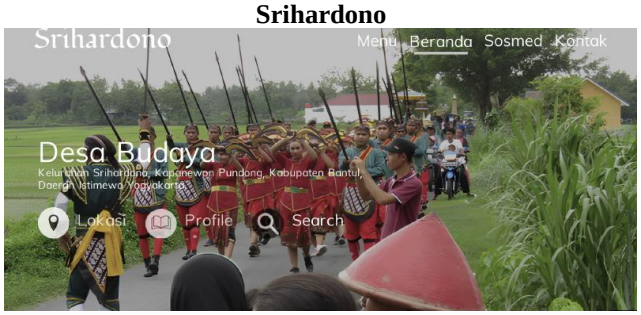


(3) Making Website Homepage

Websites can be used as a promotional medium effect. Compared to with other promotional media such as brochures, posters and others, websites are the most inexpensive, effective and efficient promotional media if can managed with appropriate (Muntoha et al., 2015).

The output form website homepage template made by members devotion This own objective for make more homepages interesting for visited and more convenient to use by the device future village _ will manage website the Homepages it also has function in the form of news information media from the village for residents, menus that can be accessed by visitor's website, and overview general about village Srihardono.

Figure 3. Appear Homepage Website Villages Srihardono



(4) Making Social Media Template

Instagram is a social media that has superiority in content photos and short videos (Rohmah, 2020). Instagram social media can utilize For managed as promotional media (Mahmudah & Rahayu, 2020). Coordinated management of Instagram will increase interaction audience (Fajri, 2017). Good management needed in management of Instagram institutions (Setyaningsih et al., 2019) This is what the Instagram social media template creation program is based on village Srihardono.

Output form social media templates Instagram has objective for interesting interest audience to visit Srihardono as destination village that can interest tourists. Moreover, this village has a lot of potential such as culture, art, and culinary tourism. Social media also works for event promotion food which is a village icon This that is Miedes. In addition, the village website, the media social too receptacle for giving information active to the most followers are inhabitant from village.

The output from this program is media templates social this expected can help media manager social in arrange how media management social village that can interesting for visited audience.

Figure 4. Appearance Village Instagram Templates Srihardono

(5) Making Video Profile

The video profile is description audiovisuals show content from village good from facet culture, arts, destinations travel and culinary. This video profile can useful as promotional media to the candidates visitors to be interested for visit to village Srihardono.

The whole aspect from output of the Kaline KKN Program (Online Kalurahan), basically aim for build an identity new or branding of a village digitally. This is done in order a village do not left behind by existence development continuing technology go ahead and do utilize technology the as tool for advance village with method utilize the potentials in the village.

CONCLUSION AND RECOMMENDATION

In accordance with KKN Kaline 's *tagline* that is move together with village; it is hoped that after this activity ends the village can continue any activities that have been exemplified first by the KKN Kaline team. So that after the

ISSN 2961-7758

KKN ends, the village can continue to progress and continue to develop village digitization. Assistance already carried out by the KKN Kaline team Can Keep going become guidelines villages to continue existing programs and can be implemented independently and sustainably by working with other village officials and related parties.

REFERENCE

Achsin, S. N., Cangara, H., & Unde, A. A. (2015). Profil Desa dan Kelurahan sebagai Sumber Informasi: Studi Evaluasi tentang Penyediaan Informasi Potensi Desa dan Kelurahan di Sulawesi Selatan oleh Badan Pemberdayaan Masyarakat Pemerintahan Desa dan Kelurahan (BPMPDK) Provinsi Sulawesi Selatan. *Jurnal Komunikasi Kareba*, *4*(4), 449–467. https://journal.unhas.ac.id/index.php/kareba/article/view/649

Ardhana, V. Y. P. (2019). Sistem Informasi Data Kependudukan Desa Berbasis Web. *SainsTech Innovation Journal*, *2*(2), 1–5. https://doi.org/10.37824/sij.v2i2.2019.99

Fajri, J. (2017). *Dimensi Interaktivitas Media Sosial*. *5*(3), 87–101.

Lail, J. (2015). Pembuatan Profil Dukuh Sentono. *Jurnal Inovasi Dan Kewirausahaan*, *4*(2), 109–111. https://journal.uii.ac.id/ajie/article/download/7907/6916

Mahmudah, S. M., & Rahayu, M. (2020). Pengelolaan Konten Media Sosial Korporat pada Instagram Sebuah Pusat Perbelanjaan. *Jurnal Komunikasi Nusantara*, *2*(1), 1–9. https://doi.org/10.33366/jkn.v2i1.39

Muntoha, Jamroni, & Tantria, H. (2015). Pemanfaatan Situs Web sebagai Sarana Promosi Desa Songbanyu, Kecamatan Giri Subo, Gunung Kidul, Daerah Istimewa Yogyakarta. *Inovasi Dan Kewirausahaan*, *4*(September), 5. https://journal.uii.ac.id/ajie/article/download/7921/6931

Rohmah, N. N. (2020). Media Sosial Sebagai Media Alternatif Manfaat dan Pemuas Kebutuhan Informasi Masa Pandemik Global Covid 19. *Al-I'lam: Jurnal Komunikasi Dan Penyiaran Islam*, *4*(1), 1–16.

Setyaningsih, P. N., Suadnya, W., & Fajarica, S. D. (2019). Manajemen Konten Media Sosial Instagram pada BKKBN Provinsi NTB sebagai Strategi Humas dalam Membangun Brand Awareness Instagram Social Media Content Management in Family Planning Coordinating Board of West Nusa Tenggara Province as Public Relations Strat. *Journal Of Media and Communication Science) 1 Diterbitkan Oleh Program Studi Ilmu Komunikasi Universitas Mataram*, *3*(1), 1–11.

Tamrin, I., Simanjuntak, D., & Afriza, L. (2022). Digitalisasi Tata Kelola Desa Wisata Kertayasa sebagai Implementasi E-Tourism. *JUSTIN (Jurnal Sistem Dan Teknologi Informasi)*, *10*(1), 34–39. https://doi.org/10.26418/justin.v10i1.45477.

ISSN 2961-7758

ISSN 2961-7758

Ethnobotanical Studies in the Ritual of Panjang Jimat Ceremony at the Kasepuhan Palace Cirebon

Muhammad Abdul Jabar[1], Bagus Hammam Falah[2], Putri Imas Andini[3], Ema Kartika[4]
[1] Biology Department, Mathematics and Natural Sciences Faculty, Universitas Negeri Semarang, Semarang, Indonesia, 50229
[2] Biology Department, Mathematics and Natural Sciences Faculty, Universitas Negeri Semarang, Semarang, Indonesia, 50229
[3] Nutritional Science Department, Medical Faculty, Universitas Negeri Semarang, Semarang, Indonesia, 50229
[4]Sociology and Anthropology Department, Social Sciences Faculty, Universitas Negeri Semarang, Semarang, Indonesia, 50229
Email: muhammadabduljabar@students.unnes.ac.id[1]; bagushammam@students.unnes.ac.id[2]; putriimas0206@students.unnes.ac.id[3]; emakartika888@students.unnes.ac.id[4]

ABSTRACT

Indonesia is the second country with a high level of biodiversity and culture from each region. One area that has high biodiversity and culture is the city of Cirebon. The unique culture of Cirebon City which combines aspects of biodiversity and culture is the Panjang Jimat Ritual which is carried out at the Kasepuhan Palace in Cirebon. This ritual is carried out on the night of 12 Rabiul Awwal which aims to commemorate the birthday of the Prophet Muhammad SAW. However, until now, there has been no research that examines the various types of plants used in this ceremony, even though knowledge of the types of plants used can help to determine the status of natural resources, the distribution of plants, and the interactions between plants and people in the city of Cirebon. Therefore, this study aims to identify various types of plants and their symbolic meanings used in the Panjang Jimat ritual. The research method used is descriptive quantitative by collecting data through interviews and observation. The results showed that there were 18 plants used in this ceremony which included *Oryza sativa*, *Cocos nucifera*, *Rosa* sp., *Mangifera indica*, *Musa paradisiaca*, *Magnolia alba*, *Curcuma longa*, *Syzygium aromaticum*, *Zingiber officinale*, *Cinnamomum verum*, *Jasminum sambac*, *Styrax japonica*, *Cananga odorata*, *Citrus* sp., *Bambusa* sp., *Arenga pinnata*, *Salacca zalacca*, *and Malus* sp. This research is the first time it has been conducted, so ethnobotanical studies are very important to determine the interaction between plants and the local people of Cirebon.

Keywords: Ethnobotany, Panjang Jimat Ritual, Cirebon City

INTRODUCTION

Indonesia is an archipelagic country which has more than seventeen thousand island (Syahrial, 2022). Each island has different geographical conditions, Indonesia's geographical position is located between two continents and two oceans and is crossed by the equator making Indonesia as one of the countries with a large level of biodiversity in the world. Indonesia also ranks seven which is estimated to have 25% of the world's flowering plant species with 20.000 species, 40% of which are native to Indonesia or endemic (Puspitasari & Roziaty, 2022).

Cirebon city is one of the areas with a high level of biodiversity quite high in Indonesia. Astronomically, this city is located at the position of 6,41° SL and 108,33° EL on the north coast of the western part of Java. The area of Cirebon city extends from west to east about 8 kilometers and from north to south about 11 kilometers with an altitude ± 5 m above sea level and includes lowland areas with varying heights between 0-200 m. In accordance with the location of the area, whichis by the sea, Cirebon City including areas with moderately high air temperatures with a minimum average air temperature of 24,13℃ and the average maximum temperature of 31,18℃.

Based on the geographical location, the biodiversity in the Cirebon City area is quite high. Although located on the coast, this city is not only rich in aquatic biodiversity, but also has a fairly high potential for terrestrial biodiversity, including in agriculture. Some of the food crops that are cultivated in this city include rice, cassava, sweet potato, and green beans. Not only is it rich in biodiversity, the geographical conditions of Cirebon City are different from other regions, also influences the community in meeting their needs, so that the city of Cirebon has a different community culture, including in terms of cultural diversity.

According to KBBI, culture means reason. In general, culture can be defined as a way of life that exist in a group of humans (Syakhrani & Kamil, 2022), which has developed and been passed down from generation to generation. Culture can also interpreted as the result of human reason, in this case various things its forms and manifestations are known throughout history and belonging to human which is not rigid, but always evolving and changing so fostering humans to adapt to cultural

ISSN 2961-7758

changes and the challenges of traditional times to enter modern times (Widyastuti, 2021).

Cirebon city is one of the cities that is still thick with traditional culture. The culture thatexist and develops in this city has different characteristics from other regions in Indonesia. The culture in the city of Cirebon departs from tradition and religion, so that each culture has religious elements that tend to be religious and then blends with the palace culture which has a very distinctive and prominent royal nuance. One form of traditional culture that is still being carried out today is a traditional ceremonial ritual. Traditional ceremonies are a form of cultural manifestation that is manifested in the form of complex patterns of human behavior in society or commonly called a social system (Embon & Ketut, 2019). This activity related to habits called rituals. Rituals are ways a person or individuals in a society that is done to present their history. Therefore, rituals are inseparable from traditional ceremonies which are carried out continuously or seasonally (Marpaung & Idris, 2022). One of the ceremonial rituals the custom that is found in Cirebon is a ritual of panjang jimat ceremony at the Kasepuhan Palace, Cirebon. The ritual of panjang jimat ceremony is a series of ceremonies which is held every year, namely on the night of 12 Rabiul Awwal. This ceremony aims to commemorate the birthday of the Prophet Muhammad SAW (Javanese Islamic, 2019). Panjang jimat is one of the cultural symbols to express admiration for the prophet Muhammad SAW. Where in Panjang jimat there are many symbols that want conveyed to the community, and at every stage it is very closely related to the birth process and Islamic teachings which have their own symbols and meanings. Symbols are something that is used to represent something else, namely a kind of sign, painting, badge, including the use of plants that state something or have a specific purpose (Dewi, 2022).

The ritual of panjang jimat ceremony as one of the traditional ceremonies as part of the product of human culture in its practical level cannot be separated from the use of natural resources, such as plants in the surrounding environment. The relationship between humans and environment is very close and has been going on for a long time (Niman, 2019). Many plants are used in traditional ceremonies carried out by the community, such as rice (*Oryza sativa*), cassava (*Manihot utilissima*), sand ginger (*Kaempferia galanga*), coconut (*Cocos nucifera*), and others. Plants used in traditional ceremonies have a main function related to symbolic meaning (Iskandar, 2017). For example, rice (*Oryza sativa*) symbolized food sufficiency, and flowers symbolizes fragrance (Kasim et al., 2021).

Traditional ceremonies carried out by the community are increasingly being eroded by the current of modernization. Regarding the use of plants in traditional ceremonies, the knowledge and use of plants by the community is decreasing, so that their existence is not noticed. Especially documentation related to the use of plants used in traditional ceremonies is still relatively small and the transfer of knowledge from generation to generation is mostly done orally. Therefore, through ethnobotanical studies the emphasis is on how to express the relationship between community culture and plant resources in the environment, especially in thePanjang jimat ceremony. So it is necessary to ethnobotanical studies, especially regarding utilization of plants used in this ceremony.

Based on some of the things above, this research was conducted to identify various kinds of plants and their symbolic meanings are used in the ritual of panjang jimat ceremony at the Kasepuhan Palace, Cirebon. This is mainly related to the lack of documentation regarding the knowledge and use of plants in the ritual of panjang jimat ceremony at the Kasepuhan Palace, Cirebon. In addition, this research on ethnobotany in the Panjang jimat ceremony is the first so that it can become a basic reference for future research.

LITERATURE REVIEW

One of the cultural diversity that exist in this country is regarding culture found in the Kasepuhan Palace, Cirebon. Cirebon has many different cultures, including the customs and traditions that exist in the Kasepuhan Palace. Like it is known that the palace is a social structure in which there are complex community rules so as to create unique culture. A culture will not arise without the interaction and existence of the community. The Kasepuhan Palace is one of the palaces that is still well maintained authenticity. We can see the uniqueness of the palace with eye from the forms and relics of part history which have become silent witnesses in the development of the times.

Besides the beauty and attractive architectural style of the palace buildings, the uniqueness of other palaces is reflected in the customs and traditions of the palace which are still upheld, as part of the obligation and efforts to preserve the nations culture. One of the well-known traditions from the Kasepuhan Palace is the Mauludan Tradition which is held every 12th of Robiul Awwal to commemorate the birth of Muhammad SAW. In the Mauludan tradition, which is a sequence of processions commemorating the birth of Muhammad SAW is symbolized with certain objects that are rich in meaning, the core goal for muslims is always follow Muhammad SAW teachings.

In its implementation, the Panjang jimat ceremony uses a wide variety of plants as a consequence of biodiversity in the area, but until now there has been no research study discussing the use of plant and their symbolic meanings in the ceremony. Previous research only studied the meanings of communication symbols in general in the Panjang jimat ceremony at the Kasepuhan palace. From the result of that study, only the denotation and connotation meanings of the

ISSN 2961-7758

various ritual tools used in the ceremony were obtained, as well as the myths believed by the people of Cirebon throughout the ceremony (Fitriyani & Nugroho, 2019). Therefore, it is important to conduct research on ethnobotanical studies on the Panjang jimat ceremony at the Kasepuhan Palace Cirebon for the first time.

Ethnobotany is the science of using plants in everyday life and ethic customs. Ethnobotanical studies are not only concerned with taxonomic data, but also regarding knowledge that is regional in nature, in the form of an overview that studies the interrelationship between human and plants, and concern the use of these plants and the preservation of natural resources (Hotimah et al., 2019). Until now, many ethnobotanical studies have been carried out by researchers in various regions in indonesia, such as the study of ethnobotany as community tradicional medicine in Kalisalak Traditional Village, Banyumas, Central Java (Hidayah et al., 2022), ethnobotanical study of Tamiang tribe wedding customs in Menanggini Village, Aceh, Tamiang, Aceh Province (Ramadhani et al., 2021), as well as ethnobotanical studies of certain species covering the entire territory of Indonesia, such as review: ethnobotanical study of *Pandanus tectorius* in Indonesia (Rustamsyah et al., 2022).

Ethnobotany is a science that can be used as a food, medicines, dyes, building materials, ritual ceremonies, myths, and others. Ethnobotany has several specific studies which consist of several types of studies. Handayani (2018) states that the study of ethnobotany is a descriptive form of documentation traditional ethnobotanical knowledge processed by the surrounding community, this study include studies of botany, pharmacology, sosanthropology, economics, linguistics, and ecology. Ethnobotany has a role including as plant conservation, which includes various varieties of agricultural and plantation crops in traditional farming systems, as well as the prsesence of other biological resources. Ethnobotany also has a role in protecting the intellectual property of local communities, such as knowledge of the use of plants develop according to the values that grow in society, also be useful from an economic perspective because it can identify new types of plants that have economic potential; and commercial value (Ridanti et al., 2022). Based on some of these things, it is important to carry out an ethnobotanical study regarding the use of plant and their symbolic meanings in the Panjang jimat ceremnony at the kasepuhan palace Cirebon.

METHOD

The research activity was carried out an October 7, 2021 at the complex Kasepuhan Palace Cirebon which is located at Jl. Kasepuhan, No. 43, Kesepuhan, Kec. Lemahwungkuk, Cirebon, West Java. The phenomenon that is the case in thisresearch is the relationship between high biodiversity, especially plants in the Cirebon area with one of the tradional ceremonial rituals, namely panjang jimat ceremony. This study focuses on the analysis of the use of plants and their symbolic meanings used in the ritual of panjang jimat ceremony at the Kasepuhan Palace, Cirebon.

Figure 1. Research sites

In this research, researchers took two sources of data, namely primary data sources and secondary data sources. Primary data source is the first data source where a data is generated. In this research, the primary data source used was to conduct direct interviews with the research subject, namely Mr. Elang Ayi as the head of the customs and traditions of the Kasepuhan Palace, Cirebon. While secondary data sources are data obtained not directly from the sources, but obtained from asecond part. This data support primary data that researchers have obtained. This secondary data sources obtained by researchers through literature studies on the book and internet. Plant data along with symbolic meanings obtained from interview sources and literature are classified based on the family and the part of used. After that, the results obtained were processed descriptively qualitatively.

RESULT AND DISCUSSION

Based on the research that has been done about the use of plants in the ritual of Panjang jimat ceremony at the Kasepuhan Palace, Cirebon. There are 17 types of plants used in the process of the ceremonial activities. Each plant has its own symbolic meaning (Table 1). From the table, it can be seen that there are 17 types of plant used in the ritual of Panjang jimat ceremony at the kasepuhan palace Cirebon which belongs to 12 families. The widely used plant family consist of 4 families, namely *Arecaceae, Poaceae, Zingiberaceae,* and *Rosaceae. Arecaceae* consist of 3 species, *Poaceae* 2 species, *Zingiberaceae* 2 species, and *Rosaceae* 2 species (Fig. 2).

ISSN 2961-7758

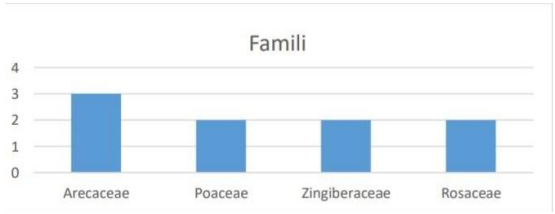


Figure 2. The four families most used in theritual of panjang jimat ceremony at the Kasepuhan Palace Cirebon

The part of the plant most used in the ritual of panjang jimat ceremony at the Kasepuhan Palace Cirebon consist of 6 types of fruit, then 5 types of flowers, followed by 2 types of rhizome, and 1 type of stem, bark, tree sap,and nira (fig. 3).

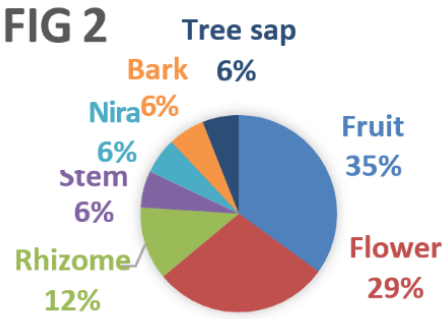


Figure 3. Percentage of plant parts used in the ritual of panjang jimat ceremony at the Kasepuhan Palace Cirebon

Table 1. A list of plants and their symbolic meanings used in the ritual of panjang jimat ceremony at the Kasepuhan Palace Cirebon

No.	Family	Species	The part of plant used	Symbol
1.	*Poaceae*	Rice *(Oryza sativa)*	Fruit	The birthday of the holy Prophet Muhammad SAW
2.	*Arecaceae*	Coconut *(Cocos nucifera)*	Fruit	Blessings on the birth of Prophet Muhammad SAW
3.	*Rosaceae*	Rose *(Rosa* sp.*)*	Flower	Amniotic fluid
4.	*Musaceae*	Banana *(Musa paradisiaca)*	Fruit	Human humility towards nature
5.	*Magnoliaceae*	Magnolia *(Magnoliaalba)*	Flower	Describe a sacred ceremony
6.	*Zingiberaceae*	Turmeric *(Curcumalonga)*	Rhizome	Treatment for mothers who have just given birth for a period of 40 days
7.	*Myrtaceae*	Clove (*Syzygium aromaticum*)	Flower	Treatment for mothers who have just given birth for a period of 40 days
8.	*Zingiberaceae*	Ginger (*Zingiber officinale*)	Rhizome	Treatment for mothers who have just given birth for a period of 40 days
9.	*Lauraceae*	Cinnamon (*Cinnamomumverum*)	Tree bark	Treatment for mothers who have just given birth for a period of 40 days
10.	*Oleaceae*	Jasmine (*Jasminum sambac*)	Flower	Describe a sacred ceremony
11.	*Styraceae*	Frankinsence (*Styrax japonica*)	Tree sap	Describe a sacred ceremony
12.	*Annonaceae*	Cananga (*Cananga odorata*)	Flower	Describe a sacred ceremony
13.	*Rutaceae*	Orange (*Citrus* sp.)	Fruit	Low self-esteem, forbid arrogance
14.	*Poaceae*	Bamboo (*Bambusa* sp.)	Bark	Means Abu Thalib who welcomed the birth of Prophet Muhammad SAW as a guide for the people to the parth of

ISSN 2961-7758

				truth
15.	*Arecaceae*	Aren (*Arenga pinnata*)	Nira	Describe adik getih (blood)
16.	*Arecaceae*	Snakefruit (*Salacca zalacca*)	Fruit	Symbol of safety and includes nutrition menu
17.	*Rosaceae*	Apple (*Malus* sp.)	Fruit	Symbol of safety and includes nutrition menu

The types of plants used in the ritual of panjang jimat ceremony at the Kasepuhan Palace Cirebon consist of 17 plant species belonging to 12 families. The four most widely used families in this ceremonial ritual are *Arecaceae* with three species namely *Cocos nucifera*, *Arenga pinnata*, and *Salacca zalacca*. Poaceae family with two species, namely *Oryza sativa* and *Bambusa* sp. *Zingiberaceae* family with two species namely *Curcuma longa* and *Zingiber officinale*. *Rosaceae* family with two species, namely *Rosa* sp. and *Malus* sp. Each species contains different meanings and symbols, but is united with one charachteristic, namely a form of commemoration and respect for the birth of the Prophet Muhammad SAW. This is inseparable from the main purpose of holding to the ritual of panjang jimat ceremony, namely to commemorate the birthday of the Prophet Muhammad SAW.

One of the most widely used herbs in the ritual of panjang jimar ceremonies is the family Poaceae, namely rice plant (*Oryza sativa*). This plant is the main ingredient for making nasi jimat, nasi uduk, and tumpeng jeneng which are mandatory dishes in the ceremony. Based on the results of interviews with respondents, is it said that rice is a one of the ingredients from nature that must be present in this ceremony, in addition to being the main ingredient, rice is also a symbol of the birth of the holy Prophet Muhammad SAW, holy like white rice, the rice used must also be brushed off by sunti virgins who havenever married and had sexual relations. This is to symbolize that the rice that will beserved is really clean and holy rice. The definition of a sunti virgin in this ceremony is different from definition in the trandition sumur penganten in the Kanoman Palace, Cirebon which defines a sunti virgin as not a woman who is not married or has children, but the definition of a sunti virgin here is a woman who always takes care of her wudhu, so that she remains saintly (Atika et al., 2020). Various rice dishes are an integral component of various rituals and traditions, as it is considered as the main or fundamental food in daily life. It can be seen that rice is a staple food that must be present in every dish and also applies to every tradition. Rice or paddy is a representation of the symbol of prosperity, fertility, and well-being in living one's life (Wahyuti et al, 2019). While bamboo (*Bambusa* sp.) used as a torch in the ritual of panjang jimat ceremony, the torch symbolizes an Abu Thalib who came at night to welcome the birth of Prophet Muhammad SAW as someone who will lead mankind to the path of truth.

Plants from the *Arecaceae* family are also plants that are widely used in the ritual of panjang jimat ceremony, one of which is coconut (*Cocos nucifera*), the part of the coconut that is most widely used in this ceremonial ritual is coconut oil used in the make of the nasi jimat, as well as coconut milk which is used in making nasi uduk, tumpeng jeneng, and various other foods. Coconut symbolized as a form of our gratitude and blessing for the birth of the Prophet Muhammad SAW. Based on the results of interviews with respondents, it is said that coconut is a plant which all parts can be used by humans, just like the Prophet Muhammad SAW who has been waiting for his birth to provide guidance, intercession, and useful knowledge that can guide his people to the straight path. Two other speciesfrom the Arecaceae family, namely aren (*Arenga pinnata*) which are the basic ingredients for making air serbat which symbolizes adik getih (blood) that comes out of someone who has just given birth. As well as salak (*Salacca zalacca*) which is used in one of the ritual stages, namely nyaji buah which symbolizes salvation for mankind and includes the nutritional menu in this ceremony.

Another plant that is also used in the ritual of panjang jimat ceremonies is turmeric (*Curcuma longa*), ginger (*Zingiber officinale*), cloves (*Syzygium aromaticum*), and cinnamon (*Cinnamomum verum*) whichis the basic ingredient for making boreh (traditional scrub). In this ritual, the four plants are the basic ingredients for making the boreh has a meaning as a treatment for mothers who have just given birth for a period of 40 days. Not much different from other traditional ceremonies, the ritual of panjang jimat ceremony too using flowers in the ritual ceremony. Flowers generally have volatile essential oil content which has an important role related to taste and smell. One of the flowers that must be present in the ritual ceremony is a rose (*Rosa* sp.) and its extract which symbolizes the amniotic fluid of a mother who has just given birth. In the research conducted by (Rofiq, 2018) it was found that the rose flower carries the meaning of the symbol "dumadine jalma menungsa", which refers to the process of one's birth into the temporal world. Therefore, the rose flower is often symbolized as a mother giving birth to her child into the world.

In the procession of siraman benda pusaka in the ritual of panjang jimat ceremony, various types of flower are also used, such as cananga (*Cananga odorata*), jasmine (*Jasminum sambac*), and magnolia (*Magnolia alba*) which symbolizes that this ritual is a very sacred ceremony as commemoration of the birthday of the Prophet Muhammad SAW. According to (Lismawanty et al., 2021) each of these flowers has its own meaning and symbol attached to them. For instance, the cananga originates from

ISSN 2961-7758

the word "kenangen ing angga", which means the hope that one's child will always remember all of their ancestral heirlooms or "pusaka". The jasmine carries the meaning that when one is about to take action, they should use a pure heart, and that their outer actions and inner intentions should be aligned. This meaning is in line with the use of jasmine flowers in the nadran ritual ceremony in Karangsong Village, Indramayu, that the meaning of jasmine flowers is that when taking action it always involves the heart, not just acting. In addition, another meaning of the jasmine flower is that in speaking it should always contain sincerity from the deepest conscience, physical and spiritual must always be the same, compact, not hypocritical (Lismawanty et al., 2021). Meanwhile, the magnolia represents a feeling of connection or "tali rasa", or "tansah kumanthil kanthil", which means a love and affection that will never be broken.

Several other types of plants are used in the ritual of panjang jimat ceremony are oranges (*Citrus* sp.) which symbolizes a human being who should not be arrogant and must always be humble towards Allah SWT, and apples (*Malus* sp.) which symbolizes salvation for mankind as well as a nutritional menu in this ceremony. In addition, there are also other types of fruit, namely bananas (*Musa paradisiaca*) which have special meaning that symbolizes human humility towards nature. Humans can do nothing except by the will of Allah SWT. Another type of plant that is also used in the ritual of panjang jimat ceremony is frankiscense (*Styrax japonica*) which is taken from the tree sap, and later burned as perfume in a series of ceremonial rituals which also has a symbol that the ritual of panjang jimat is a sacred ceremony. This is an accordance with the statement Susanti (2018) which states that the meaning of burning incense is to carry out the sunnah of the prophet. It is said to be sunnah because the prophet and the angels really like fragrant smells. One of them comes from the frankincense itself.

The part of the plant that has the highest utilization in the ritual of panjang jimat ceremony is the fruit, which is 35% of the 17 types of plants used in this ritual. Each type of fruit has its own meaning. The types of fruit include *Oryza sativa*, *Cocos nucifera*, *Musa paradisiaca*, *Citrus* sp. *Salacca zalacca*, and *Malus* sp. another part of the plant that is also widely used in this ritual is the flower, which is 29% of the 17 types of plants. The types of flowers include *Rosa* sp., *Syzygium aromaticum*, *Jasminum sambac*, *Cananga odorata,* and *Magnolia alba.* Another part of the plant used in this ritual is the rhizome, which is 12% of the 17 plants, consisting of *Curcuma longa* and *Zingiber officinale*. While other plant parts are only utilized by 6% of the 17 plants. Namely *Bambusa* sp. whose stems is used, *Cinnamomum verum* whose bark is used, *Arenga pinnata* whose nira is used, and *Styrax japonica* whose tree sap is used.

CONCLUSION AND RECOMMENDATION

Based on the results of this study, it can be concluded that there are 17 types of the plants used in the ritual of panjang jimat ceremony at the Kasepuhan Palace, Cirebon. The most widely used plant parts are fruits and flowers. The types of plants that used is *Oryza sativa* which symbolizes the birthday of the holy prophet, *Cocos nucifera* which symbolizes the blessing of the birth of Prophet Muhammad SAW, *Rosa* sp. which symbolizes amniotic fluid, *Musa paradisiaca* which symbolizes human humility towards nature. *Magnolia alba*, *Cananga odorata*, *Jasminum sambax*, and *Styrax japonica* which symbolizes a sacred ceremony. *Curcuma longa*, *Syzygium aromaticum*, *Zingiber officinale*, and *Cinnamomum verum* which have meaning as treatment for a mother who has just given birth for 40 days. *Salacca zalacca* and *Malus* sp. which symbolizes safety and nutrition. *Arenga pinnata* which symbolizes adik getih (blood). *Bambusa* sp. which symbolizes an Abu Thalib who welcomed the birth of the Prophet Muhammad SAW as a guide for the people to the path of truth, and *Citrus* sp. which symbolizes low self-esteem and prohibits arrogance.

The research on ethnobotany studies is still limited to the Panjang jimat ceremony at the Kasepuhan Palace, even though there are two other palaces in the Cirebon area which have similar ttraditions. Further research is needed regarding the Panjang jimat ceremony at the Kanoman and Kacirebonan Palace, so that we can compare the use of plants in the Panjang jimat ceremony but in different places environments. It is hoped that a broader perspective will be obtained regarding the use of plants in the Panjang jimat ceremony at the palaces of Cirebon region.

REFERENCE

Atika, R. N., Karimah, S. N., Rizki, F. M., Waluya, B., & Dahliyana, A. (2020). Tradisi Mandi Sumur Penganten di Keraton Kanoman Cirebon. *Sosial Budaya*, *17*(2), 125–132. https://doi.org/http://dx.doi.org/10.24014/sb.v17i2.8554

Dewi, N. R. S. (2022). Konsep Simbol Kebudayaan : Sejarah Manusia Beragama dan Berbudaya. *Abrahamic Religions: Jurnal Studi Agama-Agama*, *2*(1), 1–10.

Embon, D., & Ketut, I. G. (2019). Sistem Simbol dalam Upacara Adat Toraja Rambu Solo: Kajian Semiotik. *Jurnal Bahasa Dan Sastra*, *4*(2), 1–10. http://jurnal.untad.ac.id/jurnal/index.php/BDS/article/view/10056

Fitriyani, nur azizah, & Nugroho, C. (2019). Makna Simbol Komunikasi dalam Upacara Panjang Jimat di

ISSN 2961-7758

Keraton Kanoman Cirebon. *E-Proceeding of Management*, *6*(2), 4945–4950.

Handayani, I. S., Zaini, M., & Dhamono. (2018). *Buku Ajar Etnobotani untuk Perguruan Tinggi Keagamaan Islam Negeri* (1st ed.). Lambung Mangkurat University Press.

Hidayah, H. A., Alifvira, M. D., Sukarsa, & Hakim, R. R. Al. (2022). Studi Etnobotani sebagai Obat Tradisional Masyarakat di Desa Adat Kalisalak, Banyumas, Jawa Tengah. *Life Science*, *11*(1), 1–12. https://doi.org/https://doi.org/10.15294/lifesci.v11i1.59787

Hotimah, H., Hayati, A., & Zayadi, H. (2019). Studi Etnobotani Jahe (Zingiber officinale) pada Masyarakat Desa Banyior Kecamatan Sepulu Kabupaten Bangkalan. *BIOSAINTROPIS (Bioscience-Tropic)*, *4*(khusus), 33–39. https://doi.org/https://doi.org/10.33474/e-jbst.v4i3.225

Javanese Islamic. (2019). Arsitektur Masjid Sunan Gunung Jati Cirebon sebagai Akulturasi Budaya Islam, Jawa, dan Cina. *Jurnal Lingkungan Binaan Indonesia*, *8*(1), 56–63.

Kasim, A., Nurdin, M., Tellu, A. T., & Zainal, S. (2021). Identifikasi Pemanfaatan Tumbuhan Pada Upacara Siklus Hidup Suku Kaili Da'a di Desa Uwemanje Kecamatan Kinovaro Kabupaten Sigi. *Biocelebes*, *15*(2), 125–138. https://doi.org/https://doi.org/10.22487/bioceb.v15i2.15654

Lismawanty, A., Dwiatmini, S., & Yuningsih, Y. (2021). Makna Simbolis Upacara Ritual Nadran Empang Di Desa Karangsong Kabupaten Indramayu (Kajian Simbol Dan Makna. *Jurnal Budaya Etnika*, *5*(2), 99–122.

Marpaung, E. P., & Idris, M. (2022). Studi Etnobotani Tumbuhan yang Digunakan Dalam Upacara Kematian Saur Matua. *Bioedusains: Jurnal Pendidikan Biologi Dan Sains*, *5*(2), 418–424. https://doi.org/https://doi.org/10.31539/bioedusains.v5i2.4747

Niman, erna mena. (2019). Kearifan Lokal dan Upaya Pelestarian Lingkungan Alam. *Jurnal Pendidikan Dan Kebudayaan Missio*, *11*(1), 91–106.

Puspitasari, D. M., & Roziaty, E. (2022). Distribusi Lichen Genus Lobaria di Jalur Pendakian Cemoro Sewu, Magetan, Jawa Timur. *Seminar Nasional Pendidikan Biologi Dan Saintek (SNPBS)*, 381–387.

Ramadhani, L., Oktavianti, T., Andriani, Nafsiah, Sihite, R. J., & Suwardi, A. B. (2021). Studi Etnobotani Ritual Adat Pernikahan Suku Tamiang di Desa Menanggini Kabupaten Aceh Tamiang Provinsi Aceh. *Bioma: Jurnal Ilmiah Biologi*, *10*(1), 80–92. https://doi.org/https://doi.org/10.26877/bioma.v10i.6090

Ridanti, C., Dharmono, & Riefani, maulana khalid. (2022). Kajian Etnobotani Aren (Arenga pinnata Merr.) di Desa Sabuhur Kecamatan Jorong Kabupaten Tanah Laut. *JUPEIS: Jurnal Pendidikan Dan Ilmu Sosial*, *1*(3), 200–215.

Rustamsyah, A., Nuraeni, S., Fadhlillah, faizah min, Kusmiyati, M., & Sujana, D. (2022). Review: Studi Etnobotani Farmakologi dan Fitokimia Pandanus tectorius di Indonesia. *Jurnal Insan Farmasi Indonesia*, *5*(2), 192–202. https://doi.org/10.36387/jifi.v5i2.1080

Susanti, L., & Asriwandari, H. (2018). Tradisi Bakar Kemenyan dalam Kehidupan Masyarakat Nagari Sabu Kecamatan Batipuh Kabupaten Tanah Datar. *Jurnal Online Mahasiswa Fakultas Ilmu Sosial Dan Ilmu Politik Universitas Riau*, *5*(1), 1–14.

Syahrial. (2022). Diversifikasi Budaya Tuping Sebagai Identitas Masyarakat Lampung Peminggir. *Jurnal Kajian Budaya Dan Humaniora*, *4*(2), 260–265.

Syakhrani, A. W., & Kamil, M. L. (2022). Budaya dan Kebudayaan: Tinjauan dari Berbagai Pakar, Wujud-Wujud Kebudayaan, 7 unsur kebudayaan yang bersifat universal. *Cross-Border*, *5*(1), 782–791.

Widyastuti, M. (2021). The Role Of Culture in the World of Education. *Jurnal Kebhinnekaan Dan Wawasan Kebangsaan*, *1*(1), 54–64. https://journal.unindra.ac.id/index.php/jagaddhita

ISSN 2961-7758

Hubungan Tingkat Pengetahuan, Sikap, Dan Perilaku Mahasiswa Kedokteran Universitas Muhammadiyah Yogyakarta Terhadap Pencegahan Diabetes Melitus Tipe 2

Seyka Lavefivusti Kesaputri[1], Denny Anggoro Prakoso[2]
[1]Program Studi Pendidikan Dokter Fakultas Kedokteran dan Ilmu Kesehatan Universitas Muhammadiyah Yogyakarta.
[2] Program Studi Pendidikan Dokter Fakultas Kedokteran dan Ilmu Kesehatan Universitas Muhammadiyah Yogyakarta.
Email; seyka.l.fkik20@mail.umy.ac.id[1]; denny.anggoro@umy.ac.id[2]

ABSTRACT
Type 2 Diabetes Mellitus (DMT2) is a non-communicable disease characterized by persistent and preventable increases in blood sugar. To prevent it requires good knowledge, attitudes, and behaviour. The purpose of this study was to determine the relationship between the level of knowledge, attitudes, and behaviour of Universitas Muhammadiyah Yogyakarta medical students towards the prevention of DMT2. This research is a quantitative study with a descriptive observational study design involving 197 respondents based on a convenience sampling technique. The results of the analysis showed that out of 197 respondents consisting of 193 people (98.0%) had good knowledge about diet and no respondents had bad knowledge about physical activity. Based on attitude, 191 respondents (97.0%) had a positive attitude towards diet and 185 people (93.9%) also had a positive attitude towards physical activity. Furthermore, based on the respondents' behaviour towards exercise habits, as many as 130 people (66.0%) have exercise habits. Based on the results of the chi-square test, it was found that several aspects had a relationship, namely knowledge about eating patterns with attitudes about eating patterns (p = 0.010), attitudes about eating patterns with attitudes about physical activity (p = 0.000), and attitudes about physical activity with behaviour (p= 0.007). Therefore, only a few aspects have a relationship. The results of this study are expected to be used as material for evaluating medical study programs regarding increasing promotion and prevention efforts related to DM.

***Keywords**: DMT2, Knowledge, Attitude, Behaviour*

ABSTRAK
Diabetes Melitus Tipe 2 (DMT2) merupakan salah satu penyakit tidak menular yang ditandai dengan peningkatan gula darah secara persisten dan dapat dicegah. Dalam upaya pencegahannya diperlukan pengetahuan, sikap, dan perilaku yang baik. Tujuan dari penelitian ini adalah untuk mengetahui hubungan tingkat pengetahuan, sikap, dan perilaku mahasiswa kedokteran Universitas Muhammadiyah Yogyakarta terhadap pencegahan DMT2. Penelitian ini merupakan penelitian kuantitatif dengan desain studi observasional deskriptif yang melibatkan 197 responden berdasarkan teknik *convenience sampling*. Hasil analisis menunjukkan bahwa dari 197 responden terdiri dari 193 orang (98,0%) memiliki pengetahuan yang baik tentang pola makan dan tidak ada responden yang memiliki pengetahuan buruk tentang aktivitas fisik. Berdasarkan sikap, sebanyak 191 responden (97,0%) memiliki sikap positif terhadap pola makan dan 185 orang (93,9%) juga memiliki sikap positif terhadap aktivitas fisik. Selanjutnya, berdasarkan perilaku responden terhadap kebiasaan olahraga, sebanyak 130 orang (66,0%) memiliki kebiasaan olahraga. Berdasarkan hasil uji *chi-square* diperoleh hasil bahwa beberapa aspek memiliki hubungan yaitu pengetahuan tentang pola makan dengan sikap tentang pola makan (*p= 0,010*), sikap tentang pola makan dengan sikap tentang aktivitas fisik (*p= 0,000*), dan sikap tentang aktivitas fisik dengan perilaku (*p= 0,007*). Oleh karena itu, hanya beberapa aspek saja yang memiliki hubungan. Hasil penelitian ini diharapkan dapat menjadi bahan evaluasi program studi kedokteran mengenai peningkatan upaya promosi dan pencegahan terkait DM.

Kata Kunci: DMT2, Pengetahuan, Sikap, Perilaku

PENDAHULUAN

Diabetes Melitus Tipe 2 (DMT2) merupakan gangguan metabolisme kronis yang ditandai dengan kenaikan gula darah secara persisten (Goyal & Jialal, 2019). Gangguan metabolisme yang terjadi berupa gangguan metabolisme karbohidrat, protein, dan lipid. Diabetes Melitus dapat terjadi akibat gangguan fungsi insulin (resistensi insulin) dan disfungsi dari sel beta pankreas (Azriful et al., 2018).

Diabetes Melitus (DM) menjadi salah satu ancaman kesehatan global yang dapat terjadi baik di negara maju maupun berkembang (Mansy et al., 2022). Prevalensi pada tahun 2021 diperkirakan lebih tinggi di wilayah perkotaan (12,1%) daripada wilayah pedesaan (8,3%) dan prevalensi DM lebih tinggi di negara dengan penghasilan tinggi (11,1%) daripada negara yang berpenghasilan rendah (5,5%). Peningkatan terbesar prevalensi DM diperkirakan akan terjadi di negara-negara berpenghasilan menengah (21,1%) daripada negara yang memiliki penghasilan tinggi (12,2%) dan rendah (11,9%) (Sun et al., 2022). Studi berbasis populasi DMT2 di berbagai negara melaporkan bahwa jumlah penderita diabetes di seluruh dunia telah

ISSN 2961-7758

mencapai 425 juta jiwa. Dari data tersebut, jumlah penderita diabetes cenderung lebih tinggi pada pria (221 juta jiwa) dibandingkan pada wanita (204 juta jiwa). Akibat DMT2, angka kematian yang dilaporkan sebesar 4 juta jiwa dan jumlah penderita DM pada tahun 2045 diprediksi akan mengalami peningkatan mencapai 629 juta jiwa (Jumari et al., 2019).

International Diabetes Federation (IDF) memperkirakan bahwa setidaknya 463 juta orang berusia 20-79 di seluruh dunia menderita diabetes pada tahun 2019, setara dengan tingkat prevalensi 9,3% dari total populasi kelompok usia yang sama. Berdasarkan jenis kelamin, IDF memperkirakan prevalensi diabetes pada tahun 2019 sebesar 9% pada wanita dan 9,65% pada pria. Prevalensi tersebut diperkirakan akan meningkat seiring dengan bertambahnya usia penduduk menjadi 19,9% atau 111,2 juta orang saat berusia 65-79 tahun.

Di wilayah Asia Tenggara, 1 dari 11 orang dewasa (sekitar 90 juta orang) menderita DM. Jumlah orang dewasa dengan DM diproyeksikan mencapai 113 juta pada tahun 2030 dan 152 juta pada tahun 2045. Pada tahun 2021, sekitar 747.000 orang akan meninggal karena DM dan menghabiskan dana sebesar USD 10,1 miliar untuk penanganan DM. International Diabetes Federation pada tahun 2021 menyebutkan bahwa Indonesia menempati peringkat ke-5 dengan jumlah penderita DM terbesar di dunia. Prevalensi kasus tersebut meningkat sebesar 6,2% dibandingkan tahun 2019 (Sun et al., 2022).

Berdasarkan laporan Riset Kesehatan Dasar (RISKESDAS) tahun 2018, prevalensi DM pada tahun 2018 diperkirakan sebesar 10,9%. Hal ini seiring dengan peningkatan prevalensi berat badan lebih yaitu dari 11,5% menjadi 13,6%. Selain itu, obesitas sentral (lingkar pinggang ≥90 cm pada laki-laki dan ≥80 cm pada perempuan) meningkat dari 26,6% menjadi 31%.

Data-data di atas menunjukkan bahwa penderita DMT2 masih sangat banyak dan jumlahnya terus meningkat, baik di dunia, di Indonesia, maupun di DIY. Jika hal ini terus menerus dibiarkan, maka akan meningkatkan angka morbiditas dan mortalitas yang diakibatkan oleh penyakit tidak menular (PTM) khususnya DMT2. Penyakit ini dapat mengakibatkan berbagai macam komplikasi meliputi komplikasi *mikrovaskular* dan *makrovaskular*. Komplikasi *makrovaskular* yang dapat terjadi seperti trombosit otak, *stroke*, gagal ginjal kongestif, dan jantung koroner. Sedangkan, komplikasi *mikrovaskuler* yang dapat terjadi seperti *retinopati*, *nefropati diabetic*, dan *neuropati* (Smeltzer & Bare, 2010 dalam Yuhelma' et al., 2015).

Menurut penelitian yang telah dilakukan oleh (Sulistyo et al., 2019) dengan jumlah responden 33 orang menyatakan bahwa semua responden memiliki tanda dan gejala neuropati diabetik perifer, sedangkan 18 responden (54,5%) memiliki tanda dan gejala neuropati diabetik perifer yang berat. Hasil penelitian ini juga menunjukkan bahwa sebanyak 8 responden (24,4%) dan 7 responden (21,2%) yang sudah menderita DM >9 tahun mengalami komplikasi retinopati sedang dan berat karena kurangnya pengetahuan dan wawasan mengenai upaya pencegahan DM serta upaya pencegahan komplikasi DM. Komplikasi ini sangat berkontribusi terhadap morbiditas dan mortalitas penderita DMT2 (Viigimaa et al., 2020). Selain itu, biaya yang harus dikeluarkan untuk pengobatan DM cukup besar, yaitu sebanyak USD 760 miliar (Patty et al., 2021).

Pencegahan terhadap penyakit DM dapat dilakukan oleh individu yang memiliki faktor risiko maupun individu yang tidak memiliki faktor risiko DM. Pencegahan ini berguna untuk mengurangi angka kejadian DM. Pencegahan DM dapat dilakukan oleh mahasiswa kedokteran sebagai calon tenaga kesehatan yang nantinya akan melayani masyarakat. Dalam upaya pencegahan DM, mahasiswa kedokteran memerlukan pengetahuan, sikap, dan, perilaku yang baik.

Penelitian tentang tingkat pengetahuan, sikap, dan perilaku terhadap pencegahan DMT2 sangat penting untuk dilakukan. Berdasarkan penelusuran yang dilakukan di Fakultas Kedokteran, Rabigh, Universitas King Abdulaziz (KAU) Jeddah, Arab Saudi pada tahun 2018 kepada 1428 peserta, sebanyak 186 peserta memiliki skor pengetahuan baik, sedangkan sebanyak 569 dan 673 peserta memiliki skor pengetahuan sedang dan buruk. Menariknya, 1190 peserta memiliki sikap positif dan 238 peserta memiliki sikap negatif serta lebih dari setengah peserta, 844 peserta, telah berlatih cukup untuk mencegah DMT2. Berdasarkan jenis kelamin, perempuan memiliki pengetahuan umum yang lebih baik tentang DM, faktor risiko, gejala dan tanda, kontrol, manajemen dan komplikasi DM. Hasil dari penelitian tersebut juga menunjukkan bahwa peserta yang memiliki kerabat hipertensi dan DM lebih cenderung memiliki sikap positif dan praktik yang baik terhadap pencegahan DM (Gazzaz, 2020).

Ditinjau dari jumlah penderita penyakit Diabetes Melitus tipe 2 (DMT2) yang terus meningkat, penyakit ini masih banyak diderita oleh masyarakat Indonesia. Penyakit DMT2 dapat menimbulkan kerugian bahkan kematian, sehingga diperlukan penelitian yang mendalam tentang pencegahan diabetes melitus tipe 2 (DMT2). Keadaan tersebut yang membuat peneliti tertarik untuk melakukan penelitian tentang hubungan tingkat pengetahuan, sikap, dan perilaku mahasiswa kedokteran terhadap pencegahan DMT2, dengan harapan dapat meningkatkan rasa peduli kepada diri sendiri, keluarga, dan masyarakat terkait pencegahan DMT2. Dengan demikian, hasil dari penelitian ini diharapkan dapat digunakan sebagai bahan evaluasi prodi kedokteran terkait kurikulum tentang DM.

LITERATUR REVIEW

Beberapa penelitian yang sudah dilakukan yaitu berjudul "*Knowledge, Attitudes, and Practices Regarding Diabetes Mellitus Among University Students in Jeddah, Saudi Arabia*" (Gazzaz, 2020). Berdasarkan penelitian oleh Gazzaz, 2020 menunjukkan bahwa penelitian yang melibatkan 1428 peserta memperoleh hasil bahwa sejumlah

ISSN 2961-7758

186 peserta memiliki skor pengetahuan baik sedangkan 569 peserta dan 673 peserta memiliki skor pengetahuan sedang dan buruk. Sedangkan untuk sikap, sebanyak 1190 peserta (83,3%) memiliki sikap positif dan sebanyak 238 peserta (16,7%) memiliki sikap negatif.

Sejumlah 844 peserta (59,1%) sudah berlatih cukup untuk pencegahan DM. Selanjutnya penelitian yang berjudul "*Assessing Outpatients' Knowledge, Attitude, and Practice Toward Managing Diabetes in Saudi Arabia*" (Mansy et al., 2022) menunjukkan hasil bahwa penelitian yang melibatkan 300 pasien di RS Riyadh, Arab Saudi memperoleh hasil bahwa tingkat pengetahuan dan praktik tergolong kategori baik dengan presentase 37,6% dan 47,9%, tetapi pasien yang memiliki sikap positif terhadap pengelolaan DM hanya 30,9%. Berdasarkan hasil tersebut, hubungan antara tingkat pengetahuan dan jenis kelamin (p= 0,014) dan status asuransi (p= 0,008) masing-masing terbukti signifikan. Rata-rata skor sikap lebih tinggi pada laki-laki (p= 0,006). Pada penelitian ini menemukan hasil bahwa pasien DM rawat jalan memiliki pengetahuan, praktik dan sikap yang negatif terhadap DMT2.

Selain itu, penelitian berjudul "*Level of knowledge, attitude, and practice towards diabetes among nationals and long-term residents of Qatar: a cross sectional study*" (Al-Mutawaa et al., 2022) menunjukkan hasil bahwa penelitian dengan jumlah sampel yang digunakan sebanyak 2400 peserta, sebagian besar peserta (54%) memiliki total skor KAP menengah, 43% peserta dengan skor rendah, dan hanya 3% saja yang memiliki skor KAP tinggi. Sejumlah 69% peserta memiliki skor pengetahuan rendah, 29% peserta memiliki skor pengetahuan sedang, dan hanya 2% peserta memiliki skor pengetahuan tinggi. Berdasarkan sikap peserta, sebanyak 32% peserta memiliki nilai tinggi, 55% peserta memiliki nilai sedang, dan 13% peserta memiliki nilai rendah. Sedangkan berdasarkan praktik, 37% peserta memiliki nilai tinggi, 33% peserta memerlukan nilai sedang, dan 30% peserta memiliki nilai rendah.

Penelitian berjudul "Gambaran Tingkat Pengetahuan Mahasiswa FK USU Stambuk 2021 Terhadap Pencegahan Diabetes Mellitus Tipe 2" (Castika, 2021) menunjukkan hasil bahwa tingkat pengetahuan mahasiswa kedokteran USU berdasarkan jenis kelamin dan riwayat keluarga terhadap pencegahan DM tergolong kategori baik. Berdasarkan jenis kelamin, kategori tingkat pengetahuan baik pada laki-laki sebesar 55,5%; pada perempuan sebesar 75,0%. Selanjutnya, berdasarkan riwayat keluarga yang memiliki riwayat DM, sebanyak 90,9% memiliki pengetahuan baik, 9,1% memiliki pengetahuan sedang, dan 0,0% memiliki pengetahuan kurang. Sedangkan, berdasarkan tidak adanya riwayat keluarga DM, sebanyak 57,1% responden memiliki pengetahuan baik, 34,7% memiliki pengetahuan sedang, dan 8,2% memiliki pengetahuan kurang.

Perbedaan antara penelitian yang akan dilakukan dengan penelitian-penelitian sebelumnya terletak pada subjek penelitian, tempat pelaksanaan penelitian, dan variabel penelitian. Subjek dalam penelitian ini adalah mahasiswa pendidikan dokter Universitas Muhammadiyah Yogyakarta. Sedangkan tempat pelaksanaan penelitian ini di Universitas Muhammadiyah Yogyakarta yang dilakukan pada bulan Januari 2023 hingga Maret 2023. Variabel yang digunakan yaitu variabel independen berupa tingkat pengetahuan, sikap, dan perilaku dan variabel dependen yaitu pencegahan DMT2. (Tabel 1)

METODE

Jenis penelitian ini adalah kuantitatif. Desain yang digunakan adalah observasional deskriptif dengan pendekatan *cross sectional* dengan menggunakan analisis data yaitu analisis univariat dan bivariat. Teknik sampling yang digunakan adalah *non-probability* sampling yaitu *convenience sampling* dengan menggunakan kuisioner yang dibagikan melalui *google forms*. Pada teknik ini, pengambilan sampel dilakukan dengan memilih sampel secara bebas, yaitu sampel yang dianggap memenuhi kriteria dan dipandang cocok sebagai sumber data oleh peneliti. Rumus yang digunakan untuk menentukan besarnya sampel pada penelitian ini adalah Rumus Slovin.

Populasi yang menjadi subjek penelitian adalah mahasiswa Fakultas Kedokteran Universitas Muhammadiyah Yogyakarta. Sedangkan, sampel yang digunakan pada penelitian ini adalah mahasiswa program studi pendidikan dokter Universitas Muhammadiyah Yogyakarta. Jumlah minimal sampel yang diperoleh dengan rumus Slovin adalah 197 responden.

Penelitian ini dilakukan pada bulan Januari 2023 sampai dengan Maret 2023. Kuisioner dalam bentuk *google forms* berisi pertanyaan dan pernyataan mengenai karateristik responden, pengetahuan, sikap, dan perilaku responden tentang upaya pencegahan Diabetes Melitus Tipe 2 (DMT2). Pengetahuan dan sikap dalam penelitian ini dibagi menjadi dua yaitu tentang pola makan dan aktivitas fisik. Pengetahuan tentang pola makan dan aktivitas fisik dikatakan baik apabila memiliki skor ≥7 dan ≥5 serta buruk apabila memiliki skor <7 dan <5. Sedangkan sikap tentang pola makan dan aktivitas fisik dikatakan baik apabila memiliki skor ≥64 dan buruk apabila <64. Selain itu, perilaku dapat dikatakan baik apabila memiliki skor ≥62 dan buruk apabila memiliki skor <62.

Variabel dalam penelitian ini dibagi menjadi dua yaitu variabel independen dan variabel dependen. Variabel independen dalam penelitian ini yaitu tingkat pengetahuan, sikap, dan perilaku, sedangkan variabel dependen dalam penelitian ini yaitu tindakan pencegahan Diabetes Melitus Tipe 2. Uji yang digunakan dalam penelitian ini adalah *chi-square*.

HASIL DAN PEMBAHASAN

Karateristik responden disajikan dalam Tabel 1. Tabel tersebut menunjukkan bahwa mayoritas responden dalam penelitian ini adalah perempuan (68,5%). Usia responden mayoritas adalah ≥20 tahun (76,14%). Selain itu, mayoritas responden tidak memiliki riwayat personal

ISSN 2961-7758

menderita DM (98,5%). Sedangkan responden yang memiliki riwayat keluarga menderita DM sebanyak 80,7%.

Tabel 1. Karateristik Responden

Jenis Kelamin	Jumlah (n)	Presentase (%)
Laki-laki	62	31,5
Perempuan	135	68,5
Usia		
<20 tahun	47	23,86
≥20 tahun	150	76,14
Riwayat Personal DM		
Ada	3	1,5
Tidak	194	98,5
Riwayat Keluarga DM		
Ada	38	19,3
Tidak	159	80,7

Karateristik pengetahuan, sikap, dan perilaku responden meliputi tingkat pengetahuan, sikap, dan perilaku berdasarkan jenis kelamin dan riwayat DM. Berdasarkan hasil analisis statistik dengan *crosstabulation* dari data (Tabel 2) menunjukkan bahwa mayoritas responden memiliki pengetahuan yang baik terkait pola makan (98%) dan tidak ada satupun responden yang memiliki pengetahuan buruk tentang aktivitas fisik. Selanjutnya, berdasarkan sikap tentang pola makan dan aktivitas fisik, hampir semua responden memiliki sikap yang baik yaitu sebanyak 97% dan 93,9%. Sedangkan, berdasarkan kebiasaan olahraga, sebanyak 130 responden (66%) berolahraga dan sisanya tidak memiliki kebiasaan olahraga.

Tabel 2. Distribusi Frekuensi Pengetahuan, Sikap, dan Perilaku Responden tentang Diabetes Melitus Tipe 2

Tingkat Pengetahuan Tentang Pola Makan	Jumlah (n)	Presentase (%)
Baik	193	98,0
Buruk	4	2,0
Tingkat Pengetahuan Tentang Aktivitas Fisik		
Baik	197	100,0
Buruk	0	0
Tingkat Sikap Tentang Pola Makan		
Baik (Positif)	191	97,0
Buruk (Negatif)	6	3,0
Tingkat Sikap Tentang Aktivitas Fisik		
Positif	185	93,9
Negatif	12	6,1
Kebiasaan Olahraga		
Berolahraga	130	66
Tidak Berolahraga	67	34

Pengetahuan dan Sikap Responden Berdasarkan Jenis Kelamin

Berdasarkan analisis data menggunakan *crosstabulation* (Tabel 3) diketahui bahwa dari total responden perempuan (135 orang), terdapat 133 orang (98,5%) perempuan yang memiliki tingkat pengetahuan tentang pola makan yang baik. Sedangkan, dari 62 responden laki-laki terdapat 60 laki-laki (96,7%) memiliki tingkat pengetahuan tentang pola makan yang baik. Dari proporsi tersebut dapat diartikan bahwa perempuan cenderung memiliki tingkat pengetahuan tentang pola makan yang lebih baik karena perempuan lebih banyak menghabiskan waktunya untuk berdiskusi dengan teman sehingga wawasannya juga akan semakin luas (Berek et al., 2019). Selain itu, hasil analisis di atas juga menunjukkan bahwa semua responden baik laki-laki maupun perempuan memiliki tingkat pengetahuan tentang aktivitas fisik yang baik. Hal ini menunjukkan bahwa tidak ada perbedaan tingkat pengetahuan tentang aktivitas fisik antara laki-laki dan perempuan karena gender bukan merupakan faktor yang dapat mempengaruhi tingkat pengetahuan seseorang (Yuliana, 2017).

Data pada (Tabel 4) menunjukkan bahwa terdapat 133 orang (98,5%) dan 58 laki-laki (93,5%) memiliki sikap yang baik terhadap pola makan. Hasil analisis selanjutnya juga dapat diketahui bahwa terdapat 128 perempuan (94,8%) dan 57 responden laki-laki (92%) memiliki sikap yang baik terhadap aktivitas fisik. Sehingga, dapat

ISSN 2961-7758

diketahui bahwa perempuan memiliki proporsi terkait sikap tentang pola makan dan aktivitas fisik yang cenderung lebih baik daripada laki-laki karena seorang wanita lebih memiliki sikap peduli (Maulani, 2019).

Tabel 3. Distribusi Frekuensi Pengetahuan Responden Berdasarkan Jenis Kelamin

Jenis Kelamin	Tingkat Pengetahuan Tentang Pola Makan				Total
	Baik		Buruk		
	n	%	n	%	
Perempuan	133	67,5	2	1,0	135
Laki-laki	60	30,5	2	1,0	62
Jenis Kelamin	**Tingkat Pengetahuan Tentang Aktivitas Fisik**				**Total**
	Baik		Buruk		
	n	%	n	%	
Perempuan	135	68,5	0	0,0	135
Laki-laki	62	31,5	0	0,0	62

Tabel 4. Distribusi Frekuensi Sikap Responden Berdasarkan Jenis Kelamin

Jenis Kelamin	Tingkat Sikap Tentang Pola Makan				Total
	Baik (positif)		Buruk (negatif)		
	n	%	n	%	
Perempuan	133	67,6	2	1,0	135
Laki-laki	58	29,4	4	2,0	62
Jenis Kelamin	**Tingkat Sikap Tentang Aktivitas Fisik**				**Total**
	Baik (positif)		Buruk (negatif)		
	n	%	n	%	
Perempuan	128	65,0	7	3,6	135
Laki-laki	57	28,9	5	2,5	62

Perilaku Responden Berdasarkan Jenis Kelamin

Berdasarkan hasil analisis dengan *crosstabulation* Tabel 5 dari 135 responden perempuan terdapat 80 perempuan (59%) perempuan yang memiliki kebiasaan olahraga dan sebanyak 66 perempuan (33,5% dari populasi) yang memiliki kebiasaan olahraga dinyatakan memiliki tingkat olahraga sedang. Sedangkan laki-laki yang memiliki kebiasaan olahraga sebanyak 51 orang (82,2%). Responden laki-laki yang memiliki kebiasaan olahraga ternyata melakukan olahraga tingkat sedang dengan jumlah 25 orang (12,7% dari populasi). Sehingga, dapat diketahui bahwa laki-laki memiliki kecenderungan untuk melakukan olahraga apabila dibandingkan dengan perempuan.

Hal tersebut juga berkaitan dengan penelitian (The Lancet Public Health, 2019) yang menyatakan bahwa terjadi kesenjangan aktivitas fisik antara seorang laki-laki dan perempuan, dimana kesenjangan ini sudah terjadi pada saat anak berusia 3-11 tahun yang kemudian akan membentuk perilaku aktivitas fisik hingga dewasa. Banyak perempuan yang suka menunda aktivitas fisiknya karena beberapa faktor yaitu merasa tidak aman di sekitar tubuhnya ketika melakukan olahraga, adanya pembatasan budaya, dan wanita cenderung memiliki sedikit waktu luang. Hal inilah yang akan menyebabkan peningkatan faktor risiko penyakit tidak menular.

Tabel 5. Distribusi Frekuensi Perilaku Responden Berdasarkan Jenis Kelamin

Jenis Kelamin	Tingkat Olahraga						Total
	Tingkat Rendah		Tingkat Sedang		Tingkat Tinggi		
	n	%	n	%	n	%	
Perempuan	11	5,6	66	33,5	3	1,5	80
Laki-Laki	11	5,6	25	12,7	15	7,6	51

HUBUNGAN PENGETAHUAN, SIKAP, DAN PERILAKU TERHADAP PENCEGAHAN DIABETES MELITUS TIPE 2

Berdasarkan hasil analisis data responden (Tabel 6) menggunakan uji *chi-square*, didapatkan hasil bahwa jenis kelamin hanya memiliki hubungan dengan perilaku (*sig.2-tailed Pearson Chi-Square*= 0,000, nilai tersebut <0,05). Selanjutnya, riwayat personal menderita DM memiliki hubungan dengan riwayat DM pada keluarga (*sig.2-tailed Pearson Chi-Square*= 0,036, nilai tersebut <0,05). Hal ini sejalan dengan penelitian (Bete et al., 2022) yang menyatakan bahwa salah satu penyakit yang dapat diturunkan kepada keturunannya secara genetik adalah DM. Selain itu, terdapat hubungan antara pengetahuan pola makan dengan sikap pola makan (*sig.2-tailed Pearson Chi-Square*= 0,010, nilai tersebut <0,05). Hal ini menunjukkan bahwa responden yang memiliki pengetahuan tentang pola makan yang baik juga memiliki sikap positif (baik) terhadap pola makan karena sikap seseorang dapat terbentuk salah satunya karena pengetahuan dalam bentuk pengalaman yang dijadikan sebagai sumber pengetahuan (Luawo, 2021). Kemudian, seseorang yang memiliki sikap positif (baik) terhadap pola makan ternyata juga memiliki sikap positif (baik) terhadap aktivitas fisik. Hal tersebut dapat dinilai berdasarkan nilai *sig.2-tailed Pearson Chi-Square*= 0,000. Adapun, seseorang yang memiliki sikap positif terhadap aktivitas fisik juga memiliki perilaku yang baik. Hal ini ditunjukkan dengan nilai *sig.2-tailed Pearson Chi-Square*=0,007.

Akan tetapi, berdasarkan tabel hasil analisis tersebut juga dapat diketahui bahwa hasil perhitungan pada aspek pengetahuan tentang aktivitas fisik tidak dapat muncul karena semua responden memiliki pengetahuan tentang aktivitas fisik yang baik. Selanjutnya, terdapat beberapa nilai yang tidak menunjukkan hubungan antaraspek satu dengan yang lainnya dikarenakan semua responden (laki-laki, perempuan, memiliki riwayat personal dan keluarga DM, serta tidak memiliki riwayat personal dan keluarga DM) mempunyai pengetahuan, sikap, dan perilaku yang baik. Hal tersebut mencerminkan bahwa mayoritas mahasiswa fakultas kedokteran UMY sudah memiliki pengetahuan, sikap, dan perilaku yang baik terkait dengan pencegahan DM.

ISSN 2961-7758

Tabel 6. Hasil Analisis *Chi-Square*

Hasil Analisis Chi-Square		Riwayat Pribadi	Riwayat Keluarga	Jenis Kelamin	Pengetahuan Pola Makan	Pengetahuan Aktivitas Fisik	Sikap Pola Makan	Sikap Aktivitas Fisik	Perilaku
sig.2-tailed Pearson Chi-Square	Riwayat Pribadi	0,000	**0,036**	0,237	0,802	-	0,757	0,657	0,631
	Riwayat Keluarga	**0,036**	0,000	0,124	0,323	-	0,869	0,203	0,572
	Jenis Kelamin	0,237	0,124	0,000	0,420	-	0,059	0,433	**0,000**
	Pengetahuan Pola Makan	0,802	0,323	0,420	0,000	-	**0,010**	0,110	0,759
	Pengetahuan Aktivitas Fisik	-	-	-	-	-	-	-	-
	Sikap Pola Makan	0,757	0,869	0,059	**0,010**	-	0,000	**0,000**	0,175
	Sikap Aktivitas Fisik	0,657	0,203	0,433	0,110	-	**0,000**	0,000	**0,007**
	Perilaku	0,631	0,572	**0,000**	0,759	-	0,175	**0,007**	0,000

Berdasarkan analisis korelasi *Pearson* (Tabel 7) untuk meninjau nilai sig.2 *tailed* diketahui bahwa sikap tentang aktifitas fisik sangat berkaitan dengan aktivitas sehari-hari dengan nilai sig.2 *tailed* jauh lebih kecil dari 0,05, yaitu 0,004. Sikap aktifitas ini mencirikan bahwa kegiatan sehari-hari seperti berjalan, menyapu, membaca, bersepeda, dan olahraga sederhana dapat memberikan manfaat untuk mengurangi risiko diabetes.

Adapun pemahaman tentang makan dan sikap pola makan tidak mencirikan kebermanfaatan untuk mengurangi risiko DM tipe 2. Dengan kata lain, sebagian besar mahasiswa FK UMY sangat memahami pentingnya mengatur konsumsi makanan tetapi tidak dapat mempraktikkannya dengan benar. Hal ini perlu menjadi perhatian agar dapat dijadikan contoh dalam hal kesehatan masyarakat.

Tabel 7. Hasil Analisis Pearson

	Hasil Analisis Correlations Pearson	Aktivitas Sehari-hari
Nilai sig.2 tailed	Pengetahuan Pola Makan	0,350
	Pengetahuan Aktifis	-
	Sikap Pola Makan	0,461
	Sikap Aktifis	0,004
	Perilaku	0,145

Berdasarkan hasil analisis data yang telah dilakukan menunjukkan bahwa Diabetes Melitus Tipe 2 (DMT2) merupakan penyakit yang berkaitan dengan gangguan metabolik yang memiliki karateristik berupa peningkatan kadar gula darah atau hiperglikemi. Penyakit ini terjadi karena kelainan hormon insulin yang disebabkan oleh adanya gangguan kerja ataupun sekresi insulin sehingga terjadi gangguan respon biologis tubuh terhadap insulin yang dapat menyebabkan kebutuhan insulin dalam tubuh meningkat sehingga terjadi hiperinsulinemia. Hiperinsulinemia merupakan upaya tubuh untuk mempertahankan kadar glukosa dalam plasma agar tetap dalam keadaan normal.

Jumlah penderita DMT2 semakin lama jumlahnya semakin meningkat. Pada tahun 2045 diperkirakan jumlah penderita DMT2 mencapai 700 juta orang. Adanya peningkatan jumlah penderita DMT2 dapat dipengaruhi oleh beberapa faktor, diantaranya adalah faktor yang dapat dikendalikan dan faktor yang tidak dapat dikendalikan. Faktor yang dapat dikendalikan berkaitan dengan obesitas, aktivitas fisik yang kurang, hipertensi, kebiasaan merokok, dislipidemia, dan stress. Sedangkan faktor yang tidak dapat dikendalikan yaitu riwayat DM pada keluarga dan usia. Selain itu, faktor yang dapat menyebabkan seseorang menderita DMT2 juga berkaitan dengan pengetahuan, sikap, dan perilaku seseorang dalam kehidupan sehari-hari. Ketiga aspek ini sangat berkaitan erat untuk mencegah seseorang menderita DMT2. Upaya pencegahan DMT2 dapat dilakukan oleh mahasiswa, khususnya mahasiswa kedokteran. Dalam upaya pencegahan DMT2, ketiga aspek tersebut merupakan hal mutlak yang harus dimiliki karena dengan satu aspek saja tidak dapat mencegah seseorang menderita DMT2. Namun, berdasarkan data dalam penelitian ini, masih ada mahasiswa FK UMY yang memiliki pengetahuan yang baik tetapi sikap dan perilakunya kurang baik dan sebaliknya. Oleh karena itu, penelitian tentang hubungan pengetahuan, sikap, dan perilaku mahasiswa FK UMY terhadap pencegahan DMT2 sangat penting untuk dilakukan karena masih terdapat mahasiswa FK UMY yang menderita DMT2 walaupun jumlahnya tidak terlalu banyak. Sehingga dengan adanya penelitian ini diharapkan dapat menjadi bahan evaluasi program studi kedokteran mengenai peningkatan upaya promosi dan pencegahan terkait DM prodi kedokteran, khususnya Prodi Kedokteran UMY

KESIMPULAN

Terdapat hubungan antara beberapa aspek seperti jenis kelamin dengan perilaku pencegahan Diabetes Melitus Tipe 2, pengetahuan tentang pola makan dengan sikap tentang pola makan, dan sikap tentang aktivitas fisik dengan perilaku. Akan tetapi, tidak terdapat hubungan antara tingkat pengetahuan, sikap, dan perilaku dengan pencegahan Diabetes Melitus Tipe pada mahasiswa kedokteran UMY.

SARAN

Adapun saran berdasarkan penelitian ini adalah sebagai berikut:

1. Diharapkan mahasiswa kedokteran Universitas Muhammadiyah Yogyakarta dapat mempertahankan pengetahuan, sikap, dan perilaku yang sudah baik. Akan tetapi untuk sebagian kecil mahasiswa kedokteran Universitas Muhammadiyah Yogyakarta yang masih memiliki pengetahuan, sikap, dan perilaku kurang baik terhadap pencegahan DM Tipe 2 harus memperbaiki pengetahuan, sikap, dan perilakunya.
2. Diharapkan penelitian selanjutnya dapat dilakukan menggunakan metode yang berbeda, yaitu metode kualitatif seperti *focus group discussion, survey*, dan wawancara mendalam.

DAFTAR PUSTAKA

Al-Mutawaa, K. A., Farghaly, A. H., Nasir, R., Loares, A. M., Skaroni, I., Al-Thani, M., & Abou-Samra, A.-B. (2022). Level of knowledge, attitude and practice towards diabetes among nationals and long-term residents of Qatar: A cross-sectional study. *BMJ Open*, *12*(2), e052607. https://doi.org/10.1136/bmjopen-2021-052607

ISSN 2961-7758

Azriful, A., Nildawati, N., Habibi, H., & Juddin, D. R. (2018). Hubungan tingkat pengetahuan faktor risiko DM dengan status DM pada pegawai Negeri Sipil UIN Alauddin Makassar. *Al-Sihah: The Public Health Science Journal*.

Berek, P. A. L., Be, M. F., Rua, Y. M., & Anugrahini, C. (2019). HUBUNGAN JENIS KELAMIN DAN UMUR DENGAN TINGKAT PENGETAHUAN REMAJA TENTANG HIV/AIDS DI SMAN 3 ATAMBUA NUSA TENGGARA TIMUR 2018. *Jurnal Sahabat Keperawatan*, *1*(01), Article 01. https://doi.org/10.32938/jsk.v1i01.85

Bete, R. N. S., Umar, A. F., & Rua, Y. M. (2022). GAMBARAN TINGKAT PENGETAHUAN KELUARGA TENTANG PENYAKIT DIABETES MELITUS DI WILAYAH KERJA PUSKESMAS KOTA ATAMBUA KABUPATEN BELU. *Jurnal Sahabat Keperawatan*, *4*(02), Article 02.

Castika, A. (2021). *PROGRAM STUDI PENDIDIKAN DAN PROFESI DOKTER FAKULTAS KEDOKTERAN UNIVERSITAS SUMATERA UTARA MEDAN 202*. 68.

Gazzaz, Z. J. (2020). Knowledge, Attitudes, and Practices Regarding Diabetes Mellitus Among University Students in Jeddah, Saudi Arabia. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, *Volume 13*, 5071–5078. https://doi.org/10.2147/DMSO.S287459

Goyal, R., & Jialal, I. (2019). *Diabetes Mellitus Type 2*.

Jumari, J., Waluyo, A., Jumaiyah, W., & Natashia, D. (2019). Pengaruh Akupresur terhadap Kadar Glukosa Darah Pasien Diabetes Melitus Tipe 2 di Persadia RS Islam Jakarta Cempaka Putih. *Journal of Telenursing (JOTING)*, *1*(1), 38–50. https://doi.org/10.31539/joting.v1i1.536

Luawo, N. P. (2021). *Untuk Melengkapi Salah Satu Syarat*.

Mansy, W., Wajid, S., Alwhaibi, A., Alghadeer, S. M., Alhossan, A., Babelghaith, S., Alrabiah, Z., & Al Arifi, M. N. (2022). Assessing Outpatients' Knowledge, Attitude, and Practice Toward Managing Diabetes in Saudi Arabia. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, *59*, 004695802210827. https://doi.org/10.1177/00469580221082781

Maulani, F. A. (2019). Body image dan tingkat kebahagiaan pada wanita dewasa awal. *Cognicia*, *7*(3), 369–377. https://doi.org/10.22219/cognicia.v7i3.9229

Patty, Y. F. P. P., Mufarrihah, & Nita, Y. (2021). Cost of illness of diabetes mellitus in Indonesia: A systematic review. *Journal of Basic and Clinical Physiology and Pharmacology*, *32*(4), 285–295. https://doi.org/10.1515/jbcpp-2020-0502

Siregar, E. A. (2017). *PROGRAM STUDI PENDIDIKAN DOKTER FAKULTAS KEDOKTERAN UNIVERSITAS SUMATERA UTARA MEDAN 2017*.

Sulistyo, A. A. hadi, Aziz, A. F., Nurfadila, T., Dewi, N. K., & Noviya, A. F. (2019). Prevalensi Komplikasi Diabetes Melitus Berdasarkan Karakteristik Pasien Diabetes Melitus. *Jurnal Ilmu Kesehatan MAKIA*, *8*(1). https://doi.org/10.37413/jmakia.v8i1.46

Sun, H., Saeedi, P., Karuranga, S., Pinkepank, M., Ogurtsova, K., Duncan, B. B., Stein, C., Basit, A., Chan, J. C. N., Mbanya, J. C., Pavkov, M. E., Ramachandaran, A., Wild, S. H., James, S., Herman, W. H., Zhang, P., Bommer, C., Kuo, S., Boyko, E. J., & Magliano, D. J. (2022). IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes Research and Clinical Practice*, *183*, 109119. https://doi.org/10.1016/j.diabres.2021.109119

The Lancet Public Health. (2019). Time to tackle the physical activity gender gap. *The Lancet Public Health*, *4*(8), e360. https://doi.org/10.1016/S2468-2667(19)30135-5

Viigimaa, M., Sachinidis, A., Toumpourleka, M., Koutsampasopoulos, K., Alliksoo, S., & Titma, T. (2020). Macrovascular Complications of Type 2 Diabetes Mellitus. *Current Vascular Pharmacology*, *18*(2), 110–116. https://doi.org/10.2174/1570161117666190405165151

Yuhelma'., Yesi'. Hasneli, & Fathra Annis Nauli. (2015). Identifikasi dan Analisis Komplikasi Makrovaskuler dan Mikrovaskuler pada Pasien Diabetes Mellitus. *Jurnal Online Mahasiswa Program Studi Ilmu Keperawatan Universitas Riau*, *2*(1), 569–579.

Yuliana, E. (2017). *Analisis Pengetahuan Siswa Tentang Makanan yang Sehat dan Bergizi Terhadap Pemilihan Jajanan di Sekolah* [PhD Thesis]. UNIVERSITAS MUHAMMADIYAH PURWOKERTO.

ISSN 2961-7758

Screening the Activity of Epigallocatechin Gallate as a Colorectal Anticancer Agent: *In Silico* and ADMET/Pharmacokinetic Studies

Prismo Bagas Setiadi[1], Maura Shavira Alamsyah[2], Tria Ningsih[3], Qatrunada Fajriyah[4], Rifki Febriansah[5]
[1,2,3,4,5] Pharmacy Study Program, Faculty of Medicine and Health Sciences, Yogyakarta Muhammadiyah University, Bantul, Indonesia 55183
Email : prismo431@gmail.com[1], maura16shavira@gmail.com[2], triafaees44@gmail.com[3], q.nada.fajriyah@gmail.com[4], briansyah_rifki@yahoo.com[5]

ABSTRACT
Introduction - Colorectal cancer is one of the third ranked cancers in Indonesia and has a high level of malignancy. The bioactive compound *Epigallocatechin Gallate* (EGCG) is known to have antioxidant and cytotoxic activity, so it has the potential to be developed as an anticancer agent. **Purpose** - This study aims to determine the potential of EGCG compounds as anticancer *in silico*. **Methodology/Approach** - The *in-silico* tests used are molecular docking and ADMET/Pharmacokinetic profiles using *biosig pkcsm*.**Finding** - The results of the respective binding affinities formed from EGCG compounds with the target protein affinities of COX-2 and *Caspace-3* are -9.2 and -5.4 which are better links between EGCG and *Caspace*. The Lipinski rule show that the epigallocatecin compound has strength to absorb is 47%. This indicates that EGCG has the potential as a candidate for colorectal anticancer drugs with poor absorption. **Originality/Value/Implications** – *In Silico*, many studies have been carried out, but it is still rare to combine molecular docking methods with pKCSM to determine the solubility properties of compounds. The prospect of this research can become a basic or key for developing ECGC compounds into preparations because they have low bioavailability and can be continued in in vitro and in vivo research.

Keywords: Colorectal Cancer, Epigallocatechin Gallate, molecular docking, ADMET

INTRODUCTION

Cancer is a high prevalence cause of death which is characterized by cell growth that is faster than its normal cycle inducing damage to healthy segments and can invade other segments of the body or metastasize (Depkes RI, 2009). This cancer ranks third and is the second deadliest in the world. Based on research by Xi and Xu, (2021), colorectal cancer has 1.9 million cases in the world and causes 900 thousand deaths in 2020 (Xi & Xu, 2021). Colorectal cancer is a tumor that grows uncontrollably in the mucosal lining of the intestine to the rectum which specifically represents a condition of malignancy of the tumor (Sayuti & Nouva, 2019). Treatment of cancer that is often found in general is with chemotherapy instruments, radiation, and surgery. Treatment through chemotherapy is defined as an instrument of eradicating cancer cells with drugs in certain categories. Chemotherapy has several disadvantages, such as the emergence of undesirable toxic effects that invade healthy segments in the body. Nausea and vomiting are an effect of chemotherapy. Current therapy regimens need to be approached with side effects due to chemotherapy, not all of them have good effects. Chemotherapy has many effects that lead discomfort to patients (Nurgali, *et al.*, 2018). Thus, it is necessary to develop new treatments with minimal side effects and maximum therapeutic effects.

Trend 'Back to Nature' is currently a new pattern for the world community in medicine because it is considered to have minimal side effects compared to conventional drugs. Green tea (*Camelia sinensis*) is a commodity that is consumed in various parts of the world and widely cultivated in the highlands of Indonesia. According to research, *Camellia sinensis* can be used to support antibacterial, antidiabetic, antiviral, antifungal, and anticancer therapy because contain of the seconder metabolites such as *catechin*. *Epigallocatechin Gallate* (EGCG) contains the most abundant concentration in *catechins* (Amelia, 2019). EGCG has anticancer effects with several pathways such as modulation, inhibition of proliferative activity, tumorigenesis, and inducing cell death (Min & Kwon, 2014).

In this paper, we will discuss the content of EGCG which has the potential as an anticancer using *in silico* studies. This research was conducted using molecular docking and *pkcsm* so that in the future it can be developed as an insight into knowledge and preparation innovation. Previous research discussed the activity of *Epigallocatechin* and *Epicatechin* as antivirals for SARS Cov-2 (Naufa, et al., 2022) and the effects of *quercetin* on COX-2 and *Caspase-3* cells (Putri, et al., 2019). This study aims to determine the anticancer activity and pharmacokinetic profile of EGCG linked to COX-2 and *Caspase-3* cells. The research results are expected to be a scientific trace of the potential of the EGCG compound as a colorectal anticancer agent based on molecular docking and to develop its pharmacokinetic profile based on *pKCSM*.

ISSN 2961-7758

LITERATURE REVIEW

Colorectal Cancer

Colorectal cancer is an event that is associated with epithelial changes in the normal intestine into a small precancerous wound that widens into invasive carcinoma and somatically or inherited genetic mutations with a span of 10-15 years. Supporting conditions run from three molecular pathways, namely chromosomal instability, mismatch repair, and hypermethylation (Lotfollahzadeh, et al., 2022). Based on Saraiva, et al. (2023), risk factors for colorectal cancer are classified as modifiable and unmodifiable. Modifiable factors include:

- Overweight
- Diabetes mellitus
- Use of alcohol and tobacco
- Fiber-poor foods
- Dyslipidemia
- Low amount of normal flora

Factors that cannot be modified, such as:

- Genetic factor
- Lynch syndrome
- Familial adenomatous polyposis
- Inflammatory bowel disease (IBD)

Symptoms that are a sign of the appearance of colorectal cancer are changes in bowel movements, such as changes in stool volume and colour, diarrhoea or constipation, a full stomach, and blood in the stool (Sayuti & Nouva, 2019).

EGCG Compound

ECGC is one of the main polyphenolic compounds in the composition of green tea secondary metabolites. EGCG (Figure 1) is the only interesting compound to study in medicinal chemistry because of its very high antioxidant effect (Legeay, et al., 2015). In addition, EGCG has several pharmacological effects, such as increasing insulin receptor sensitization, inhibiting carcinogenesis, tumorigenesis, and mutagenesis, preventing metastatic cancer, protecting against cardiovascular disease and neurodegenerative diseases (Shiyan, 2021).

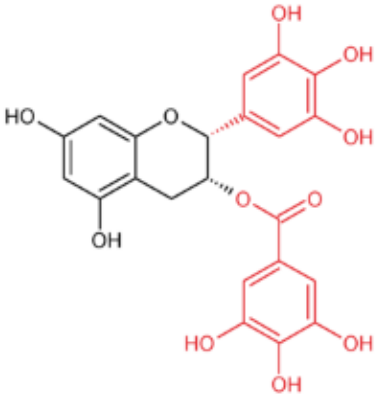


Figure 1. ECGC Molecular Structure (Legeay, *et.al.*, 2015).

Based on previous research conducted by Febriansah, et al. (2021) regarding EGCG and *Acetogenin* targeting the *bcl-xl* protein having a docking score of -8.1 kcal/mol and -6.7 kcal/mol. ECGC can be supposed to work to inhibit cell life and trigger apoptosis through the emergence of cancer cells. In addition, research by Fitriyani, et al. (2020), found that the *catechin* compounds like EGCG, EGC, and ECG can interact with the *HER-2* receptor even though the free energy formed is higher than the original ligand. In addition, *catechins* are also known to interact with *ASP863*.

METHOD

Tools

The instruments used in this study were Visualizer Discovery Studio software, Marvin Sketch, Autodock Tool, Autodock Vina, and the website https://biosig.lab.uq.edu.au/pkcsm/prediction accessed on 23 March 2023.

Materials

The materials used in this study are inflammatory proteins COX-2 *(5F19)* and executioner *Caspase-3 (2XZT)* which can be downloaded via https://www.rscb.org/ and the structure of the EGCG compound can be downloaded from https://pubchem.ncbi.nlm.nih.gov/ accessed on 23 March 2023.

RESEARCH PROCEDURE

Molecular Docking Methods

Should be downloaded several supporting applications in this method such as *Autodock Vina*, Discovery Studio Visualizer, and supporting software. Protein targets are obtained by downloading them to the *RSCB* in Protein Data Bank format. Native ligands were obtained from absorbed target proteins and stored in *PDBQT* Autodock Tools format. After obtaining the file in *PDBQT* form, it can be docked with *Autodock Vina* to get the *RSMD* value. The ideal *RSMD* value is determined by less than 2 Å. Docking visualization was carried out to see the bonds between proteins and ligands in the Discovery Studio test as a visualization application (Saputri, et al., 2022).

Pharmacokinetics Profile

To analyze ECGC compounds including absorption, distribution, metabolism, excretion, and toxicity properties with *pkcsm*. The data will be entered by entering *smiles* from *pubchem* to be entered and analyzed on the *pkcsm* website (Fajriaty, et al., 2023).

RESULT AND DISCUSSIONTest *In Silico* Molecular Docking

Molecular docking is part of a computational method with directions to describe the interaction events between compounds and their target receptors (Motiejunas & Wade, 2006). This computational method has a role in predicting the binding strength of two molecules (Mukesh & Rakesh, 2011). Another function is to relate the interactions of active substances and protein targets with

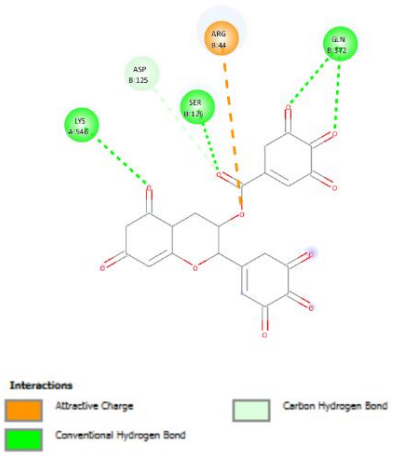
ISSN 2961-7758

the specific aim of obtaining data that can be used in conducting *in vitro* tests. This research is devoted to linking ECGC compounds to proteins that cause inflammation and execute apoptosis in colorectal cancer cells. Molecular docking results show an interaction between ECGC and COX-2 and *Caspase-3*.

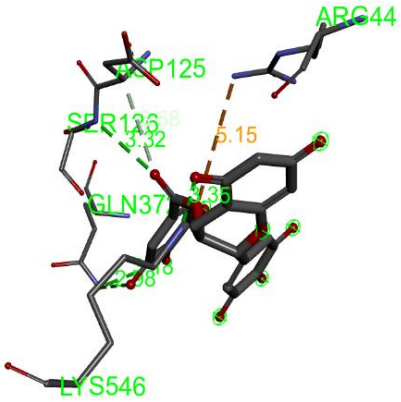
Table 1. Observation results of docking EGCG with cancer cell proteins.

Active Compound	Protein	RSMD (Å)	Docking Score
Native Ligand	COX-2	1.902	-8.0
EGCG		1.943	-9.2
Native Ligand	*Caspase-3*	1.020	-3.1
EGCG		1.970	-5.4

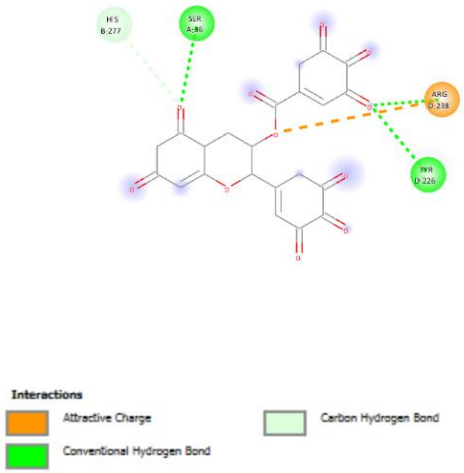
Based on table 1, the results of the docking of the link between EGCG and COX-2 and *Caspase-3* showed a higher affinity value compared to the native ligand of each receptor. The resulting affinity value between EGCG and COX-2 is -9.2 and EGCG with *Caspase-3* is -5.4. This shows good affinity compared to the native value of the ligand. Apart from that, research conducted by Febriansah et al. (2020), the binding between EGCG and the BCL-xl receptor showed the highest docking score compared to other compounds such as acetogenin, doxorubicin, and 5-Flourouracil (Febriansah, *et al.*, 2021). In previous studies, EGCG had good binding affinity for *bcl-xl* apoptosis-inducing compounds. In more detail, EGCG binds to amino acid residues in the COX-2 protein, namely *ARG44, ASP125, SER126, GLN372* and in EGCG bonds with *Caspase-3* protein binds to amino acid residues, namely *HIS277, SER36, ARG238, TYR226*.



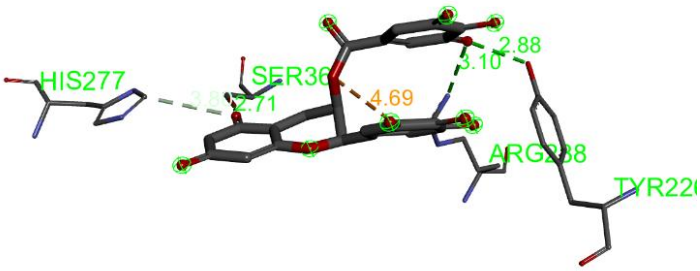
(1)



(2)



(3)



(4)

Figure 2. 2D (1) and 3D (2) interactions between EGCG and *COX-2* protein; 2D (3) and 3D (4) interaction between EGCG and *Caspase-3* protein.

ISSN 2961-7758

Pharmacokinetic Profile Test

Table 2. Pharmacokinetic Prediction of ADMET on EGCG compounds

ADMET Indicator	Result
Intestinal Absorption (%)	47.395
Distribution Volume (Log L/kg)	0.806
Metabolism (Log ml/min/kg)	CYP3A4 Inhibitor
Total Clearance (Log ml/min/kg)	0.292
Oral Rat Toxicity (mol/kg)	2.522
Hepatotoxic	No

Table 2 describes the ADMET profile (Absorption, Distribution, Metabolism, Excretion, and Toxicity) of EGCG compounds by looking at indicators of water solubility, gastrointestinal absorption, volume of distribution in blood, metabolism, total clearance, LD_{50}, and hepatotoxicity. The results showed that the EGCG compound had a BM of 458 (<500 Da), a log P value of 2.2332 (<5) and had a donor-acceptor value of 11;8 (maximum 5;10) respectively, so that is uncomplied Lipinski's rules it was categorized as having poor absorption. This compound has an absorption value of 47% so it is still in the intermediate range when given orally, has a high VD (volume of distribution) value, is metabolized in CYP3A4 inhibitors, and does not cause hepatotoxicity based on *biosig* laboratories. This test can become data for the development of the EGCG compound.

CONCLUSION AND RECOMMENDATION

Based on the linkage with molecular docking, the EGCG compound has better binding affinity than the native ligand in COX-2 and *Caspase-3* proteins by giving respective scores of -9.2 and -5.4 kcal/mol. A review of the ADMET profile using the *pKCSM biosig* lab found that the EGCG compound cannot be absorbed properly when given orally, has a high VD and metabolized in CYP3A4 inhibitors. This research can be continued to support the best profile of EGCG uptake with various possible modifications. Furthermore, to strengthen this compound, *in vitro* and *in vivo* tests can be carried out, thus it can be used as an alternative cancer treatment.

REFERENCE

Amelia, J. (2019). Manfaat Ekstrak Air *Green Tea* (*Camellia sinensis*) Terhadap Jumlah Sel Neutrofil dan *Foam Cell* Makrofag Pada Tikus Wistar Model Diabetes Mellitus Tipe-2 dengan *Oral Candidiasis*. *SKRIPSI*. Fakultas Kedokteran Gigi Universitas Airlangga Surabaya.

Departemen Kesehatan Republik Indonesia. (2009). *Sistem Kesehatan Nasional*. Jakarta.

Fajriaty, I., Ih, H., Fidrianny, I., Kurniati, N.F., Reynaldi, M.A., Adnyana, I.K., Kurniawan, F., & Tjahjono, D.H. (2023). *In Vivo* Pharmacodynamics of Calophyllum soulattri as Antiobesity with *In Silico Molecular Docking* and ADME/Pharmacokinetic Prediction Studies. *Pharmaceuticals*, 16(191).

Febriansah, R., Putri, N., & Dewanto, I. (2021). Antioxidant and Chemoprevention Activity of Camelia Sinensis-Annona muricata Extract Combination against WiDr Cells Line. *Mutiara Medika: Jurnal Kedokteran dan Kesehatan*, 21(2): 130-137.

Fitriyani, Tjahjono, D.H., & Fakih, T.M. (2020). *In Silico Studies* of Green Tea Catechins Against HER-2 Receptor in Breast Cancer. *Current Trends in Biotechnology and Pharmacy*, 14(5): 194-199.

Legeay, S., Rodier, M., Fillon, L., Faure, S., & Clere, N. (2015). Epigallocatechin Gallate: A Review of Its Beneficial Properties to Prevent Metabolic Syndrome. *Nutrients*, 7(7): 5443-5468.

Lotfillahzadeh, S., Recio-Boiles, A., & Cagir, B. (2022). *Colon Cancer*. Treasure Island (FL): StatPearls Publishing. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470380/ .

Min, K.J. & Kwon, T.K. (2014). Anticancer Effect and Molecular Mechanism of Epigallocatechin-3-gallate. *Integrative Medicine Research*, 3(1):16-24.

Motiejunas, D., & Wade, R.C. (2006) Structural, Energetic, and Dynamic Aspect of Ligand-Receptor Interactions. *Med Chem II*, 4: 193-214.

Mukesh, B., & Rakesh, K. (2011). *Molecular Docking*: A Review. *Int J Res Ayurverda Pharm*, 2(6): 1746-1751.

Naufa, F., Mutiah, R., & Indrawijaya, Y.Y.A. (2022). Studi *In Silico* Potensi Senyawa Katekin Teh Hijau (*Camellia sinensis*) sebagai Antivirus SARS CoV-2 terhadap Spike Glycoprotein (*6LZG*) dan Main Protease (*5R7Y*). *Journal of Food and Pharmaceutical Sciences*, 10(1):584-596.

Nurgali, K., Jagoe, R.T., Abalo, R. (2018). Editorial: Adverse Effect of Cancer Chemotherapy: Anything New to Improve Tolerance and Reduce Squale? *Front Pharmacol*, 9: 245.

Putri, P.V.P., Susanti, N.M.P., & Laksmiani, N.P.L. (2019). Senyawa Kuersetin Sebagai Agen Antikanker Kolorektal Secara *In Silico*. *Journal of Chemistry*, 13(2): 166-171.

Saputri, D.Y., Kusumaningtyas, T., Setiadi, P.B., & Febriansah, R. (2022). Investigation of *Moringa* Leaf Compound as Colon Anticancer Agents Using *Bioinformatics* and *Molecular Docking* Methods. *Proceedings University of Muhammadiyah Yogyakarta Undergraduate Conference*, 2(2): 24-27.

Saraiva, M.R., Rosa, I., & Claro, I. (2023). Early-Onset Colorectal Cancer: A Review of current knowledge. *World J Gastroenterol*, 29(8): 1289-1303.

ISSN 2961-7758

Sayuti, M. & Nouva. (2019). Kanker Kolorektal. *Averrous*, 5(2).

Shiyan, S. (2021). *Teknologi Fitofarmasetika: Sistem Pembawa Katekin dan EGCG pada Terapi Diabetes*. Sleman: Penerbit Deepublish.

Xie, Y. & Xu, P. (2021). Global Colorectal Cancer Burden in 2020 and Projection to 2040. *Transational Oncology, 14*.

ISSN 2961-7758

Oral Health-Related Quality of Life (OHRQoL) in Menopausal Medically Compromised Patients at RSGM UMY

Bella Pardian Nur Allifiah[1], Dyah Triswari [2], Hartanti [3]
[1] Post Graduate Student, Faculty of Dentistry, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia
[2] Department of Biomedic, Faculty of Dentistry, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia
[3] Department of Periodontic, Faculty of Dentistry, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia
Email: bellaallifiah@gmail.com[1]; dyahtriswari@gmail.com[2], hartanti@umy.ac.id[3]

ABSTRACT
Menopause is the time of life when a woman's ovaries stop producing hormones and the menstrual periods stop. Menopausal women experience a decrease in the function of estrogen and progesterone hormones as a sign of the stopped fertile period for women. Menopause causes hormonal change and systemic conditions for menopausal woman. The systemic condition from hormonal change often makes medically compromised in menopausal woman. These conditions can be related to quality of life-related dental and oral health. This study aims to describe Oral Health-Related Quality of Life (OHRQoL) in menopausal patients with medically compromised at RSGM UMY. This type of research used is descriptive observational with cross-sectional design. 110 participants menopausal women with medically compromised ≥ 45 years were given were given the OHIP-14 questionnaire using interview techniques. This study used Oral Health Impact Profile-14 (OHIP-14) questionnaire instruments with frequency data distribution analysis. 40 respondents (36.6%) have good quality of life, 66 respondents (60%) have moderate quality of life, and as many as 4 respondents (3.6%) have poor quality of life. The respondents mayority felt complaints on the physical disturbance dimension of discomfort when chewing. Based on OHIP-14 questionnaire showed that most of the respondents have moderate quality of life (60%).

Keywords: menopause, medically compromised, quality of life, OHIP-14, dental

INTRODUCTION

Women starting from the age of 45 will experience changes in tissue, metabolism, hormones, and also reproductive function, and experience menopause. Menopause can be a marker of changes in the body's hormonal system for older women. Menopause is the cessation of female reproductive function characterised by the cessation of menstruation. Menopausal women experience a decrease in the function of the hormones estrogen and progesterone as a sign of the cessation of the fertile period for women (Turang, V. K., Tendean, L., & Anindita, P. S. (2018)

Many elderly people nowadays have systemic problems that make them medically compromised. Medically compromised patients are patients who have systemic diseases so that when going to carry out a treatment, various medical considerations are needed. Medically compromised conditions can be a problem that causes limitations in daily life. Patients who are included in the *medically compromised* group are patients who have disorders: cardiovascular, blood disorders, respiratory, endocrine, immune system, neurology, gastrointestinal, and renal disorders (Vitria,2011) with the following explanation:

- Cardiovascular Disorders

Cardiovascular disease is one of the medically compromised diseases. The estrogen hormone in the female body can be a cardio protection that will regulate lipoprotein density levels. A decrease in estrogen in the body can cause an increase in cardiovascular disease due to an increase in cholesterol and an increase in angiotensin resin which will trigger vasoconstriction and endothelial dysfunction and cause the risk of atherosclerosis to increase so that the risk of cardiovascular disease will increase (Riyadina, 2019).

- Blood Disorders (haematology)

Blood is a very important cell in the human body. Blood functions such as delivering oxygen to the tissues, transporting metabolic chemicals, and also as an immune material in the body. Blood disorders or haematology can be defined as conditions that cause one or more parts of the blood to not work normally, for example anaemia, leukaemia, thalassaemia, haemophilia, and others(Guyton and Hall, 2016).

- Pulmonary disorders

Pulmonary disorders or disorders in the respiratory system are abnormalities in the respiratory system that can be caused by abnormalities in lung ventilation, abnormalities in pulmonary membrane diffusion, and abnormalities in blood gas transport between the lungs and tissues (Guyton and Hall,2016.)

- Gastrointestinal Disorders

ISSN 2961-7758

Gastrointestinal disorders are abnormalities or diseases of the food passage or digestive system often associated with diseases of the oesophagus, stomach, intestine, colon, liver, bile ducts and pancreas (Wulansari, P., & Apriyani, H., 2017)

- Genitaurinary disorders

Genitourinary disorders are disorders of the urogenital system which consists of the urinary system (urinary system) and genitalia system (reproductive system). Genitourinary Syndrome of Menopause (GSM) is a new term that describes the various symptoms and signs of menopause including not only genital symptoms (dryness, burning, and irritation), and sexual symptoms (lack of lubrication, discomfort or pain, and impaired function, but also urinary tract symptoms (urgency, dysuria, and recurrent urinary tract infections) (Kim et al,2015).

- Endocrine Metabolic Disorders

The endocrine system is a system that functions by mediating chemical substances or commonly called hormones. Hormones in the body are produced by endocrine glands. One of the endocrine metabolic disorders is insulin hormone disorder which can cause diabetes mellitus. (Guyton and Hall,2016)

- Immunological Disorders

Immunological disorders are disorders of the body's immune system where there is a disruption of the immune system in fighting disease (Kusumo, P. D.,2012) .

- Neurological and Psychiatric Disorders

A system that studies psychiatric disorders resulting from diseases in the neurological system or nervous system. The most prominent symptoms are in the psychological element, the main cause can come from the body (somatogenic), in the social environment (sociogenic), or psychologically (psychogenic) (Effendy, E.,2021).

WHO in 2012 stated that quality of life is an individual assessment of a person's life which is closely related to standards, goals, and expectations about life. One of the main indicators to be able to measure quality of life can be seen from oral health. Measuring quality of life using dental health indicators is called Oral Health Related Quality of Life (OHRQoL). OHRQoL is closely related to age expectancy, physical, mental, and psychological health of a person, which is usually connected to income, living environment, and also the support of various parties both family and social life (WHO, 2012).

This study aims to determine the description of OHRQoL in menopausal patients with *medically compromised* at the Dental and Oral Hospital of Universitas Muhammadiyah Yogyakarta.

MATERIALS AND METHODS

This study used analytical observational research with a *cross sectional* research design. This research was conducted at RSGM UMY. The sample of this study was a minimum of 94 *medically compromised* menopausal women. With *total sampling* technique and this research was conducted from October 2022 to December 2022. The inclusion criteria are menopausal female patients who are willing to become respondents and have at least 1 *medically compromised* who have medical record data including patient identity, telephone number, and other information at RSGM UMY. The inclusion criteria are *medically compromised menopausal* female patients who are not willing to become respondents. A total of 110 respondents were given *informed consent* before the examination and filling out the questionnaire.

Socio-demographic Characteristics

The research subjects were asked to fill in personal data such as name, address, age, gender, latest education, occupation, history of *medically compromised* diseases and then continued with the Oral Health Impact Profile-14 (OHIP-14) questionnaire.

Oral Health Impact Profile-14 (OHIP-14)

The Oral Health Impact Profile-14 is a developmental instrument of the *Oral Health Impact Profile-* 49 (OHIP- 49). OHIP-14 has 14 questions that show 7 dimensions of functional limitations, physical discomfort, psychological discomfort, physical disability, psychological disability, social disability, and handicap (disability) (*Husain, F. A., & Tatengkeng, F.,2017*). The *Oral Health Impact Profile-14* can be assessed using a Likert scale. The Likert scale consists of several options, namely: never given a score of 0, rarely given a score of 1, sometimes given a score of 2, often given a score of 3, very often given a score of 4. OHIP-14 is shorter and practical, and has validity and has good reliability so that many researchers use OHIP-14 as a quality of life measurement instrument (*Papaioannou, W., Oulis, C. J., Latsou, D., & Yfantopoulos, J., 2011*.) .

Quality of Life

The classification of quality of life will be classified according to the score from OHIP-14 answered by the respondent. Where for the minimum overall score gets

ISSN 2961-7758

a value of 0 and for the maximum score is a value of 56 which consists of 14 questions (*Ratnawidya et al, 2018*). 56 Filling The OHIP-14 questionnaire can be categorised as respondents with a score of 0- 19 indicating the respondent's quality of life is good, a score of 20-37 indicates the respondent's quality of life is moderate, and > 37 indicates the respondent's quality of life is poor. this is determined based on the categorisation scale formula (Azwar, 2012).

RESULTS

The respondents studied in this study were 110 people who had experienced menopause with *medically compromised* who fit the inclusion criteria and exclusion criteria of the study. The age of respondents was grouped based on the classification of the elderly age range according to WHO. There were 61 respondents aged 45-59 years (55.6%), 45 people (40.9%) aged 60-74 years and 4 people (3.6%) aged 75-90 years. Table 1 shows the distribution of the education history of the respondents, the results showed that 58 people (52.7%) studied up to senior high school, 23 people (20.9%) completed their studies up to bachelor, 12 people (10.9%) were junior high school graduates, 9 people (8.2%) were elementary school graduates, 4 people (3.6%) studied up to Diploma 3, 3 people (2.7%) completed their education up to Master degree and 1 person (0.9%) studied Diploma 2.

Table 1. Education of respondents

Education	Frequency (n)	Percent (%)
Elementary	9	8,2
Junior High School	12	10,9
Senior High School	58	52,7
Diploma 1	0	0
Diploma 2	1	0,9
Diploma 3	4	3,6
Bachelor	23	20,9
Master Degree	3	2,7
Total	110	100.0

Respondents in this study were mostly housewives (IRT) as many as 68 people (61.8%), 20 people (18.2%) worked as entrepreneur, 4 people (3.6%) were casual labourers, 3 people (2.7%) worked as civil servants (PNS), then there were 2 respondents (1.8%) who worked as employees, as many as 4 people (3.6%) as medical staff, 8 people (7.3%) and there were teacher 1person (0.9%) shown in table 2

Table 2: Occupational distribution of Respondent

Occupational	Frequency (n)	Percent (%)
Housewife	68	61,8
Entrepreneur	20	18,2
Lapour	4	3,6
PNS	3	2,7
Employee	2	1,8
Medical Staff	4	3,6
Retired	8	7,3
Teacher	1	0.9
Total	110	100.0

Table 3 shows the distribution of *meical compromise*. The majority of respondents had a history of hypertension as many as 68 people (51.9%), 27 people (20.6%) had a history of diabetes mellitus, 10 people (7.6%) a history of magh. 8 people (6.1%) history of hypotension, 3 people (2.3%), vertigo 3 people (2.3%), people with a history of brain tumours, heart problems, allergies, kidney stones have each 2 respondents (1.5%). Then for people with herpes, stroke, kidney tumours, hyperthyroidism each had a total of 1 respondent (0.8%).

Table 3. Frequency of medically compromised disease

Disease	Frequency (n)	Percent (%)
Hypertension	68	51,9
DM	27	20,6
Magh	10	7,6
Hypotension	8	6,1
Asthma	3	2,3
Herpes	1	0,8
Brain tumours	2	1,5
Vertigo	3	2,3
Stroke	1	0,8
Kidney tumour	1	0,8
Heart Disorders	2	1,5
Allergies	2	1,5
Kidney stones	2	1,5
Hyperthyroid	1	0,8
Total	110	100.0

Oral Health Related Quality of Life (OHIP-14) or the quality of life of menopausal women with *medically compromised* can be seen in table 4, it can be seen that the quality of life of the dimension of functional limitations with the question of difficulty in pronouncing words is: 37.3% answered never; 20% of respondents answered rarely; 22.7% answered sometimes; 13.6% answered often; and 6.4% answered very often. For the question of difficulty in tasting flavours, there were : 39.1% of respondents answered never; 12.7% answered rarely; 10% of respondents answered sometimes; 30% answered

ISSN 2961-7758

often; and 8.2% answered very often.

The second dimension is the Physical Disorders dimension with the question of pain in the oral cavity, 0.9% of respondents chose never; 18.2% chose rarely; 24.5% chose sometimes; 52.7% chose often; and 3.6% chose very often. In questions related to discomfort when chewing food, there were: 2.7% chose never; 21.8% answered rarely; 12.7% with the answer sometimes; 39.1% chose often; and 23.1% with the answer very often.

The third dimension, namely psychological discomfort with questions related to feeling anxious, 52.7% answered never; 7.3% answered rarely; 16.4% answered sometimes; 20% answered often; and 3.6% answered very often. Questions related to feeling tense related to oral problems were answered by respondents with: 10.9% answered never; 19.1% answered rarely; 23.6% answered sometimes; 40% answered often; and 6.4% answered very often.

The fourth dimension is the dimension of physical limitations, there is a question about food being less satisfying because of oral disorders, then there are 4.5% who answered never feel less satisfying; 25.5% answered rarely feel less satisfying; 25.5% answered sometimes feel less satisfying; 36.4% answered often feel less satisfying; and there are 6.4% answered very often. The question with the same dimension related to whether people have ever stopped eating because of problems in their oral cavity was answered by respondents with 37.7% answering never; 12.7% answering rarely; 27.3% answering sometimes; 18.2% answering often; and 4.5% answering very often.

The fifth dimension is the dimension of psychological inability, with the question of whether it is difficult to feel relaxed regarding oral problems, then 28.2% answered never; 12.7% answered rarely; 17.3% answered sometimes; 38.2% answered often; and 3.6% answered very often. The next question is still with the same dimension, namely related to feelings of embarrassment, with 47.3% answering never; 16.4% answered rarely; 10.9% answered sometimes; 12.7% answered often; and 12.7% answered very often.

The sixth dimension is the social ability dimension, with questions related to feeling offended by the condition of the oral cavity, 45.5% answered never; 10% answered rarely; 27.3% answered sometimes; 11.8% answered often, and 5.5% answered very often. The question related to difficulties in carrying out daily activities is also included in the social ability dimension, with answers of 40.9% feeling never; 20% answered rarely; 13.6% answered sometimes; 22.7% answered often; and there were 2.7% who answered very often.

The seventh dimension, namely the handicap dimension with the question that life feels less satisfying due to the condition of the oral cavity, obtained an answer of 42.7% who said never; 15.5% answered

rarely; 17.3% answered sometimes; 16.4% answered often; and there were 8.2% who answered very often. The next question from the seventh dimension, which is related to the condition of the respondent's oral cavity causing the respondent not to carry out activities, obtained answers, namely 66% answered never; 6.4% answered rarely; 9.1% answered sometimes; 20.9% answered often; and as many as 3.6% answered very often unable to carry out activities due to the condition of their oral cavity.

Table 4. Frequency of OHIP-14

Quality of Life		Never		Seldom		occasionally		Often		Very Often	
Dimensions	Question	n	%	n	%	n	%	n	%	n	%
Functional Limitations	Difficulty in pronouncing words	41	37,3	22	20,0	25	22,7	15	13,6	7	6,4
	Difficulty in tasting	43	39,1	14	12,7	11	10,0	33	30,0	9	8,2
Physical Disorders	Pain in the oral cavity	1	0,9	20	18,2	27	24,5	58	52,7	4	3,6
	Discomfort when chewing food	3	2,7	24	21,8	14	12,7	43	39,1	26	23,1
Psychological Discomfort	Feel anxious	58	52,7	8	7,3	18	16,4	22	20,0	4	3,6
	Feel tense	12	10,9	21	19,1	26	23,6	44	40,0	7	6,4
Physical limitations	Food is less than satisfying	5	4,5	28	25,5	28	25,5	40	36,4	9	8,2
	Stop eating	41	37,3	14	12,7	30	27,3	20	18,2	5	4,5
Psychological Incompetence	feel hard to relax	31	28,2	14	12,7	19	17,3	42	38,2	4	3,6
	Feel embarrassed	52	47,3	18	16,4	12	10,9	14	12,7	14	12,7
Social Skills	Feel offended	50	45,5	11	10,0	30	27,3	13	11,8	6	5,5
	Difficulty carrying out daily activities	45	40,9	22	20,0	15	13,6	25	22,7	3	2,7
Handicap	Life is less than satisfying	47	42,7	17	15,5	19	17,3	18	16,4	9	8,2
	Not doing activities	66	60,0	7	6,4	10	9,1	23	20,9	4	3,6

Table 5 shows that the distribution of the quality of life status of *medically compromised* menopausal women in 110 respondents mostly fell into the moderate category with 66 respondents (60%), then in second place was the good category with 40 respondents (2.6%), and as many as 4 people (3.6%) were in the bad category.

Table 5. Frequency of respondents' status based on quality of life

	Frequency	Percent
Good	40	26,4
Medium	66	60,0
Bad	4	3,6
Total	110	100.0

DISCUSSION

Based on research on *Oral Health Related Quality of Life* in Menopausal Women with *medically compromised* at RSGM UMY, it shows that the distribution of characteristics related to respondents is seen from the average Oral Health Related Quality of Life or quality of life related to teeth and mouth in

ISSN 2961-7758

medically compromised menopausal patients at RSGM UMY in a table that provides information that the highest average score is in the dimension of physical disorders, especially complaints of pain in the oral cavity and discomfort in chewing food. The results of this study are in line with the research of (Berutu, M. S., Dharmautama, M, 2015) which states that the highest complaints are owned in the dimension of physical disturbance in respondents who use GTL with the OHIP-14 instrument which states that GTL users feel uncomfortable when eating and performing masticatory movements compared to when they still have natural teeth. Couto et al, 2018 also obtained the results of their research that the dimension of physical disturbance was the most frequent dimension of disturbance to respondents, and then the existence of poor oral health causes pain, feelings of discomfort , decreased self-confidence levels, and can cause difficulties in rest and sleep, this then makes a person's quality of life decrease.

The distribution of respondent characteristics based on the dimension of functional limitations in difficulty pronouncing words described in table 4 provides information that this is not a complaint for *medically compromised* menopausal women respondents. Alamsyah, R. M. (2018) in his research found similar results, that in his research there were 37.3% of respondents who had never felt any speech impairment based on problems with their teeth and mouth. in research on the quality of life of *medically compromised* menopausal women in RSGM itself, it was found that 39.1% of respondents stated that they did not experience changes in taste when tasting food, the results of this study are also in line with research conducted by Massie et al (2016) where in their research most respondents did not experience complaints about functional limitations due to problems from their teeth and mouth where respondents also mentioned that they were satisfied with the condition of their oral cavity which was assisted by using dentures.

The dimension of physical disturbance in this study is mentioned in table 4 which states the results that the majority of respondents feel frequent pain in their teeth and mouth (52.7%), especially feelings when chewing food and frequent feelings of discomfort (39.1%). Couto, P., Pereira, P. A., Nunes, M., & Mendes, R. A, (2018) in their research stated that most of the respondents, namely 61.9% of the respondents felt that there were physical disorders related to their oral cavity. Physical disorders related to one's oral cavity can occur due to discomfort and feelings of pain suffered (Baiju, R., Peter, E., Varghese, N., & Sivaram, R., 2017). The feeling of discomfort felt by most respondents occurs due to gingivitis, subgingival calculus, deep caries, and the loss of permanent teeth so that it interferes with them when eating and masticating, this causes them to be at risk of disruption of nutrition for the body(Sheng et al 2018)

The dimension of psychological discomfort can be obtained information in table 4 with the highest distribution value is that respondents answered that they never felt anxious and tense due to dental and oral problems, namely with a percentage (52.7%). (*Ratnawidya et al. 2018*.) also have research results that are in line with the results of this study that most respondents do not feel anxious or tense. In this study, most of the respondents, namely menopausal women with *medically compromised*, stated that they did not feel anxious and tense due to easy access to treatment, especially for teeth and mouth.

The dimension of physical limitations in seen in table 4 which in the table provides information that most respondents do not stop when chewing food (37.3%) but most respondents often feel dissatisfied with the food consumed (36.4%) due to their oral cavity problems. The same thing was also mentioned by Massie et al (2016) who stated that the majority of their respondents felt that they never stopped suddenly while consuming food. In this study, most of the respondents felt dissatisfied with the food they consumed because one of the factors was that most of the respondents were elderly people who had lost many teeth, and also most of the respondents came with pain in their teeth, so this affected satisfaction with the food they consumed.

The distribution of psychological disability characteristics in table 4 shows that the majority of respondents did not feel any feelings of embarrassment (47.3%) but felt that it was often difficult to relax due to the condition of their teeth and mouth (38.2%). *Berutu(2015*) also has similar research results that some of his respondents did not feel any feelings of embarrassment in his respondents. Darjanki, C. M., Perdana, S., Purwaningsih, Y., & Palupi, R, (2020) stated that the psychological dimension was the least felt by respondents where their research stated that their research had no effect on psychological disability and also had no effect on the social life of the respondents. Some *medically compromised* menopausal respondents mentioned that most of them were more concerned with health than appearance and aesthetics due to their age, most of whom were no longer young and also most suggested that their oral disease was not a life-threatening disease so that it did not make patients feel tense or excess stress. The feeling of difficulty relaxing in this study was found to be one of the factors because most of the respondents were patients who came in a state of dental pain so that it had an effect on their feelings of difficulty relaxing.

Complaints on the social ability dimension can be seen

ISSN 2961-7758

in table 4 which shows that most respondents never feel offended (45.5%) and never feel that their oral problems interfere with their daily activities (40.9%). This is similar to the research of Darjanki et al (2020) which states that the majority of respondents were only slightly disturbed in the social dimension. This can occur because respondents are more accepting of the conditions felt in their oral cavity so that this does not become an obstacle in their social life (Hongxing, L., List, T., Nilsson, I. M., Johansson, A., & Astrøm, A. N, 2014).

The distribution of characteristics in the handicap dimension in table 4 shows that most respondents have never felt that their lives are less satisfying (42.7%) and do not prevent them from carrying out activities due to complaints felt in their oral cavity (60.0%). This is in line with research conducted by Warsi et al (2018) which in their research found that respondents did not feel complaints about the handicap dimension. Handicap or disability or disability is less of a priority for respondents so that the results of the handicap dimension are placed in the distribution of characteristics with the lowest position(Skos kiewicz-Malinowska, K., Kaczmarek, U., Ziętek, M., & Malicka, B, 2015).

The status of respondents based on Oral Health Related Quality of Life in *medically compromised* menopausal female patients at RSGM UMY described in table 5 shows that the quality of life of respondents related to their oral health mostly has a moderate quality of life (60%). This research is in line with the research of Syariza et al (2018) which has the result that individuals with systemic diseases such as hypertension have a lower quality of life, especially in individuals who use terpai drugs, this happens because one of the factors is drug therapy from hypertension that controls their disease.Setijanto (2019) mentioned that the quality of life of most women can be affected by oral health disorders which will have an impact on their physical, psychological, and social well- being. *Medically compromised* systemic diseases are associated with various other complications in addition to oral and dental diseases whose presence can also interfere with quality of life and cause patients to underestimate the oral health problems they experience. In another study also mentioned that hypertensive patients have a high risk of oral disorders due to the therapy caused so that it affects their quality of life(Wong, F. M., Ng, Y. T., & Leung, W. K, 2019).

The results of research on Oral health Related Quality of Life in medically compromised menopausal women stated that most had a moderate quality of life. Quality of life is related to self-adjustment to the demands of the situation, if a person has a good quality of life, then the individual is easier to adjust to the demands that exist so that the stress experienced is low, otherwise people who have a low quality of life will increase the stress of the demands faced, this is what makes it difficult to adjust to the chronic disease faced, causing high levels of stress(Riyadina, 2019).

CONCLUSIONS

1. Most of the respondents of *medically* compromised menopausal women patients at RSGM UMY were at the age of 45-59 years.
2. Most of the *medically compromised* menopausal women respondents worked as housewives.
3. Most of the *medically compromised* menopausal women respondents had a high school education level.
4. Most of the *medically compromised* menopausal women respondents felt complaints on the physical impairment dimension of chewing discomfort.
5. Most respondents never had difficulties with the functional limitation dimension, psychological discomfort dimension, physical limitation dimension, social ability dimension, and handicap dimension.
6. Most of the *medically compromised* menopausal women respondents at RSGM UMY had hypertension.
7. Most of the *medically compromised* menopausal women respondents had moderate quality of life based on OHIP- 14.

RECOMMENDATION

Future research is expected to consider conducting research on the relationship between quality of life with *medically compromised* menopausal women patients and can also increase supervision, control, and comprehensive services by health care providers to *medically compromised* menopausal women patients related to their oral health by providing education to patients in maintaining oral and dental health in order to maintain a good quality of life.

REFERENCE

Alamsyah, R. M. (2018). Kondisi Rongga Mulut terhadap Kualitas Hidup Ibu Hamil di Puskesmas di Medan. Talenta Conference Series: Tropical Medicine (TM), 1(1), 330–335.

Azwar, S. 2012. Penyusunan Skala Psikologi.Edisi 2. Yogyakarta: Pustaka Pelajar.

Baiju, R., Peter, E., Varghese, N., & Sivaram, R. (2017). Oral health and quality of life: Current concepts. Journal of Clinical and Diagnostic Research. Journal of Clinical and Diagnostic Research, 11(6), ZE21–ZE26.

Berutu, M. S., Dharmautama, M. (2015). Kualitas Hidup Manula Yang Menggunakan Gigi Tiruan Lengkap Berdasarkan OHIP-14 Di Kota Makassar (Quality Of Life Of Elderly Using

ISSN 2961-7758

Complete Denture Based On OHIP-14 In Makassar). Dentofasial, 14(1), 55–57.

Couto, P., Pereira, P. A., Nunes, M., & Mendes, R. A. (2018). Oral Health_Related Quality Of Life of Portuguese Adults with Mild Intellectual Disabilities. PLOS ONE, 13, 3. doi: https://doi.org/10.1371/journal.pone.0193953

Darjanki, C. M., Perdana, S., Purwaningsih, Y., & Palupi, R. (2020). Relationship Between Age in Patients with Dental and Oral Health Problems with Quality Of Life. European Journal of Molecular & Clinical Medicine, 07(10), 1375–1397.

Effendy, E. 2021. Gejala dan Tanda Gangguan Psikiatri: Yayasan Al-Hayat.

Guyton, A., & Hall, J. 2016. Guyton and Hall textbook of medical physiology. 13th edition.USA: Elsevier.

Hongxing, L., List, T., Nilsson, I. M., Johansson, A., & Astrøm, A. N. (2014). Validity and Reliability of OIDP And OHIP-14: A Survey of Chinese High School Students. BMC Oral Health, 14(1), 1–10.

Husain, F. A., & Tatengkeng, F. (2017). Oral Health-Related Quality of Life Appraised by OHIP-14 Between Urban and Rural Areas in Kutai Kartanegara Regency, Indonesia: Pilot Pathfinder Survey. The Open Dentistry Journal, 11(1),557–564. https://doi.org/10.2174/1874210601711010557.

Kim, H.-K., Kang, S.-Y., Chung, Y.-J., Kim, J.-H., & Kim, M.-R. (2015). The Recent Review of the Genitourinary Syndrome of Menopause. Journal of Menopausal Medicine, 21(2), 65–71. https://doi.org/10.6118/jmm.2015.21.2.65

Kusumo, P. D. (2012). Gangguan Imunodefisiensi Primer (PID). 9.

Massie, N. S. W., Wowor, V. N. S., & Tendean, L. (2016). Kualitas hidup manusia lanjut usia pengguna gigi tiruan di Kecamatan Wanea. E-GIGI, 4(4).

Papaioannou, W., Oulis, C. J., Latsou, D., & Yfantopoulos, J. (2011). Oral Health-Related Quality of Life of Greek Adults: A Cross-Sectional Study. International Journal of Dentistry, 2011, 1–7. https://doi.org/10.1155/2011/360292

Ratnawidya, W., Rahmayanti, F., Soegiyant, A. I., Mandasari, M., & Wardhany, I. I. (2018). Indonesian short version of the oral health impact profile (OHIP-14). Journal of International Dental and Medical Research, 11(3), 1065– 1071.

Riyadina, W. 2019. Hipertensi pada Wanita Menopause. LIPI Press.

Setijanto, R. D., Setyowati, N., Bramantoro, T., & Aghasy, A. (2019). Could The Severity of Infected Gingiva in Pregnant Woman Affect The Quality of Life? Indian Journal of Public Health Research and Development, 10(7), 862–866.

Sheng, X., Xiao, X., Song, X., Qiao, L., Zhang, X., & Zhong, H. (2018). Correlation Between Oral Health and Quality of Life Among The Elderly In Southwest China from 2013 to 2015. Medicine (United States). 97(21), 1–7.

Skos kiewicz-Malinowska, K., Kaczmarek, U., Ziętek, M., & Malicka, B. (2015). Validation of The Polish Version of The Oral Health Impact Profile-14. Advances in Clinical and Experimental Medicine. 24, 1, 129–137.

Syariza, W.N., Nasir, W.M., Alwani, W.N., Haslinda., Dzulkhairi, M., Muslimah. (2018). Oral Health-Related Quality Of Life Of Villagers In A SemiUrbanDistrict In Malaysia. International Journal for Studies on Children, Women, Elderly and Disabled. 134–137.

Turang, V. K., Tendean, L., & Anindita, P. S. (2018). Perbedaan Waktu Pembekuan Darah Pasca Pencabutan Gigi pada Pasien Menopause dan non-menopause. e-GIGI, 6(2). https://doi.org/10.35790/eg.6.2.2018.20953

Vitria, E. E. (2011). Evaluasi dan penatalaksanaan pasien medically-compromised di tempat praktek gigi Evaluation and management of medically compromised patient in dental practice. Journal of Dentomaxillofacial Science, 10(1). https://doi.org/10.15562/jdmfs.v10i1.252

Warsi, I., Younus, A., Rasheed, A., Ahmed, J., Mahida, H., Hashmi, R., & Qureshi, A. (2018). Oral Health-Related Quality of Life in Patients with Upper Gastrointestinal and Hepatic Disorders in Pakistan: Validation of The Oral Health Impact Profile-14 in The Urdu Language. BDJ Open, 4(1), 1–7.

WHO. (2012). Programme On Mental Health: WHOQOL User Manual. WHO, 1–19.

Wong, F. M., Ng, Y. T., & Leung, W. K. (2019). Oral Health and its Associated Factors Among Older Institutionalized Residents—A Systematic Review. International Journal of Environmental Research and Public Health, 16(21), 4132.

Wulansari, P., & Apriyani, H. (2017). Diagnosis Keperawatan Pada Pasien Dengan Gangguan Pencernaan. Jurnal Ilmiah Keperawatan Sai Betik, 12(1), 40–45. https://doi.org/10.26630/jkep.v12i1.341

ISSN 2961-7758

Reliability test of a questionnaire to investigate behaviour of using traditional medicines among urban students of Elementary School

Riska Cahyani[1], Aris Widayati[1]
[1]Faculty of Medicine and Health Sciences, Department of Pharmacy, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia
Corresponding author: ariswidayati@umy.ac.id

ABSTRACT
Introduction. The use of traditional medicine among the adult population is prevalent. Previous studies have explored the use of traditional medicine among adults. However, traditional medicine usage among adolescents is still rare, especially among elementary school students. Therefore the instruments for research on the use of traditional medicine among adolescents are also still limited. **Objective.** This study aims to calculate the reliability scale of a questionnaire based on the Theory of Planned Behavior. The questionnaire can be used to explore the behavior of using traditional medicine among elementary school students. **Methods.** The tested instrument has been assessed for its content validity using a professional judgement approach and language clarity. In this study, instrument reliability was calculated using Cronbach Alpha approach. The test respondents were elementary school students in Yogyakarta City namely SD Negeri Ungaran Yogyakarta. Fifty respondents were selected using purposive sampling and given a self-asministered questionnaire. Data were entered and calculated for Cronbach Alpha using SPSS software. **Results.** Twelve percent of the 50 data sets were ineligible for inclusion due to incomplete answers, resulting in 44 data sets (88%) being analysed. The analysis produces a Cronbach's Alpha scale of 0.840 with 24 items in the questionnaire. **Conclusion.** The conclusion is that the instrument is reliable because the scale of Cronbach's Alpha is more than 0.60 as the standard point. It can be used to investigate a behaviour regarding traditional medicines usage among Elementary Students in urban areas.

Keywords: Reliability test, TPB Questionnaire, Elementary School, Traditional Medicine.

INTRODUCTION

Indonesia is rich in natural resources used for generations as traditional medicine. Traditional medicine is part of cultural knowledge and experience used to maintain health, prevent or treat various physical ailments (Widiarti et al., 2016). The use of traditional medicine is still held firmly by some people in Indonesia as an effort to maintain health. More than 7,000 of 30,000 plant species are used as medicine (Adiyasa & Meiyanti, 2021). More than 9,609 types of plants in Indonesia are used as medicinal ingredients, including 940 species used as traditional medicines (Yassir & Asnah, 2019).

Basic Health Research (Riskesdas) data in 2013 revealed that around 30.4% of Indonesia's population had used traditional medicine. In the Province of D.I Yogyakarta, the use of traditional medicine reached 44.0%, with the type of herb reaching 58.1%. Residential characteristics also have an influence, where the proportion of households using traditional medicine in urban areas (32.2%) is higher than in rural areas (28.7%). Based on the type of herb, the main reason for using it was to maintain health and fitness (52.7%), followed by tradition (12.3%), effectiveness (18.4%), experimentation (2.8%), desperation (1.8%), and cost considerations (6.8%) (Ministry of Health RI, 2013).

Research on traditional or herbal medicines has been conducted in many Indonesian communities and adolescents. For example, research by Abadi & Widayati (2022) involved 78 respondents from the Demak Model Pharmacy Vocational School, which showed that 35% of respondents used traditional medicine at least once a month. However, research on the use of traditional medicines in children still needs to be improved (Abadi & Widayati, 2022).

Elementary school is a stage of primary education for children aged 6-12 years who have an essential role in their developmental stages (Istiqomah & Suyadi, 2019). Data from the Ministry of Education and Culture shows that the number of elementary school students in DIY reaches 274,729 children (Kemdikbud, 2023). This study involved Yogyakarta Unggaran 1 Elementary School as a model elementary school in an urban environment, with 688 students in 2023. Special attention is needed in managing children's health, given their tendency to be susceptible to disease. Although many medicinal plants are used as traditional medicine in Indonesia, children rarely consume herbal medicines or are attracted to herbal medicine (Setiawan et al., 2018).

Better health behaviour levels have a positive impact on overall health status. The Theory of Planned Behavior (the intention to take health action (Widayati, 2019). This intention is influenced by three main factors: Attitude, Subjective Norms, and Perceived Behavioral Control (Ajzen, 2016).

Although traditional medicines are common among adults, their prevalence among adolescents, especially primary school students, is still under-explored. Instruments to investigate traditional medicine use among adolescents are still urgent. Therefore, this study aims to calculate the reliability scale of a questionnaire based on the Theory of Planned Behavior. This questionnaire can be used to explore the behaviour of using traditional medicine among elementary school students based on the Theory of Planned Behavior concept.

ISSN 2961-7758

LITERATURE REVIEW

Traditional medicine is an integral part of Indonesia's cultural heritage, consisting of natural ingredients such as plants, minerals and animal ingredients, or a combination of the three. The use of traditional medicine has been passed down from generation to generation and follows the norms prevailing in society (Ministry of Health, 2018). Traditional medicine has essential cultural values and is considered an effort to support health (Dewantari, 2018). Among the known traditional medicine types are Jamu (Bahasa Indonesia), standardized herbal medicines, and phytopharmaca (Pratiwi et al., 2018). Jamu, in particular, is a traditional medicine widely known and used by the public (Adiyasa & Meiyanti, 2021). For example, Basic Health Research in 2010 showed that the prevalence of herbal medicine consumption in Indonesia was higher in urban areas (64.29%) compared to rural areas (53.37%) (Ministry of Health RI, 2010). Examples of herbal medicine are Beras Kencur (Bahasa Indonesia) and Kunir Asem (Bahasa Indonesia) (Putriana & Sugoro, 2013).

Children in the age range of 6-12 years experience essential development in thinking and behaviour. They enter a more serious stage of education and are better prepared to understand more complex concepts (Setiawan et al., 2018). Children's growth and development affect their desire and ability to learn and participate in various activities (Istiqomah & Suyadi, 2019). Nonetheless, children's knowledge about using traditional medicines, such as herbal medicine, still needs to be improved, even though many medicinal plants are around them (Setiawan et al., 2018).

The Theory of Planned Behavior (TPB) suggests that intentions influence a person's behaviour. Three main factors in the TPB can predict behavioural intention:

1. Attitude: An individual's attitude towards a behaviour plays a role in shaping intention. Attitude includes an individual's view of the benefits and disadvantages of this behaviour (Widayati, 2019). Research by Laila et al. (2022) showed that a positive attitude is related to treatment intentions.
2. Subjective Norms: Subjective norms reflect an individual's perception of social pressure to behave in a certain way. This is influenced by individual beliefs and other people's views of this behaviour (Mihartinah & Coryanata, 2019). Various studies have shown that subjective norms significantly influence behavioural intentions (Suwarni & Selviana, 2015; Karos & Widayati, 2022).
3. Perception of Behavioral Control: This refers to an individual's beliefs about the extent to which he has the resources and opportunities to perform certain behaviours (Mahyarni, 2013). This behavioural control has been shown to positively affect behavioural intention to use traditional medicine (Laila et al., 2022).

Behaviour measurement often uses a Likert Scale in the form of a questionnaire. Respondents were asked to provide an assessment of the statement with a score range that describes the level of agreement or disagreement with the statement (Gayatri, 2014). This Likert scale can provide insight into the perceptions and attitudes of respondents towards the behaviour of using traditional medicine.

In the context of this research, several previous studies have been conducted and become a reference. For example, Zaini & Soediono (2018) found that subjective attitudes and norms jointly influence consumer intentions in using herbal medicines. Widarti et al. (2016) showed that attitude factors and perceptions of the seriousness of the disease influenced the use of local wisdom as traditional medicine. Likewise, research by Sarmento (2016) found that attitude did not affect the intention to buy herbal medicine, but the intention to buy herbal medicine did affect the act of buying. Therefore, this study brought a different approach by taking a sample of Yogyakarta 1 Elementary School students as respondents.

METHOD

This study used a cross-sectional design and quantitative data. This study aims to calculate the reliability scale of a questionnaire based on the Theory of Planned Behavior. This questionnaire can be used to explore the behaviour of using traditional medicine among elementary school students based on the Theory of Planned Behavior concept. This questionnaire was previously tested for validity and a language comprehension test. So, this study only conducted reliability tests.

The sample for testing this questionnaire was determined as many as 50 students taken purposively. The inclusion criteria were grade 5 students willing to complete the questionnaire. At the same time, the exclusion included students who did not fill out the questionnaire entirely or had never used traditional medicine. The test included distributing and filling out questionnaires by respondents and evaluating the instrument's reliability. Data analysis was performed using SPSS version 22 to calculate the Cronbach Alpha value in the reliability test of this questionnaire.

RESULT AND DISCUSSION

In the initial phase of the analysis, 12% of the total 50 data sets did not meet the inclusion criteria due to incomplete answers. A total of 44 data met the criteria and were used in further analysis.

The test results showed a Cronbach Alpha value of 0.840 for the 24 question items on the tested questionnaire. This instrument is reliable, with Cronbach's Alpha values exceeding the recommended threshold. Good Cronbach Alpha values range from 0.7 to 0.95 (Tavakol & Dennick, 2011). These results indicate that the questionnaire instrument tested has a good level of consistency in measuring the factors studied (Bolarinwa, 2015).

These results also indicate that the initial data collection stage has challenges regarding incomplete answers, in which 12% of the data set must be excluded. This can be an essential consideration for future researchers that when involving elementary school students, they must be accompanied better so they can complete the questionnaire. However, of course, the intended assistance is not to affect the respondents' answers, only to ensure that the questionnaire is completed thoroughly.

ISSN 2961-7758

CONCLUSION AND RECOMMENDATION

This analysis produces a Cronbach Alpha reliability coefficient of 0.840 for a questionnaire of 24 items. This result indicates good internal consistency. This instrument can be used to examine the behaviour of using traditional medicines among elementary school students in urban areas. Further research is needed to broaden the application of this instrument to other contexts and age groups to enable a comprehensive understanding of data on traditional medicine use behaviour.

REFERENCE

Abadi, B. B. A., & Widayati, A. (2022). Profile of The Use of Traditional Medicines Among Adolescents in SMK Farmasi Teladan Demak. *Journal of Pharmaceutical Sciences and Community*, *19*(2), 71–77. https://doi.org/10.24071/jpsc.003638

Adiyasa, M. R., & Meiyanti, M. (2021). Pemanfaatan obat tradisional di Indonesia: Distribusi dan faktor demografis yang berpengaruh. *Jurnal Biomedika dan Kesehatan*, *4*(3), 130–138. https://doi.org/10.18051/JBiomedKes.2021.v4.130-138

Adliyani, Z. O. N. (2015). *Pengaruh Perilaku Individu terhadap Hidup Sehat*.

Ajzen, I. (2016). Consumer attitudes and behavior: The theory of planned behavior applied to food consumption decisions. *Italian Review of Agricultural Economics*, 121-138 Pages. https://doi.org/10.13128/REA-18003

Anggita, A. D., Purnamasari, I., & Rais, R. (2021). Analisis Faktor-Faktor Yang Mempengaruhi Perilaku Menyimpang Pada Anak Usia Sekolah Dasar di SD Negeri Pleburan 03 Semarang. *Harmony: Jurnal Pembelajaran IPS dan PKN*, *6*(1), 1–5. https://doi.org/10.15294/harmony.v6i1.43951

Bolarinwa OA. Principles and methods of validity and reliability testing of questionnaires used in social and health science research. Niger Postgrad Med J. 2015;22(4):195–201. https://doi.org/10.4103/1117-1936.173959 .

Karos, V. A., & Widayati, A. (2022). Intensi Swamedikasi di Kalangan Masyarakat Kecamatan Umbulharjo Yogyakarta Pada Masa Pandemi Covid-19: Tinjauan Theory Of Planned Behavior. *Jurnal Kefarmasian Akfarindo*, 20–28. https://doi.org/10.37089/jofar.vi0.155

Dewantari, R. (2018). *Jenis Tumbuhan yang Digunakan sebagai Obat Tradisional Di Daerah Eks-Karesidenan Surakarta*.

Gayatri, D. (2014). Mendesain Instrumen Pengukuran Sikap. *Jurnal Keperawatan Indonesia*, *8*(2), 76–80. https://doi.org/10.7454/jki.v8i2.151

Istiqomah, H., & Suyadi, S. (2019). Perkembangan Fisik Motorik Anak Usia Sekolah Dasar Dalam Proses Pembelajaran (Studi Kasus di SD Muhammadiyah Karangbendo Yogyakarta). *El Midad*, *11*(2), 155–168. https://doi.org/10.20414/elmidad.v11i2.1900

Laila, S., *et al*. (2022). *(Community Perception Through Theory of Planned Behavior (TPB) Approach with Treatment of Dental Pain in East Banjarmasin District)*.

Mihartinah, D., & Coryanata, I. (2019). Pengaruh Sikap Terhadap Perilaku, Norma Subjektif, dan Kontrol Perilaku Persepsian Terhadap Niat Mahasiswa Akuntansi Untuk Mengambil Sertifikasi Chartered Accountant. *Jurnal Akuntansi*, *8*(2), 77–88. https://doi.org/10.33369/j.akuntansi.8.2.77-88

Pratiwi, R., Saputri, F. A., & Nuwarda, R. F. (2018). Tingkat Pengetahuan dan Penggunaan Obat Tradisional di Masyarakat: Studi Pendahuluan Pada Masyarakat di Desa Hegarmanah, Jatinangor, Sumedang. *Dharmakarya*, *7*(2). https://doi.org/10.24198/dharmakarya.v7i2.19295

Putriana, F., & Sugoro, I. (2013). *Analisis Cemaran Mikroba Pada Sediaan Jamu Gendong Di Sekitar*. *4*.

Sarmento, T. A. (2016). *Modifikasi Model Theory Of Planned Behavior*. *27*(3).

Setiawan, I., Suharyanto, S., & Dianto, R. (2018). Peningkatan Pengetahuan Tentang Jamu Pada Siswa-Siswi di Sekolah Dasar Negeri 1 Boyolali. *Jurnal Surya Masyarakat*, *1*(1), 54. https://doi.org/10.26714/jsm.1.1.2018.54-58

Suharyat, D. Y. (2004). *Hubungan Antara Sikap, Minat dan Perilaku Manusia*.

Suwarni, L., & Selviana, S. (2015). Inisiasi Seks Pranikah Remaja dan Faktor Yang Mempengaruhi. *Jurnal Kesehatan Masyarakat*, *10*(2), 169. https://doi.org/10.15294/kemas.v10i2.3378

Tavakol M, Dennick R. Making sense of Cronbach's Alpha. Int J Med Educ. 2011; 2:53–5. https://doi.org/10.5116/ijme.4dfb.8dfd

Yassir, M., & Asnah, A. (2019). Pemanfaatan Jenis Tumbuhan Obat Tradisional di Desa Batu Hamparan Kabupaten Aceh Tenggara. *Biotik: Jurnal Ilmiah Biologi Teknologi dan Kependidikan*, *6*(1), 17. https://doi.org/10.22373/biotik.v6i1.4039

ISSN 2961-7758

MONITORING PEDICULOSIS CAPITIS IN STUDENTS AT AL-MUHAJIRIN ISLAMIC BOARDING SCHOOL, CIKARANG PUSAT, WEST JAVA

Reza anindita [1*], Ega Nuraini Wahyu[2] , Melania Perwitasari[3], Dede Dwi Nathalia[4], Maya Uzia Beandrade[5], Intan Kurnia Putri[6]

[1,3,4,5,6] Department of Pharmacy, STIKes Mitra Keluarga, Bekasi City, West Java, Indonesia
[2] Department of Medical Laboratory Technology, STIKes Mitra Keluarga, Bekasi City, West Java, Indonesia

Email correspondence author : rezaaninditaa@gmail.com

ABSTRACT

Introduction – Pediculosis capitis is a scalp hair disorder caused by an infestation of the lice (lice) of *Pediculus humanus capitis*. The spread of this disease is dominant in Islamic boarding school students. This disease besides causing itching and lesions on the scalp also causes loss of concentration and enjoyment of learning in children. **Purpose** – The purpose of this study was to determine the percentage of female students infested with *P. humanus capitis*. **Methods**-The design of this research is cross-sectional. Methodology/Approach – The sample for this study was 41 female students of grade 7 at AL-Muhajirin Islamic Boarding School, Central Cikarang, West Java. Examination of *P. humanus capitis* on all female students was carried out using the serit method. The *P. humanus capitis* lice found were then collected and preserved preparations were made for microscopic morphological identification. **Findings** – The conclusion from this study is that the percentage of pediculosis capitis in female students is high, so it is necessary to take countermeasures in the form of head lice medication and education about personal hygiene for class 7 female students at Al-Muhajirin Islamic Boarding School, Central Cikarang, West Java

Keywords: *Pediculosis ; capitis; lice ;boarding school; Cikarang*

INTRODUCTION

Pediculosis capitis is a scalp disorder caused by an infestation of the lice (lice) of *Pediculus humanus capitis* commonly called head lice. This disease generally attacks school children in poor countries and develops by spreading (transmission) through hair, clothes, combs, hats, towels, and personal items from one person to another. Meanwhile, in Indonesia, pediculosis capitis is still classified as a neglected disease with the highest prevalence rate in girls living in Islamic boarding schools. Therefore, the prevalence of pediculosis capitis in Indonesia is still dominant in Islamic boarding schools (Octavia *et al*., 2020).

According to Massie *et al*. (2020) the prevalence rate of pediculosis capitis is generally influenced by climate, geographical environment, health conditions, income, and family density. Some data on the percentage prevalence of pediculosis capitis mentions that the Asian continent is 15.1% ± 12.8%, Europe is 13.3% ± 17.0%, South America is 44.1% ± 28.0%. At the country level, the prevalence of pediculosis capitis in Turkey is 9.4%, Iran is 4%, Saudi Arabia is 12%, Jordan is 13.4%, Egypt is 21.6%, Philistines is 32.4%, Malaysia is 35%, Pakistan is 87%, Bangkok 23.32%, and Argentina 42.7%. Meanwhile, based on the literature review Octavia *et al*. (2020) the prevalence rate of pediculosis capitis in Indonesia at Islamic boarding schools is above 50% with more female than male sufferers.

The high prevalence rate of pediculosis capitis creates a public health problem, especially in children aged 5-11 years. This is because *P.humanus capitis* will enter its saliva and feces when it sucks blood on the human head.

According to Adham *et al*. (2020) *Pediculus humanus capitis* bites can cause pruritus (itching on the head) causing skin disorders in the form of erythema, macules and papules. If when scratched it produces a wound (abrasions) then it has the potential to cause a secondary infection in the form of impetigo and furunculosis. Considering that the activity of *P. humanus capitis* bites increases at night, it will trigger itching and head-scratching responses, causing children to experience sleep disturbances at night. In cases of chronic infestation of pediculosis capitis can cause anemia, lethargy, drowsiness thereby affecting learning performance, children's cognitive function.

Sulistyani and Khikmah (2019) *Pediculus humanus capitis* bites can cause pruritus (itching on the head) causing skin disorders in the form of erythema, macules and papules. If when it is scratched it produces a wound (abrasion) then it has the potential to cause a secondary infection in the form of impetigo and furunculosis. Considering that the activity of *P. humanus capitis* bites increases at night, it will trigger itching and head-scratching responses, causing children to experience sleep disturbances at night. In cases of chronic infestation of pediculosis capitis can cause anemia, lethargy, drowsiness which affects learning performance, children's cognitive function. Kartashova *et al*. (2019) adding that pediculosis capitis also causes psychological impacts, namely children feel embarrassed and ostracized from the social environment because other children are worried about being infected by children who are infested

ISSN 2961-7758

Referring to the problems and impacts caused by pediculosis capitis, it is necessary to carry out surveys and research on pediculosis capitis in Indonesia, especially in Islamic boarding schools in the Bekasi area. As for several previous studies regarding pediculosis capitis in Islamic boarding schools in several cities in the Greater Jakarta area (Jakarta, Bogor, Depok, Tangerang, Bekasi) have been carried out by Gumsah and Apriani (2021) reported the percentage of pediculosis capitis in children aged 3-12 years in the Babakan Asem, Teluknaga, Tangerang area of 68%. Khamaruddin *et al*. (2020) stated that the percentage of pediculosis in students of Al Hamid Islamic Boarding School, East Jakarta was 69%. Nurdiani (2020) added that the percentage of children aged 6-12 years at the Sirojan Mustaqim Islamic Boarding School and the residents of RW 03 Pondok Ranggon Village, Cipayung District, East Jakarta was each 71 (64.54%) with the distribution as follows: 41 (57.7%)) in dormitories and 30 (42.3%) in residential areas.

The results of other studies reported by Sisirawaty & Siahaan (2016) found the egg stage of on conventional motorcycle taxi helmets in Bekasi City at 16.7%. Research Suhesti & Pramitaningrum (2020) revealed that the percentage of pediculosis capitis in children aged 3-12 years in one of the Cibitung housing areas, Bekasi Regency was 73%.

Based on the results of previous studies, not much data has been published regarding the percentage of pediculosis in Islamic boarding schools in Bekasi City. In fact, information regarding the incidence of pediculosis capitis in Bekasi City is needed for the Health Service which is integrated with the local Puskesmas. The existence of this information will assist the puskesmas in compiling preventive, curative and promotive programs regarding pediculosis in children at Islamic boarding schools. This is considered important because if prevention and control are not carried out it can have an impact on the quality of human resources as the main asset for the development of the Indonesian nation in the future. The results of this study are expected to assist the Bekasi City and District Health Offices in compiling programs for managing and preventing pediculosis in Islamic boarding schools in Bekasi.

METHOD

This type of research is descriptive quantitative with cross sectional design. The research location is the Al-Muhajirin Islamic Boarding School, Central Cikarang, Bekasi Regency, West Java. Research tools and materials include serit combs, plastic clips, chambers, object glass, cover glass, pipettes, microscopes, 10%, 15% Potassium Hydroxide (KOH), aquadest, 30%, 50%, 96% alcohol, absolute alcohol, and xylol. The sample of this research were 41 female students of class 7 at Al-Muhajirin Islamic Boarding School.

Figure 1. Map of the location and condition of the Al-Muhajirin boarding school's rooms

Examination of *P. humanus capitis* was carried out by combing female students' hair using a fine-toothed/serit comb. The female students' hair is wetted first, then a piece of plain paper is placed under the head. Hair is combed from top to bottom, left side and right side of the head. The presence of P. humanus capitis that fell on the paper was then observed, recorded, and preserved preparations were made for morphological examination of *P. humanus capitis* microscopically.

ISSN 2961-7758

Figure 2. Examination of *P. humanus capitis* using serit comb

Sequentially the preparation of preserved preparations was carried out by soaking P.humanus capitis in 10% KOH, 15% (24 hours), distilled water (rinsing), 30% alcohol (15 minutes with 3x change of solution). The body of *P. humanus capitis* was then pressed with 2 glass objects to remove the fluid from the body. The samples were then immersed in 50%, 96%, and absolute alcohol (15 minutes). Then the samples were immersed in Xylol 2x each with a duration of 5 minutes, 15 minutes, 25 minutes and 60 minutes. The sample is then placed on a glass object, given an entelan, covered with a cover glass, and observed under a microscope to examine the morphological identification of *P. humanus capitis.* The morphological identification of *P. humanus capitis* refers to the book ATLAS of Medical Parasitology (Wijaya *et al.* 2016).

Figure 3. slide of *P. humanus capitis*

Data analysis in this study used descriptive statistics which were carried out by processing data in the form of tables and figures. All data were systematically arranged and then described to see the description of pediculosis in the research subjects. As for the image data, it is described to see the morphological characteristics of *P. humanus capitis* as a cause of pediculosis.

RESULT DAN DISCUSSION

Pediculosis examinations at the Al-Muhajirin Islamic Boarding School are conducted separately between female students in grades 7-1 and 7-2. The number of respondents who participated in this research was 49 female students from classes 7-1 and 7-2, but at the time of the research, three female students were not present in class 7-1, and 5 female students in class 7-2 so that the final number of respondents who participated in In this study, there were 41. The results of the P. humanus capitis examination on 41 female students at the Al-Muhajirin Islamic Boarding School can be seen in the table below:

Table. Results of examination of P. humanus capitis on the hair of female students in grades 7-1 and 7-2 at the Al-Muhajirin Islamic Boarding School, Central Cikarang, West Java.

Results	**Number of Respondents**	**Percentage (%)**
Positive	36	87,8 %
Negative	5	12,1 %
Total	**41**	**100 %**

ISSN 2961-7758

Based on the table above, it can be seen from the examination of 41 female student respondents that as many as 36 female student students (87.8%) tested positive for *P. humanus capitis*, and five female student students (12.1%) tested negative for *P. humanus capitis*. The positive presence of *P. humanus capitis*, as much as 87.8%, proves that the incidence of pediculosis in grade 7 female students at the Al-Muhajirin Islamic Boarding School, Central Cikarang, West Java, is still relatively high. The results of this research complement the results Nurdiani's (2020), which reported that as many as 6-12 years old children at the Sirojan Mustaqim Islamic Boarding School and the residents of RW 03 in Pondok Ranggon Village, Cipayung District, East Jakarta obtained results of 60 (77.93 %) women and 11 (33.33%) men tested positive for *P. humanus capitis*; The selection of research samples that focused more on girls refers to the results of research by Gumsah & Apriani (2021) which reported that examinations of children 3-12 years old resulted in 31 (76%) positive girls and 3 (33%) negative boys for pediculosis in Babakan Asem Village, Teluknaga District, Tangerang and research by Suhesti and Pramitaningrum (2020) which revealed that the percentage of children aged 3-12 years in one of the Cibitung housing complexes, Bekasi Regency was 28 (85%) women who tested positive for pediculosis capitis.

Another study that selected the location of Islamic boarding schools and female students was also carried out by Setyoasih and Suryani (2006), who stated that out of 84 female students at Muhammadiyah Boarding School Prambanan Sleman Yogyakarta, 43 (51.2%) female students were positive for pediculosis captis infestation. The findings of the incidence of pediculosis in Islamic boarding school children were also shown in the research of Ary *et al.* (2019), who reported that out of 193 students, 93 (48.2%) were infested with pediculosis with age and most being 13 years old and class VIII respectively amounting to 45 (48.4%) and 35 (37.6%) students at Madrasah Tsanawiyah. (MTs) at Islamic Boarding School X, East Mempawah District, West Kalimantan. The high incidence of pediculosis was also shown in Hapsari (2021), which showed that of the 48 female students living in Islamic boarding school dormitories, 31 (64.6%) were found to have *P. humanus capitis* at the PPAI An Nahdliyah Islamic Boarding School, Malang Regency.

According to Gumsah and Apriani (2021), the incidence of pediculosis capitis is influenced by personal hygiene and the environment. *Islamic boarding schools* generally have a dominant environment for the spread of pediculosis capitis. This is because Islamic boarding schools have bedrooms with a high residential density, making it easier to spread pediculosis capitis from one female student to another. Several risk factors for supporting pediculosis capitis in Islamic boarding schools include sharing towels, not washing your hair twice a week, not changing bed sheets once a week, and using shared bedding, combs, and accessories.

Azim and Andrini (2018) explained that pediculosis capitis in Islamic boarding schools is more dominant in girls than boys. This is because girls tend to have longer hair than boys. Women with long hair are easier to serve as reservoirs for the survival and reproduction of *P. humanus capitis*. However, there is no relationship between gender and the incidence of pediculosis capitis, considering that many other factors can potentially cause pediculosis capitis. The research results of Mitriani *et al.* (2017) in boarding students for classes VII, VIII, and IX This is because class VII students still have poor knowledge about preventing pediculosis, the behavior of exchanging headscarves and sleeping equipment between students is not good.

Regarding the relationship between risk factors for pediculosis in students at Islamic boarding schools, Lukman *et al.* (2015) proved that gender, frequency of washing hair, use of shared combs or hair accessories, use of shared mats or beds, hair length and hair type were correlated with the incidence of pediculosis at the Miftahul Ulum Islamic boarding school, Jember with gender being the biggest risk factor in influencing the incidence of pediculosis capitis. This proves that although pediculosis can attack all genders, women are twice as susceptible to pediculosis capitis infestation compared to men because the majority of women have long, straight, or curly and loose hair, making it more difficult to clean and beneficial for *P. humanus capitis* to grow shelter and metamorphosis. Apart from that, female students more often exchange hair accessories and gather with other students, thus facilitating the transmission of *P. humanus capitis* easily and quickly.

Other evidence was presented by Sari *et al.* (2022), who reported that the use of combs and headscarves together was the risk factor that had the most influence on the incidence of pediculosis in junior high school students aged ≤ 15 years at the Subullussalam Islamic Boarding School, Palembang. Indirectly, using combs together causes eggs and adult tuma from students suffering from pediculosis capitis to stick to the comb and be transferred to other students. The use of the headscarf can indeed reduce the risk of transmission of pediculosis because it avoids direct contact. However, using the headscarf by students suffering from pediculosis can increase the scalp's moisture, especially when the headscarf is

ISSN 2961-7758

worn when the hair is still wet, thus becoming an optimal habitat for the reproduction of *P. humanus capitis.* If another student wears the headscarf without cleaning it, the tuma attached to it can be transferred to other students. Therefore. After using the hijab, wash it immediately and dry it in the sun so that it can kill *P. humanus capitis.*

Another risk factor that influences pediculosis capitis is shown in research by Rohmaniah and Prajayanti (2022), which states that personal hygiene knowledge and attitudes have a significant correlation with the incidence of pediculosis capitis in female students at the Al-Manshur Popongan Islamic Boarding School, Klaten. Female students with good personal hygiene knowledge and attitudes, such as clean skin, hair, and clothing, tend not to be infected with pediculosis capitis. In contrast, female students with low personal hygiene knowledge and attitudes tend to be more easily infested with pediculosis capitis. As for students with good personal hygiene knowledge but with poor personal hygiene attitudes, such as still having the habit of exchanging personal items with other female students and not applying personal hygiene knowledge to their personal lives, the prevalence of pediculosis capitis tends to remain high. This attitude is supported by inadequate dormitory facilities between female students with good and poor knowledge of personal hygiene, which remains a risk factor that continues to trigger an increase in pediculosis capitis even though female students of more mature age have good personal hygiene knowledge and attitudes.

Setiyani *et al*. (2021); Nurcahyati and Rangkuti (2020) female students with poor personal hygiene knowledge of 61.9% and 63.6% tend to increase the percentage of pediculosis capitis incidents in Islamic boarding school environments in children aged 5-16 years by 74.5% and 69 .8%. The same results were also reported in the research of Pringgayuda *et al*. (2021), who stated that the percentage of personal hygiene knowledge in children aged 12-18 years at the Miftahul Falah Islamic boarding school Banyumas Pringsewu, Lampung caused an increase in the incidence of pediculosis capitis by 67.5%.

A different case occurred in the research of Analdi and Santoso (2021), which reported an infestation of female students at the Anshor Al-Sunnah Islamic Boarding School, Riau, in Classes VIII, IX, and X who had good personal hygiene behavior of 88.2%. In this case, transmission of pediculosis capitis occurs through direct contact between female students, so prevention efforts are no longer carried out. However, effective treatment is needed to break the chain of pediculosis capitis transmission. Treatment and mitigation efforts were demonstrated in the research of Khamaruddin *et al.* (2020) who reported that before treatment and control efforts were carried out, the percentage of cases of pediculosis capitis in 60 students of Al-Hamid Islamic Boarding School, East Jakarta was 69%, but after treatment and control efforts were carried out in the form of a policy of shaving hair, cleaning hair 3x a week, and administering medication for head lice was able to reduce the incidence of pediculus capitis by 33% or a decrease of 36%.

The environmental conditions at the Al-Muhajirin Islamic Boarding School are inadequate, with the number of female students in one bedroom reaching 15 to 25 children.

The facilities in the room only have one fan, which causes the female students' rooms to become damp and hot during the day. How mattresses, blankets, and headscarves are placed in a pile and mess, and the habit of female students exchanging headscarves is thought to be the cause of the high incidence of pediculosis capitis in this study.

The examination for pediculosis capitis in the study was carried out using a single-use comb (disposal comb), which aims to prevent the migration of lice from one child to another, in addition to preventing false positives from occurring in children who are not infected with pediculosis capitis. Pediculosis capitis examination is carried out in a room that has good lighting. The student's hair is first combed to avoid tangles, making it easier to examine *P. humanus capitis*. Female students who have long, tangled hair are combed using a comb with a sparse density so that it does not cause pain when combing. The entire head and hair are examined carefully, especially the temples, nape, and behind the ears. Students are declared positive for *P. humanus capitis* infection if one *P. humanus capitis* egg/nymph/adult is found in the scalp area. The spread of head lice is limited to the skin or hair area of the head, especially at the back of the head and near the ears in children. The results of P. humanus capitis found in the head area of the female students at the Al-Muhajirin Islamic boarding school can be seen in the image below.

ISSN 2961-7758

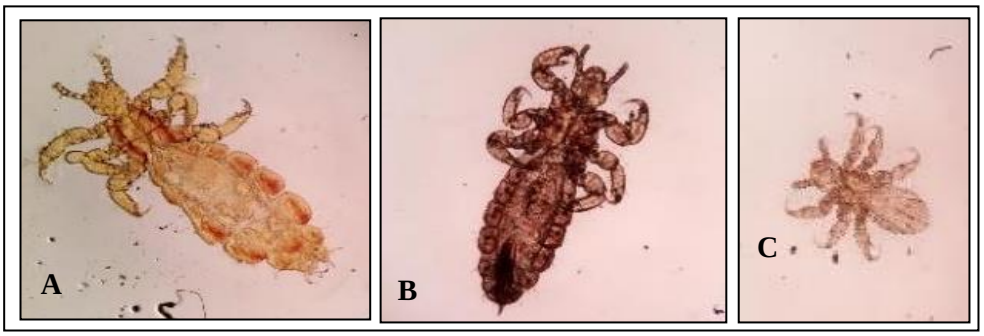


Figure 4. A. P. Humanus capitis adult (female). B. *P. humanus capitis* adult (male). C. *P. humanus capitis* nympha phase

Figure 4 shows that adult *P. humanus capitis* has short antennae that are long and thin (filiform) with five segments and has three pairs of legs consisting of coxa, femur, tibia, and tarsus. The length of the front, middle, and hind legs is almost the same. The tip of the tarsus is shaped like claws, which grasp the hair shaft. The difference between male and female *P. humanus capitis* can be seen in the shape of the abdomen, where the abdomen of the male *P. humanus capitis* is slimmer with a rounded tip of the abdomen. In comparison, the abdomen of the female *P. humanus capitis* is larger, with the tip forming the shape of the letter V.

The male *P. humanus capitis* his genitals. Namely, the aedagus (penis), while the female *P. humanus capitis* has a terminal portion called the gonopod and uterine gland which functions to secrete a cement fluid like glue (called nit) which functions to place the eggs in the hair so that they do not come off easily.

According to Wijaya *et al*. (2016), adult pediculus has a size of 1-3 mm. The size of the nymph is smaller than the adult pedicle. The difference is visible in the size of the abdomen due to the increase in abdominal segments. Pediculus is incapable of flying because it does not have wings, but its movement is fast, up to 23 cm/minute.

The advantage of this research is that the selection of Islamic boarding schools as endemic locations and female students as sample objects for pediculosis capitis examinations is precisely able to provide information about the incidence of pediculosis capitis in Bekasi Islamic boarding schools. The limitations of this study are that the number of Islamic boarding school locations does not cover a large area, the use of a cross-sectional design, and an analysis of the risk factors that cause pediculosis in the research locations has not been carried out.

Conclusion

The conclusion from this study is that the percentage of pediculosis capitis in female students is high, so it is necessary to take countermeasures in the form of head lice medication and education about personal hygiene for class 7 female students at Al-Muhajirin Islamic Boarding School, Central Cikarang, West Java

ISSN 2961-7758

DAFTAR PUSTAKA

Adham, D., Moradi-Asl, E., Abazari, M., Saghafipour, A., & Alizadeh, P. (2020). Forecasting head lice (Pediculidae: Pediculus humanus capitis) infestation incidence hotspots based on spatial correlation analysis in Northwest Iran. *Veterinary World*, *13*(1), 40–46. https://doi.org/10.14202/vetworld.2020.40-46

Analdi, V., & Santoso, I. D. (2021). Gambaran perilaku kebersihan diri terkait infestasi kutu kepala (Pediculus humanus capitis) pada santriwati di Pondok Pesantren Anshor Al-Sunnah Riau. *Tarumanagara Medical Journal*, *3*(1), 175–181. https://doi.org/10.1016/j.fander.2021.04.004

Ary, W. B., Natalia, D., & Fitriangga, A. (2019). Gambaran dan Hubungan Karakteristik Individu dan Frekuensi Cuci Rambut dengan Kejadian Pediculosis capitis. *Jurnal Cerebellum*, *5*(2), 1296–1306. https://jurnal.untan.ac.id/index.php/jfk/article/view/32926

Azim, F., & Andrini, N. (2018). Perbandingan Angka Kejadian Pedikulosis Kapitis antara Anak Laki-Laki dengan Anak Perempuan di Pondok Pesantren Al-Kautsar Al-Akbar Medan. *Ibnu Sina Biomedika*, *1*(1), 72–79. http://www.tjyybjb.ac.cn/CN/article/downloadArticleFile.do?attachType=PDF&id=9987

Gumsah, A. S., & Apriani. (2021). Pedikulosis Pada Anak Di Wilayah Desa Babakan Asem Kecamatan Teluknaga. *Jurnal Sehat Indonesia (JUSINDO)*, *3*(02), 74–83. https://doi.org/Doi : 10.36418/jsi.v3i2.30 74

Hapsari, R. R. (2021). Pediculosis Capitis in Female Students' Life At Pondok Pesantren PPAI An-Nahdliyah Kabupaten Malang. *Media Gizi Kesmas*, *10*(1), 24. https://doi.org/10.20473/mgk.v10i1.2021.24-31

Kartashova, O. V, Lobuteva, L. A., Zakharova, O. V, Lobuteva, A. V, & Goykhman, A. A. (2019). Medical and Social Factors of Pediculosis. *Journal of Medical Sciences*, *7*(19), 3240–3244. https://doi.org/https://doi.org/10.3889/oamjms.

Khamaruddin, S., Daulay, W., Sukamti, S., & Suparni. (2020). Effect of Education on Behavior About Head Lice on Students In East Jakarta. *Asian Journal of Applied Sciences*, *8*(2), 105–109. https://doi.org/10.24203/ajas.v8i2.6101

Lukman, N., Armiyanti, Y., & Agustina, D. (2015). *Hubungan Faktor-Faktor Risiko Pediculosis Capitis Terhadap Kejadiannya Pada Santri di Pondok Pesantren Miftahul Ulum Kabupaten Jember*. 27. http://repository.unej.ac.id/bitstream/handle/123456789/65672/Ainul Latifah-101810401034.pdf?sequence=1

Massie, M. A., Wahongan, G. J. P., & Pijoh, V. (2020). Prevalensi Infestasi Pediculus humanus capitis pada Anak Sekolah Dasar di Kecamatan Langowan Timur. *Jurnal Biomedik*, *12*(1), 24–30. https://doi.org/https://doi.org/10.35790/jbm.12.1.2020.26934

Mitriani, S., Rizona, F., & Ridwan, M. (2017). Hubungan Pengetahuan dan Sikap Tentang Pediculosis Capitis Dengan Perilaku Pencegahan Pediculosis Capitis pada Santri Asrama Pondok Pesantren Darussalam Muara Bungo. *Jurnal Keperawatan Sriwijaya*, *4*(2), 26–36.

Nurcahyati, F. I., & Rangkuti, A. F. (2020). Analisis Tingkat Pengetahuan dan Personal Hygiene Dengan Kejadian Pediculosis Capitis di Pesantren Binaul Ummah Kabupaten Bantul. *Dunia Keperawatan: Jurnal Keperawatan Dan Kesehatan*, *8*(3), 479. https://doi.org/10.20527/dk.v8i3.8088

Nurdiani, U. C. (2020). Faktor-Faktor Yang Mempengaruhi Pediculosis Capitis Pada Anak-Anak Umur 6-12 tahun Di Pondok Pesantren Sirojan Mustaqim Dan Penduduk RW 03 Kelurahan Pondok Ranggon Kecamatan Cipayung Jakarta Timur. *Jurnal Ilmiah Analis Kesehatan*, *6*(1), 39–48. https://doi.org/http://journal.thamrin.ac.id/index.php/anakes/issue/view/35 39

Octavia, N. S., Wiryosoendjojo, K., & Nugroho, R. B. (2020). Hubungan Personal Hygiene Terhadap Kejadian Pediculosis capitis pada Santriwati Pondok Pesantren. *Prosiding Setiabudi-CIHAMS*, *15*(4), 225–231. https://cihams.setiabudi.ac.id/index.php/proceeding

Pringgayuda, F., Putri, G. A., & Yulianto, A. (2021). Personal Hygiene Yang Buruk Meningkatkan Kejadian Pediculosis Capitis Pada Santri Santriwati Di Pondok Pesantren. *Jurnal Keperawatan Muhammadiyah*, *6*(1), 54–59. https://doi.org/10.30651/jkm.v6i1.7235

Rohmaniah, S., & Prajayanti, D. E. (2022). Hubungan Pengetahuan dan Sikap Tentang Personal Hygiene pada Santriwati dengan Kejadian Pediculosis Capitis di Pondok Pesantren Al-Manshur Popongan. *SEHATMAS: Jurnal Ilmiah Kesehatan Masyarakat*, *1*(4), 561–568. https://doi.org/10.55123/sehatmas.v1i4.915

Sari, R. P., Handayani, D., Prasasty, G. D., Anwar, C., & Fatmawati. (2022). Hubungan Penggunaan Barang Bersama dengan Pedikulosis Kapitis pada Santri di Pondok Pesantren Subulussalam Palembang. *Journal of Agromedicine and Medical Sciences*, *8*(2), 78–84.

Setiyani, E., Mulyowati, T., & Binugraheni, R. (2021). Hubungan Personal Higiene Dengan Kejadian Pediculosis Capitis Pada Santriwati Di Pondok Pesantren Rohmatul Qur ' an Mejobo Kudus. *Jurnal Labora Medika*, *5*, 35–38.

Setyoasih, A., & Suryani, D. (2006). Hubungan Antara Pengetahuan, Personal Hygiene, dan Infestasi Pediculus humanus var. capitis Pada Santriwati Muhammadiyah Boarding School Prambanan Sleman Yogyakarta. *Jurnal Kedokteran Dan Kesehatan*, *12*(2), 190–201.

Sisirawaty, & Siahaan, R. M. (2016). Perbandingan Temuan Pediculus Humanus Capitis Pada Helm Ojek Online Dan Ojek Konvensional Di Daerah Bekasi Bulan Desember Tahun 2016. In *Bunga Rampai Saintifika FK UKI (Nomor 6)* (pp. 1–23).

Suhesti, R., & Pramitaningrum, I. K. (2020). Pedikulosis Anak Di Salah Satu Perumahan Di Bekasi. *Jurnal Mitra Kesehatan*, *3*(1), 35–40. https://doi.org/10.47522/jmk.v3i1.49

Sulistyani, N., & Khikmah, N. (2019). Hubungan Pedikulosis Kapitis, Status Anemia Dan Prestasi Belajar Pada Siswa Sekolah Dasar. *Jurnal Penelitian Saintek*, *24*(2), 65–74.

ISSN 2961-7758

Wijaya, M., Surja., S.S., Yolanda, H. Joprang, S.F., Prasetio, B.V., Monintja, C.K., Makimian, R., Jukiani, M. dan Padmasutra, L. 2016. Penuntun Praktikum Parasitologi Kedokteran. Departemen Parasitologi FK UNIKA ATMA JAYA : Jakarta