Ethnobotany of Dayak medicinal plants in Kayu Ara village, Landak regency as a learning resource

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Abstract: The lack of scientific documentation on the ethnobotany of Dayak medicinal plants makes this knowledge vulnerable to disappearing. Ethnobotany as a learning resource is one very effective step to make students more familiar with and love the knowledge of their ancestors. The purpose of this study was to determine the kinds of drugs and plants used by the community in Kayu Ara village and also the potential of ethnobotany of Dayak medicinal plants as a learning resource. This research uses a qualitative method where researchers divide 2 stages of research from collecting medicinal plant data by interview and observation. Interviews were conducted using snowball sampling technique. Further data collection is in the form of questionnaire results of potential biology learning resources. The results of the study found 21 types of medicinal plants which are divided into 16 families. The most widely used part is the leaves 45% and the least part of the fruit is only 3%. Potential learning resources obtained Clarity of Potential 88.89%, Suitability with Purpose 100%, Clarity of Target 91.67%, Clarity of Information Revealed 88.89%, Clarity of Exploration Guidelines 100%, Clarity of Expected Gain 100%. These results indicate that the ethnobotany of Dayak medicinal plants in kayu ara village, jelimpo sub-district, landak district is very effective in being used as a biology learning resource, especially in class X on biodiversity subject matter.

Keywords: Dayak tribe, ethnobotany; learning resource; local wisdom; medicinal plants

Introduction

Indonesia has a rich ethnic and cultural diversity in the practice of traditional medicine. With 1,340 ethnic groups, each tribe brings unique knowledge and methods in medicine, reflecting the richness of local cultures and traditions. This makes Indonesia a country with a very diverse and valuable heritage of traditional medicine (Fajarwati, 2024). Indonesia is a tropical country rich in biodiversity. This diversity needs to be properly utilised and preserved for the sustainability of the environment and the welfare of society (Fardana et al., 2023). Plants have been a biological resource utilised by humans around the world since ancient times as the main ingredient and the relationship between humans and plants has a very important role. Understanding through ethnobotany is also the key to uncovering the functions of various plants that are still not revealed by modern society (Rizal et al., 2021).

Ethnobotany is a scientific discipline that focuses on the study of how humans interact with plants traditionally and in its development explores human relationships with natural resources in the surrounding environment (Solechah et al., 2021). Ethnobotanical studies also play a crucial role as a major foothold in the process of developing and selecting medicinal plants for various purposes such as disease treatment, symptom reduction, and prevention of health problems (Dogara et al., 2020). Through understanding ethnobotany, we can find out the deep relationship between humans and plants in the use of plants as medicine, especially the Dayak tribe, which has been known to use medicinal plants as

a way to treat health (Julung et al., 2023).

Knowledge of plants as medicine is a local wisdom that comes from previous generations.Local wisdom is a valuable heritage from ancestors that contains life values. When a community adapts to their environment, they develop valuable ideas and tools to fulfil their needs and maintain their identity (Nur et al., 2023). However, over time, many younger generations have lost knowledge of local wisdom due to the rapid process of globalisation (Nur et al., 2024).

Local wisdom possessed by various ethnic groups in Indonesia includes the use of various biodiversity in daily life, especially by communities living around forests. Each local community utilises plants to meet their needs, such as health care using medicinal plants. Knowledge regarding the use of these plants is usually conveyed orally, so the knowledge is limited to certain groups and is vulnerable to degradation due to the influence of cultural acculturation and modernisation (Ibo & Arifa, 2021).

Learning is a dynamic process that occurs through complex interactions between students and the surrounding environment, interactions between fellow students, interactions with various learning resources, and interactions with teachers. Optimal learning quality is achieved when the material learned is not only understood theoretically, but also applied concretely in the context of everyday life. Thus, meaningful learning occurs when students are able to connect the information they learn with the experiences and realities they encounter in their environment (Jacinda et al., 2023). Learning by taking learning resources from around needs to be done, one of which is learning resources from ethnobotanical studies of medicinal plants.

Research on ethnobotany of power tribes has been carried out a lot, such as research Lovadi et al., (2021) which examines the ethnobotany of medicinal plants of the Dayak saloka tribe in West Kalimantan found 85 plants that are used as medicines, also research from Elsi et al., (2020) examining the ethnobotany of drugs of the Dayak merantus tribe in South Kalimantan found 31 types of plants that are used as medicines, and research from Reynaldi et al., (2019) But the absence of ethnobotany of Dayak medicinal plants, especially in the district of Landak, which is made as a source of learning based on local wisdom, makes me interested in doing this research.

Utilising local wisdom as a learning resource to the fullest will make students understand the learning materials, where later students can relate the material learned to the conditions in their environment. Dayak tribes that still utilise plants as medicine offer a valuable perspective in this field. This research aims to find out the kinds of drugs used by the Dayak tribe in Kayu ara village along with the types of plants used and also wants to know the potential of ethnobotany of Dayak medicinal plants in Kau ara village as a source of learning biology.

Method

The research was conducted in April-May 2024 in Kayu ara village, Jelompo sub-district, Landak district, West Kalimantan province. This research uses a qualitative method by taking direct data through interviews and observations in two hamlets, namely mimpin hamlet and Kayu ara hamlet, Jelimpo sub-district, Landak district. Interviews were conducted using the snowball sampling technique. According to Firmansyah & Dede, (2022) Snowball sampling technique is a non-probability sampling method in which research subjects recommend future subjects from their circle of acquaintances. In this way, the sample grows like a rolling snowball. As the sample continues to grow, relevant data will accumulate until it reaches an adequate amount for the research purpose. This sampling method is especially beneficial in hidden populations that are difficult for researchers to reach.

This researcher divides informants into key informants and general informants. The first informant of the key informants is the customary leader, then the medicine maker and finally the elder or the elder. General informants are people who still use medicinal plants as a way to treat diseases. The data taken includes the name of the plant, the part used, the manufacturing process, and its usefulness. The addition of samples is stopped when the data is saturated and does not provide new data anymore. All data will be analysed narratively. Furthermore, direct observation is carried out to get what has been obtained from the results of interviews which will be analysed descriptively. The results of plant findings will be identified by plant experts.

The results of the identification and findings of medicines used by Dayak people in Kayu ara village, Jelimpo District, Landak Regency will later be analysed as potential biology learning resources, especially at the high school level. The basis for analysing using the independent curriculum. The potential of learning resources will be reviewed from the Learning Outcomes (CP) to find out the potential of learning resources researchers distributed questionnaires to several biology teachers by giving 14 questions from 6 indicators to 3 related biology teachers. The questionnaire used is a Guttman scale questionnaire which contains a checklist with only Yes/No options. The use of the Guttman scale provides clear (firm) and consistent answers from respondents. Later the results of the questionnaire will be analysed to find out the potential as a learning resource, can be seen in Tabel 1.

Table 1. Provision of Learning Resources Potential Questionnaire Score

Answers	Score
Yes	1
No	0

(Mandasari et al., 2020)

To calculate the percentage of teacher questionnaires, the following Formula 1.

$$P = \frac{f}{N} \times 100\%$$ (1)

Description :
P = percentage
f = number of scores obtained
N = maximum score
(Febriyanda et al., 2022)

Furthermore, the percentage score of the ethnobotanical questionnaire results of traditional medicinal plants was analysed according to the assessment score criteria as shown in Table 2.

Table 2. Assessment Score for Potential Learning Resources Questionnaire.

Number	Percentage	Rating Category
1.	81-100%	Very Effective
2.	61-80%	Effective
3.	41-60%	Moderately Effective
4.	21-40%	Not Effective
5.	0-20%	Very Not Effective

(Fahrazi et al., 2023)

Results and Discussion

Ethnobotany is a scientific discipline that focuses on the study of how humans interact with plants traditionally, and in its development, explores human relationships with natural resources in the surrounding environment (Solechah et al., 2021). The ethnobotany studied in this study is medicinal plants used by the Dayak tribe in Kayu Ara village, Jelimpo District, Landak Regency.
The people of Kayu Ara village, Jelimpo sub-district are Dayak tribes which are divided into several sub-tribes, namely; Dayak mali and Dayak taba. These tribes usually utilise plants to treat illness in their daily lives. This community habit is a hereditary belief from the ancestors, interestingly there are some drugs that appear and are created from their own experiences or you could say concocting drugs by trial and error. This is common in the area because they believe that medicinal plants will appear on their own if needed and are difficult to find if no one is sick. Some of the medicines that are efficacious according to the community in Kayu ara village, Jelimpok sub-district, Landak district can be seen in Table 3.

Table 3. Dayak medicine in Kayu Ara village, Jelimpo sub-district, Landak district

No.	Name of Medicine	Plants Used	Plant parts used	Manufacturing Process	Empirical efficacy
1.	Maroyan	Wak Padak Bujang Semalam Tigari	Roots Roots Roots	Take all the ingredients and chop them, boil them, then drink them.	Treating Maroyan after childbirth, Relieving aches and pains
2.	Kidney pain medicine	Sarang Semut	Tubers	Sarang semut is taken and then cut into small tubers and boiled. The results of the stew will be drunk later	Treats all diseases related to the kidneys
3.	Anamt Ungan	Tigari Rapetek Bebadi	Roots Roots Roots	Ingredients are prepared then boiled then drunk	Treating the body that feels sore after heavy

No.	Name of Medicine	Plants Used	Plant parts used	Manufacturing Process	Empirical efficacy
		Patah Kembudi	Roots		work
4.	Relieves bloody bowel movements	Asam Bacang Durian Petai	Stem Bark Stem Bark Stem Bark	Ingredients are prepared, all the stem bark is cut into small pieces and then boiled then drunk	Can reduce bloody bowel movements (defecation)
5.	Medicine for Vomiting Blood	Bawang Dayak	Tubers	Dayak onion bulbs are taken and then cut into small pieces and boiled. The result is drunk immediately	Lowers blood pressure and helps eliminate vomiting and bleeding
6.	Cavities Medicine	Pakis Nage	Stem	Take the stem of the nage fern and break the sap that comes out and then apply it to the aching tooth.	Relieves toothache and cavities
7.	Malaria Medicine	Patah Kembudi	Roots	Take the root of the broken back then clean it then boil it. The result of the decoction is drunk	Treat malaria
8.	Waist Pain Medicine	Bujang Semalam	Roots and leaves	The roots and leaves of the bujang are taken overnight and then boiled and drunk.	Relieving back pain
9.	Anggin-lowering medicine	Tanyak Wek	Leaves	Several leaves of tanyak wek are taken and burned until the leaves turn black and then placed on the stomach	Relieving flatulence due to colds
10.	Ulcer Medicine	Pengkelas	Leaves	Taken a few leaves of pengkelas then pounded until thirsty then applied to the skin affected by boils.	Treat boils
11.	Vomiting blood medicine	Sabang Merah	Leaves	Take one red vinegar leaf and then eat it immediately	Treating vomiting of blood
12.	Fever Medicine	Langsat	Stem bark	The bark of the langsat tree is taken and then cut into small pieces and boiled. The result of the decoction is drunk immediately	Treating fever
13.	Burn Medicine	Bunga Kisu	Leaves	Take the leaves of the kisu flower and rub it on the palm of the hand and	Treating burns

No.	Name of Medicine	Plants Used	Plant parts used	Manufacturing Process	Empirical efficacy
				then stick it on the burned area.	
14.	Mouth ulcer medicine	Senggani	Fruit	Take the ripe sengani fruit and crush it then apply it on the lips that have canker sores.	Treat mouth ulcers
15.	Toothache medicine	Ngaramk	Leaves	Take 1 easy ngaramk leaf and pound it until smooth then attach it to the cheek where the tooth hurts.	Relieves toothache and relieves swollen cheeks caused by toothache
16.	Eye pain medication	Sirih Merah	Leavers	Red betel leaves are taken and boiled then cooled. Red betel leaf boiled water is dripped into the sore eye.	Relieves eye pain
17	Scar removal medicine	Durian	Leavers	Take a few durian leaves and scrape the bottom of the golden-coloured durian leaves. The results of the durian leaf scraping powder are given a little water and then applied to the scarred skin.	Removing scars
18	Cough medicine	Daon Batok	Leavers	Taken a few batok leaves and chewed if it has been destroyed directly swallowed	Treats cough

D The people of Kayu ara village, Jelimpo sub-district, Landak district are Dayak tribes which are divided into several sub-tribes, namely; Dayak mali and Dayak taba. Based on interviews with 20 informants, it was found that these tribes usually utilise plants to treat illness in their daily lives. This community habit is a hereditary belief from the ancestors, interestingly there are some drugs that appear and are created from their own experiences or you could say concocting drugs by trial and error. This is common in the area because they believe that medicinal plants will appear on their own if needed and are difficult to find if no one is sick. In the process of taking plants used as medicine, the Dayak tribe in Kayu ara village, especially the medicine makers or village shamans, have a tradition. Based on the results of interviews, usually before taking the medicine there are readings that are done to make it easier to find some plants that are difficult to find and there are also taboos or restrictions when already using drugs such as not eating sour foods. The process of making medicine by the Dayak tribe in Kayu ara village is usually directly consumed such as eating and drinking, there are also uses such as sticking on the sore spot.

Dayak people in kayu ara village, Jelimpo sub-district, Landak district usually use leaves as a medicinal herb. The percentage of parts used can be seen in Figure 1.
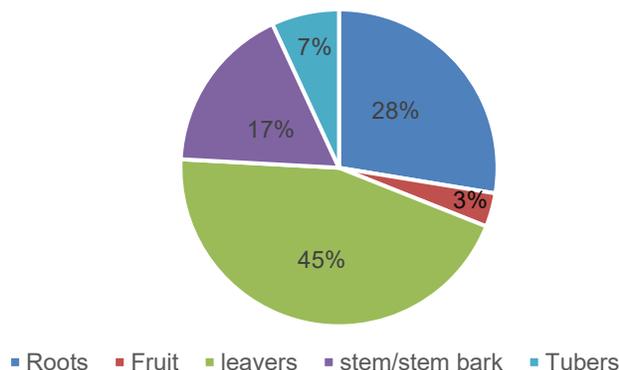

Figure 1. Percentage of plant parts used as medicine

Based on Figure 1, it is known that the leaves are the most widely used as medicine at 45% while the fruit is the least at 3%. Many people use leaves as medicinal materials because they contain various secondary metabolite compounds such as alkaloids, flavonoids, polyphenols, saponins, and other compounds that are useful in medicine (Halhaji & Suryadarma, 2022). In addition, choosing leaves over other parts of the plant as medicinal materials can extend the life of the plant because the leaves can continue to regrow and be used repeatedly. In addition, leaves often show signs of secondary metabolites that are toxic, repellent, or have anti-nutritional effects on plant-eating animals (Patiola et al., 2023). The Identified medicinal plant species presented in Tabel 4.

Table 4. Identified Medicinal Plant Species

No.	Pictures of Plants	Local Name	Scientific Name	Family	Compound content
1.		Tigari	*Neomarica gracilis*	*Iridaceae*	-
2.		Bujang Semalam	*Ludwigia hyssopifolia*	*Onagraceae*	.-
3.		Daun Batok	*Anredera cordifolia*	*Basellaceae*	-
4.		Pakis Nage	*Diplazium esculentum*	*Polypodiaceae*	-

No.	Pictures of Plants	Local Name	Scientific Name	Family	Compound content
5.		Tanya Wek	*Ruellia tuberosa*	*Acanthaceae*	-
6.		Pengkelas	*Gynura procumbens*	*Asteraceae*	flavonoids, tannins, saponins, steroids/triterpenoids, as well as the elements potassium, calcium, and magnesium (Widyaningsih, 2010)
7.		Patah Kembudih	*Emilia sonchifolia*	*Asteraceae*	Alkaloids, Polyphenols, Flavonoids, Tannins, and Tripenoids/Steroids (Herawati et al., 2024)
8.		Ngaramk	*Rubus moluccanus*	*Rosaceae*	-
9.		Sabang Merah	*Excoecaria cochinchinensis*	*Euphorbiaceae*	Flavonoids (Hutuba et al., 2023)
10.		Langsat	*Lansium domisticum correa*	*Meliaceae*	Langsat stem bark contains antioxidant compounds, tannins, flavonoids, & terpenoids (Apridamayanti & Kurniawan, 2018)
11.		Bawang Dayak	*Eleutherine palmifolia*	*Iridaceae*	Dayak onion bulbs contain flavonoids (Sa'adah et al., 2017) flavonoids, saponins, tannins, alkaloids & quinones (Wigati & Rahardian, 2018)

No.	Pictures of Plants	Local Name	Scientific Name	Family	Compound content
12.		Bunga Kisu	*Cyanthillium Cinereum*	*Asteraceae*	Fenol, alkaloid, flavonoids, steroid, tannins, glikosida, dan saponins (Saputri et al., 2024)
13.		Sarang Semut	*Myrmecodia tuberosa*	*Rubiaceae*	flavonoids, tannins, saponins dan terpenoids (Imaniar et al., 2022)
14.		Sirih Merah	*Piper crocatum*	*Piperaceae*	minyak atsiri, alkaloid, tannin, flavonoid, saponin ,hidroksikavikol, kavikol, kavibetol, karvakrol, eugenol, p-simen, sineol, kariofilen, kadimen estragol, terpenena, dan fenil propanoid (Nisa et al., 2014)
15.		Durian	*Durio zibethinus*	*Bombacaceae*	The crude extract of durian stem bark contains flavonoids, alkaloids, triterpenoids and saponins. (Fajaryantie et al., 2021)
16.		Petai	*Leucaena leucocephala*	*Fabaceae*	Flavonoids and Kumarin (Mustanir et al., 2013)
17.		Senggani	*Melastoma candidum*	*Melastomataceae*	Phytochemical screening results showed that senggani fruit contains metabolite groups of Alkaloids, Saponins, Flavanoids, Phenolics, Tannins, and Terpenoids (Rauf et al., 2023)

No.	Pictures of Plants	Local Name	Scientific Name	Family	Compound content
18.		Rapetek	*Paspalum conjugatum*	*Poaceae*	-
19.		Asam Bacang	*Mangifera foetida*	*Anacardiaceae*	-
20.		Wak Padak	*Imperata cylindrica*	*Poaceae*	-
21.		Bebadi	*Phyllanthus niruri*	*Phyllanthaceae*	-

A total of 21 plant species used as traditional medicine by the Dayak people in Kayu ara village are classified into 16 families. Fewer than the research conducted Lovadi et al., (2021) which found 85 plant species in the Dayak Saloka Cakar alam raya pasi tribe but still more than the research Reynaldi et al., (2019) which found 10 species of medicinal plants in the Dayak Bakumpai tribe Muara ripung village, South Barito Regency. The difference in the number of plants used by a community group is influenced by their lifestyle and the availability of plants around their environment (Hafizah & Fitmawati, 2023). Medicinal plants include all types of plants that can be found around settlements, both intentionally planted and naturally growing, which have been identified and are believed to have medicinal benefits (Halhaji & Suryadarma, 2022).

All plants used by the community there grow wildly, the reason for the absence of plants cultivated for their own needs is because the plants used as medicines grow on their own and are very difficult to cultivate, especially grass plants that grow on their own in rice fields, roadsides, and several other places. Community beliefs there also believe that some plants will appear if needed and difficult to obtain if not necessary.

One of the plants that are often used by the people there is the kisu flower plant *(Cyanthillium cinereum)* or in Indonesian the dog flower where the plant starts from the roots to the leaves are very useful also the plant grows everywhere. One of the uses of these plants is to treat burns by applying kisu flower leaves to the burned skin. In the research of Saputri et al., (2024) found the content of compounds in these plants in the form of phenols, flavonoids, steroids, tannins, glycosides, and saponins.The suitability of high school biology teaching materials with the ethnobotanical potential of Dayak medicinal plants in Kayu Ara village, Jelimpo sub-district, Landak district is seen based on ATP (Flow of Learning Achievements).

Based on the explanation above, it is obtained that the ethnobotanical potential of Dayak medicinal plants in Kayu ara village, Jelimpo sub-district, Landak district with class X biology teaching material, namely Biodiversity. One of the characteristics of a good learning resource is its ease of access, both because of its proximity to users and because of the sufficient availability of various learning resources (Nurliza et al., 2023).

Based on the findings of interviews that have been conducted, through observation and documentation

of the morphological characteristics of plants. The results of identification and the results of the use of plants as medicines will be used as a learning resource in the form of a document of findings The results of the questionnaire obtained on the potential of learning resources can be seen in Table 5.

Table 5. Suitability as a Learning Resource

No.	Aspects	Percentage	Rating Category
1.	Clarity of Potential	88.89%	Very Effective
2.	Conformity with Objectives	100%	Very Effective
3.	Clarity of Objectives	91.67%	Very Effective
4.	Clarity of Information Disclosed	88.89%	Very Effective
5.	Clarity of Exploration Guidelines	100%	Very Effective
6.	Clarity of Expected Gains	100%	Very Effective
	Average	92.86%	Very Effective

Learning about local potential aims to increase students' understanding of the advantages and wisdom that exist in the area where they live, and to make the learning process more practical and meaningful (Wulandari & Djukri, 2021). All learning resources should not be viewed separately, but rather as an integral part of the learning process that can contribute positively to learning outcomes (Karmadi et al., 2023).

Based on Table 5, it shows 6 requirements for learning resources, namely: aspects of clarity of suitability for purpose, clarity of objectives, clarity of information disclosed, clarity of exploration guidelines, and clarity of expected gains.

Clarity of potential: Clarity of potential is an object that has potential as a learning resource if the object contains problems that can be revealed in teaching and learning activities. The availability of objects in this research is the ethnobotany of Dayak medicinal plants in Kayu Ara village, Jelimpo sub-district, Landak district. Information that can be raised in this study is biodiversity. The potential of ethnobotany of Dayak medicinal plants can be used as a learning resource because students can know firsthand and can get to know the biodiversity of plant species and their uses as traditional medicines. This is in accordance with Astari & Putri, (2022) The potential of an object is determined by the availability of the object and the problems that can be revealed to produce facts and concepts from the research results which are the objectives in the curriculum.

Suitability to objectives: The suitability of learning resources with learning objectives should be selected based on what objectives will be achieved by using these learning resources. Ethnobotany of Dayak medicinal plants in kayu ara village, jelimpo sub-district, landak district can make students able to observe, identify, classify and analyse the types of plants found around and can also find out the uses as traditional medicine. According to Andriliyani et al., (2021) the suitability of learning resources with learning objectives should be selected based on what objectives will be achieved by using certain learning resources.

Clarity of object: The target in question is the clarity of object observation targets and subject designation targets (Agus & Listiatie, 2014). Clarity of object observation targets, namely plants used as traditional medicine by Dayak tribes in Kayu Ara village, Jelimpo sub-district, Landak district. The target subject is high school students, especially class X biology teaching materials (Biodiversity) which are determined in accordance with the results of the analysis that has been verified that the results of this study have compatibility with the Learning Outcomes (CP) of high school. According to Dara et al., (2016) The scope of biological material includes an understanding of biology, its various branches, its benefits for life, the level of organisation of life, and relevant biological issues at the global level.

Clarity of information disclosed: The clarity of information disclosed in this study is that there are 21 plants used as traditional medicine by Dayak people in Kayu ara village, Jelimpo sub-district, Landak district. The information obtained from the observation results is clearer and more factual because students can directly know the local wisdom of the knowledge of medicinal plants.

Clarity of exploration guidelines: Clarity of exploration guidelines is a work procedure in the field that starts from determining the object of research, tools and materials, how to work, and data analysis and conclusion drawing. In this study, the ethnobotany of Dayak medicinal plants in kayu, ara village, jelimpo sub-district, landak district can be utilised as a knowledge based on local wisdom that can become a natural laboratory in biology learning because it is not yet available. This is in accordance with the opinion of Nursela & Setiadi, (2023) understanding is not limited to the classroom, but can also be extended to the external environment and natural laboratories that have the potential to enrich learning experiences.

Clarity of expected gains: Learning by incorporating local knowledge can help students to achieve the expected learning objectives, namely the cognitive aspects of students as well as knowing, understanding, applying and analysing what happens around the community. This is in line with Qasrin et al., (2020) The expected gain is clarity in the results and research process, in the form of learning resources that can be used in biology learning to achieve various aspects.

Conclusion

Ethnobotany of medicinal plants is a study of how humans use plants around them as medicines to treat diseases. This research found 21 species of medicinal plants with 16 families. There are still many plants that cannot be explored due to regulations from local medicine experts making the lack of information obtained. Based on the results of the questionnaire analysis, the potential of learning resources was found to be very effective with an average of 92.96%.

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Conflicts of Interest

The researcher declares no competing interests related to the writing of this article.

Author Contributions

D. Sunarya: Methodology, analysis; writing original draft preparation., **H. M. Rahayu:** review and editing, and **A. Sunandar:** review and editing.

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