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An Exploration of Phytochemical Content in The Endemic Flora of Seruyan District, Central Kalimantan

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ABSTRAK

Pengetahuan terbatas tentang senyawa kimia dalam flora endemik Seruyan, belum optimalnya eksploitasi komersial fitokimia, dan kebutuhan kontribusi konservasi biodiversitas serta pembangunan berkelanjutan menjadi sorotan. Data ilmiah yang memadai mengenai jenis tumbuhan endemik dan senyawa fitokimia yang terkandung pada tumbuhan masih terbatas karena itu perlu dilakukan eksplorasi mendalam dalam hal ini. Penelitian bertujuan untuk menganalisis keragaman senyawa kimia yang terkandung dalam flora endemik Kabupaten Seruyan dan untuk memahami bagaimana senyawa-senyawa ini dapat dimanfaatkan dalam berbagai industri. Metode penelitian mencakup literature study dengan fokus pada informasi tentang tanaman endemik yang dimanfaatkan oleh suku Dayak. Penelitian diawali dengan studi pustaka tentang Tumbuhan endemik Kabupaten Seruyan yang dimanfaatkan oleh suku Dayak. Selanjutnya dilakukan observasi lapangan untuk memverifikasi hasil studi pustaka dan melakukan wawancara dengan masyarakat setempat untuk memperoleh informasi tentang jenis tanaman, penggunaannya, serta bagian yang biasa dimanfaatkan. Sampel diambil dari tumbuhan yang jumlahnya lebih banyak terdapat di daerah tersebut. Tujuan dari pengambilan sampel pada daerah yang berbeda adalah untuk mendapatkan tumbuhan yang mewakili daerah Kabupaten Seruyan secara keseluruhan. Hasl penelitian menunjukan bahwa tanaman endemik Kabupaten Seruyan memiliki kandungan flavonoid, alkaloid, steroid, tannin dan saponin. Tumbuhan tersebut meliputi paku nahas, galengang, mantal, bunge putih, ulin, bajai atei, hampelas, tolot, akar kuning, pahangkat, tawas'ud, somboum, janar puti, sunkai, mahambung, pandan hutan, sambung maut, momong, sirih hutan, sisik naga, sapapaya, bengkel darat, bidarah, samangkawang, sawung angui, bengkel Sungai, kalue, jangkut dan uboh. Jika dilihat dari bahan aktif yang ada pada tumbuhan ini, dapat disimpulkan, tumbuhan ini dapat dimanfaatkan baik bidang kesehatan, industry, perikanan dan yang lainnya.

ABSTRACT

Limited knowledge about the chemical compounds present in Seruyan's endemic flora, the underutilization of phytochemical commercial potential, and the necessity to contribute to biodiversity conservation and sustainable development are highlighted. Despite the scarcity of sufficient scientific data on endemic plant types and their phytochemical compounds, there's a pressing need for comprehensive exploration in this domain. This research aims to analyze the diverse chemical compounds within Seruyan Regency's endemic flora and comprehend their applicability across various industries. The methodology includes a literature review, focusing on information about endemic plants used by the Dayak tribe. It commenced with a literature review on Seruyan's endemic plants utilized by the Dayak tribe, followed by field observations and local interviews to gather details about plant types, uses, and commonly utilized parts. Samples were collected from abundant plants in different areas to represent the entirety of Seruyan Regency. The findings reveal that Seruyan's endemic plants encompass flavonoids, alkaloids, steroids, tannins, and saponins. These plants, including fern nahas, galengang, mantal, and others, potentially serve various sectors like health, industry, fisheries, and more based on their active ingredients.

1. INTRODUCTION

Indonesia's biodiversity, especially in the Central Kalimantan region, is one of the richest in the world. This area provides a variety of habitats, including abundant tropical rainforests, extensive lowlands, and hills that are home to various types of endemic plants. This endemic flora has very special characteristics, namely its ability to live and grow only in certain areas, one of which is the Seruyan Regency area, Central Kalimantan. This endemic flora plays an important role in the ecosystem. They have developed

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special adaptations to their local environment over thousands of years, creating a unique ecological balance and are often considered an indicator of stable ecosystem health. However, behind this uniqueness, endemic flora also contains great potential in terms of valuable natural resources (Setyani et al., 2016; Zengin et al., 2014).

Research into phytochemistry is a very important field of research because it provides insight into a variety of chemical compounds that can have a major impact on human health, the environment, and industry. Phytochemical studies help reveal the potential of plants for use in a variety of contexts, from health care to the development of consumer products. Phytochemistry helps us understand more deeply about the various compounds found in plants (Sklirou et al., 2021;Ilyas et al., 2015). This allows us to identify and understand the chemical properties of plants, which can be used for medical, pharmaceutical, food and other purposes. Many phytochemical compounds have pharmacological activity and can be used in drug development (Hemmami et al., 2023; Mothana et al., 2011). For example, compounds such as alkaloids can have certain pharmacological effects and be used as a basis for medicines. Several phytochemical compounds found in plant foods have significant health benefits. For example, the flavonoids in fruits and vegetables have been linked to a variety of health benefits, including protection against heart disease, cancer, and other disorders. Phytochemicals can also affect the taste, color and aroma of food. It can make important contributions in the culinary field and influence human taste preferences for various types of food (Francioso et al., 2019; Kremer et al., 2015).

Some phytochemical compounds act as a plant's natural defense against pest and disease attacks. Understanding these compounds can help in the development of more natural and environmentally friendly plant protection methods. Phytochemical studies also help in understanding plant ecology. Chemical compounds produced by plants can influence the relationships between plants, animals and microorganisms in the ecosystem. Many phytochemical compounds are used in the pharmaceutical and cosmetic industries to manufacture medicines, skin care products, and other cosmetics (Putra & Fitriani, 2018;Baker & Brooks, 1989).

A previous study relevant to this research on phytochemistry and antibacterial activity of Etlingera sublimata Poulsen (Zingiberaceae), an endemic plant of Sulawesi, stated the presence of phytochemical content (Pitopang et al., 2022). So far, scientific research investigating endemic flora in Seruyan Regency, especially in the context of its phytochemical content, has not been fully explored properly. Adequate scientific data regarding endemic plant types and the phytochemical compounds contained in these plants is still limited. This creates a valuable opportunity to fill this knowledge gap and undertake in-depth exploration in this regard. Natural chemical compounds, known as phytochemical compounds, are found in various types of endemic plants. These compounds have become an interesting focus of research in various fields, such as pharmaceuticals, cosmetics, and the food industry. This is because this flora has the potential to produce new medicines, industrial raw materials, or other innovative products that can be used in the world of health, food, industry, agriculture and including fisheries. Seruyan Regency, which is part of Central Kalimantan, is one of the areas that is home to various types of endemic flora that still require deeper understanding from a scientific perspective. Therefore, exploratory research is very important to investigate and reveal the potential of endemic flora in producing valuable phytochemical compounds. This research aims to understand the diversity of chemical compounds contained in the endemic flora of Seruyan Regency and to understand how these compounds can be utilized in various industries.

The aim of this research is to analyze and explore the phytochemical content in the endemic flora of Seruyan Regency, Central Kalimantan. With a deeper understanding of endemic flora and their phytochemical content, this research is expected to provide valuable insights for the conservation of biodiversity, sustainable development of natural resources, and contribution to the development of science. Apart from that, this research also has the potential to provide significant economic benefits for local communities through exploiting the commercial potential of the phytochemical compounds discovered.

2. METHOD

The research began by conducting a literature study on the endemic plants of Seruyan Regency which are used by the Dayak tribe. Next, field observations were carried out to verify the results of the literature study and interviews with local people to obtain information about plant types, their uses, and the parts commonly used. After that, plant samples were taken randomly from 3 different areas. Samples were taken from plants that were more abundant in the area. The aim of sampling in different areas is to obtain plants that represent the Seruyan Regency area as a whole. After taking samples, plant types are identified based on the literature and phytochemical tests are carried out to determine the active ingredient content of the plants. The sampling location can be seen in Figure 1.

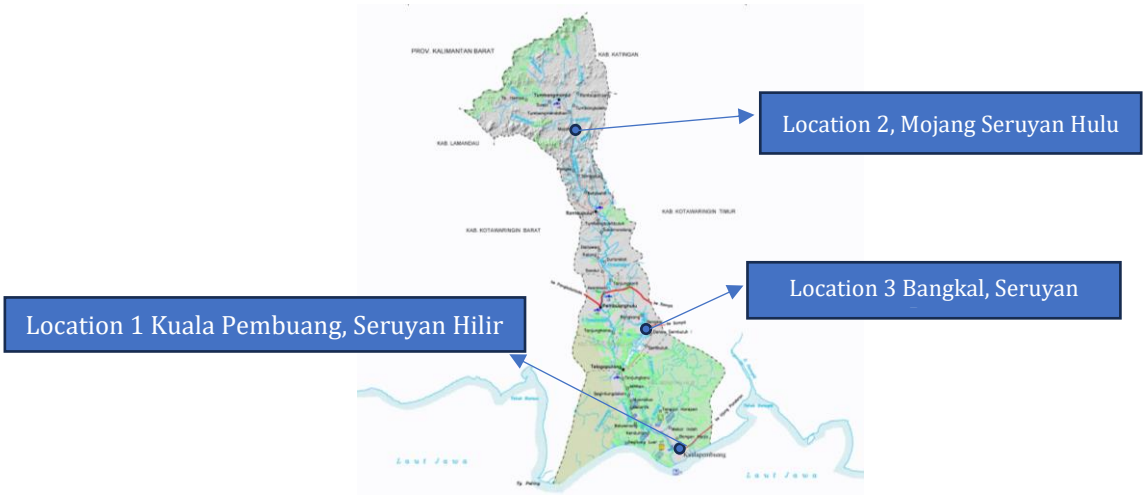

Figure 1. Sampling Location

Plant Phytochemical Screening
Sample Preparation

Plants obtained in the field are collected and cleaned of dirt. Then the plants are cut into small pieces, then dried in the sun and then crushed using a blender and sieved with a No. 40 sieve, then stored as a preparation of plant samples for phytochemical testing.

Extraction and Phytochemical Screening of Samples

Plant extraction was carried out using the maceration method with ethanol solvent. The samples were extracted by maceration by soaking the samples in 96% ethanol solvent (Simplisia: solvent = 1:4) and incubated at room temperature for 24 hours with stirring. After that, the remaceration soak is filtered using filter paper. After this activity, phytochemical screening was carried out. Phytochemical screening of secondary metabolite compounds is carried out using a qualitative method with a color reaction by adding a reagent for each compound to be tested by observing changes in color and shape of the liquid being tested. The compounds tested in this study included flavonoids, alkaloids, steroids, tannins and saponins.

Data analysis

The resulting data from observations and phytochemical tests are then presented in table form which is then described.

3. RESULT AND DISCUSSION

Result

Based on the results of identification in the field, there are 30 plants commonly used by the Dayak tribe in Seruyan Regency. This plant is usually used for food and medicine. The following are the uses of plants commonly used by local residents. Endemic plant types and their contents identified in the Serayan district can be seen in Table 1, and Table 2.

Table 1. Endemic Plant Types Identified in the Seruyan Regency Area

No.	Types of Flora	Benefits of Plants
1	Paku Nahas	Used to treat infections or reduce swelling in wounds, usually the leaves are used for this treatment.
2	Galenggang	Usually used to treat skin diseases and the leaves are used.
3	Mantal	It can lower sugar and blood pressure, the tops of the leaves are used
4	Bunge Putih	Usually used to treat toothache, the part used is the root.
5	Ulin	Used to blacken hair and can also be used to treat heart disease. The part used is the fruit.
6	Bajai Atei	Usually used for hemorrhoids, the part used is the tuber.
7	Gambir	Usually used for urinary stones and the part used is the leaves.
8	Daun Hampelas	Usually used as a mixture of herbs to treat liver disease, the leaves are usually used.

No.	Types of Flora	Benefits of Plants
9	Tolot	Usually used for skin diseases and malaria. The part used is the leaf.
10	Akar Kuning	Usually used for gout and the part used is the root.
11	Pahangkat	Usually used to increase vitality and the part used is the root.
12	Tawas 'ud	Usually used for internal diseases and the part used is the tuber
13	Samboum	It can be used to eliminate internal heat, the part used is the leaves.
14	Janar Puti	It commonly used in vomiting blood and can also treat cancer. The part used is the tuber
15	Sungkai	Used for diabetes and hypertension, this plant is also used as a flavoring. The part used is the leaf
16	Mahambung	Used for skin diseases such as smallpox, the part used is the leaves.
17	Pandan Hutan	Usually used for breast cancer, the part used is the tuber
18	Sambung Maut	Usually used for sprains and broken bones, the part used is the leaf
28	Momong	Used for typhus and malaria. The part used is the leaves.
20	Sirih Hutan	Used for festering wound infections, usually the leaves are used.
21	Sisik Naga	It can reduce heat, the part used is leaves
22	Sapapaya	Used to heal wounds after giving birth, the part used is the leaves.
23	Bengkel Darat	It can increase breast milk production and can also be used as a mixture in making cold powder. The part used is the leaf.
24	Bidarah	It can treat liver disease, the part used is the root
25	Samangkawang	Used to treat festering wounds, the part used is the leaves.
26	Sawung Angui	Usually used to stretch the mother's nerves after giving birth, the part used is the leaves.
27	Bengkel Sungai	Facilitates breast milk and treats malaria, it can also be used as fresh vegetables to eat. The part used is the leaf.
28	Tawas 'ud	Used to treat internal diseases, the part used is the root
29	Kalue	Reduces aches and pains in the body and the leaves are usually used
30	Jangkut	Used for urinary stones and bleeding, usually the tuber is used.
31	Uboh	Usually used for cooking, the part used is the leaves

Tabel 2. Phytochemical Content of Endemic Plants in Seruyan Regency, Central Kalimantan

No.	Types of Flora	Active Ingredient Content				
		Flavonoid	Alkaloid	Steroid	Saponin	Tanin
1	Paku Nahas	+	+	+	-	-
2	Galenggang	+	+	+	-	+
3	Mantal	+	-	+	-	+
4	Bunge Putih	-	+	+	-	+
5	Ulin	+	+	+	-	+
6	Bajai Atei	-	+	+	-	+
7	Gambir	+	-	-	+	+
8	Daun Hampelas	+	-	+	+	+
9	Tolot	-	+	+	-	+
10	Akar Kuning	+	+	+	-	+
11	Pahangkat	+	+	+	-	+
12	Tawas 'ud	-	-	-	-	+
13	Samboum	-	+	-	-	-
14	Janar Puti	+	+	-	-	-
15	Sungkai	-	+	-	+	+
16	Mahambung	-	-	-	+	+
17	Pandan Hutan	-	+	-	-	-
18	Sambung Maut	-	+	-	+	+
19	Momong	-	+	+	+	+
20	Sirih Hutan	-	+	+	-	+
21	Sisik Naga	-	+	-	-	-
22	Sapapaya	+	+	+	+	+
23	Bengkel Darat	-	+	-	-	-
24	Bidarah	-	+	-	-	-

No.	Types of Flora	Active Ingredient Content				
		Flavonoid	Alkaloid	Steroid	Saponin	Tanin
25	Samangkawang	+	-	+	+	+
26	Sawung Angui	-	+	-	+	-
27	Bengkel Sungai	+	+	-	-	-
28	Tawas 'ud	-	+	-	-	+
29	Kalue	-	+	+	-	+
30	Jangkut	-	+	-	-	+
31	Uboh	+	-	-	+	+

Information + contains active ingredients, - does not contain active ingredients

From the results of phytochemical screening of 31 plants that were sampled, each plant contained a different active ingredient and some plants contained more than one active ingredient. The following is the percentage of active plant ingredients identified. The active ingredients most commonly found in plants are alkaloids, then saponins, steroids, flavonoids and tannins. The percentage of active ingredient content in plants can be seen in Figure 2.

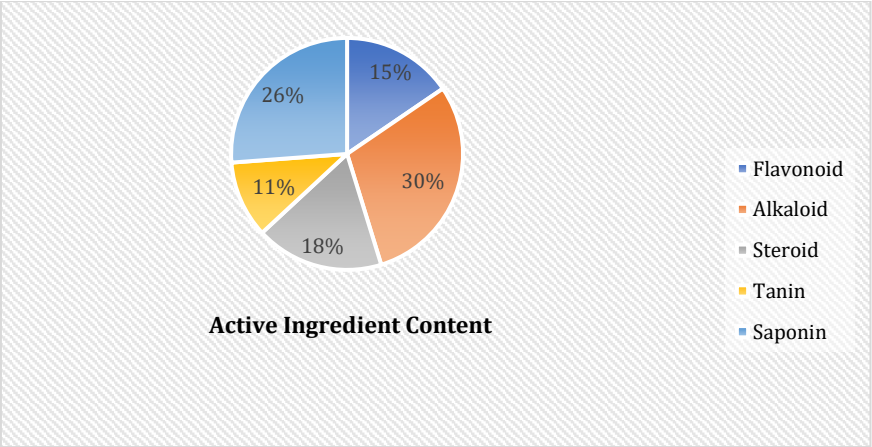

Figure 2. Percentage of Active Ingredient Content

From the percentage of active ingredient content in plants, it can be seen that the percentage of endemic flora found in Seruya Regency is 15% flavonoids, then 30% alkaloids, 18% steroids, 11% tannins and 26% saponins. The endemic flora that has the highest percentage is saponin with a percentage of 26%. Saponin is a type of phytochemical found in various plants. These compounds have certain chemical properties that give them foaming characteristics or cleaning properties. Saponins generally consist of glycosides consisting of a non-polar part (hydrophobic core) and a polar part (hydrophilic group). This causes saponins to have amphipathic properties, which allows them to interact with water and fat.

Discussion

This research uses various types of endemic plants in Seruyan Regency. In this research activity, 31 types of plants were obtained which are used for medicine and food. If you look at the results of the phytochemical screening in Figure 1, all plants have different bioactive contents. The bioactive content consists of flavonoids, alkaloids, steroids, tannins and saponins. The Dayak people, who inhabit the area around the forest area, have passed down traditions that are rich in knowledge about forest flora and fauna. In everyday life, they rely on plants found in the forest as a source of medicine and food. These traditions have been woven into their culture for centuries, and are often passed down from generation to generation. Although these practices have become an integral part of life, often their understanding of the chemical properties or medical potential of the plants they use may be limited. The use of plants as traditional medicines or food ingredients is usually based on observations and practical experience in overcoming health problems or meeting daily nutritional needs.

However, in recent years, there have been efforts to better understand the chemical content of the plants used by the Dayak tribe. Scientific research has helped identify the active compounds in the plant and their potential use in medicine. This has opened the door to collaboration between researchers and Dayak tribal communities, enabling the merging of traditional knowledge with modern scientific knowledge. This collaboration can have double benefits, namely the preservation of Dayak tribal culture

and sustainable development of natural resources, as well as the development of more effective natural medicines. Thus, maintaining a balance between hereditary traditions and scientific knowledge can be an important basis for efforts to preserve culture and sustainable development among the Dayak tribe. If you look at Figure 2, the potential of endemic plants in Seruyan Regency has the potential to be used as medicinal ingredients because all the identified plants have various active ingredients. From the 31 plant samples taken, plants contained 30% Alkaloids, then 26% Saponins, 18% Steroids, 15% Flavonoids and 11% Tannins. The use of this plant can be used in the fields of health, cosmetics, foodstuffs and including aquaculture to increase fish production. The use of endemic plants in Kalimantan has begun, one of which is the sangkareho plant which is used as traditional medicine, which contains chemical compounds such as alkaloids, flavonoids, tannins and steroids (Ketut et al., 2023; Mahomoodally et al., 2005). Apart from that, yellow root plants have also been researched and have the potential to have antibacterial effects against Staphylococcus aureus and Escherichia coli (Ilyas et al., 2015).

Flavonoids

Flavonoids are a group of phenolic compounds that are abundant in various plant tissues. This compound has an important role in plants and stands out as a natural antioxidant. The antioxidative activity of flavonoids comes from their ability to donate hydrogen atoms to free radicals, thereby helping to protect plant cells from oxidative damage. Apart from that, flavonoids also have the ability to form complexes with heavy metals in plants, which helps in regulating excessive levels of heavy metals that can damage plants (Pao et al., 2022). Flavonoids are also a group of secondary metabolites that are essential in plant growth and development. They play a role in various physiological processes, such as response to environmental stress, protection against pathogen attack, and regulation of interactions with herbivores and pollinators. In addition, flavonoids also have valuable applications in the food industry, where they can be used as natural colorants and increase the nutritional value of foods. In the pharmaceutical field, flavonoids have become basic ingredients for the development of herbal medicines and health supplements due to their potential antioxidative activity (Yulisma & Fathiya, 2023).

In-depth scientific studies of flavonoids have provided a better understanding of their important contributions in plant life and in practical applications in various industries. More and more research is being conducted to uncover new properties and potential benefits of flavonoids, providing a more complete view of their role in plant ecology and human health. If you look at Table 2, the plants that contain flavonoids are Nakas nail, galenggang, mantal, ulin gambir, hampelas, yellow root, pahangkat, janar puti, sampapaya, samangkawang, river workshop and uboh. Flavonoids, a group of phenolic compounds widely found in various plants, have been the subject of intensive research in the world of pharmacology due to their various prominent pharmacological activities. Some of the main pharmacological activities of flavonoids are anti-inflammatory, anti-oxygen, anti-diabetic and anti-bacterial (Bago, 2020).

Inflammation is a physiological process that occurs in the body as a response to the entry of foreign substances. This is an important self-protection mechanism used by the body to fight potential threats from foreign substances that can create disturbances in internal balance (Zhao et al., 2023). When foreign substances enter the body, the body naturally and immediately responds by releasing various biochemical compounds that act as pro-inflammatory agents. These include compounds such as prostaglandins, leukotrienes, interleukins, nitric oxide, and proinflammatory cytokines (Konay et al., 2019; Wakhidah, 2020). This process is known as inflammation, and its purpose is to protect the body from potential damage that can be caused by foreign sAubstances, such as pathogenic microorganisms, foreign bodies, or dangerous chemicals. During inflammation, a series of biochemical reactions occur that cause swelling, redness, increased blood flow, and increased vascular permeability in the affected area. All of this is designed to facilitate the immune system's response to fighting the threat.

Alkaloids

Alkaloids are one of the most abundant types of organic compounds in the natural world, and most alkaloid substances come from plants. They generally have one or more nitrogen atoms in their structure, giving them basic properties that give rise to the term "alkaloid." Alkaloids have an important role in plant life, functioning as protection against disease and pest attacks. In addition, they also play a role in regulating plant development as well as acting as mineral bases that help regulate ion balance in various parts of the plant. This group of compounds falls into the category of secondary metabolites, meaning that they are produced by plants in response to the environment and play a role in a variety of functions that include plant defense and adaptation to environmental changes (Beridze et al., 2020).

Alkaloids have received wide recognition and are used significantly in various human needs, especially in the pharmaceutical field. Some of the prominent uses of alkaloids include their use in the treatment of dysentery, management of earaches and abdominal conditions, as well as their effectiveness

in fighting the growth of cancer cells (Pao et al., 2022). In the context of fisheries, it is more related to antibiotics, antiparasitics, or other chemicals that can affect fish health or water quality in aquaculture environments.

Alkaloids also have diverse roles in the plant world and applications in the field of pharmacology. They function as toxic compounds that protect plants from pest and disease attacks, performing an important natural defense role. Alkaloids also have the potential to affect the nervous system, increase blood pressure, reduce pain, and have antimicrobial activity. In drug development, they are used as a base for sedatives and in the treatment of heart disease. In addition, their antibacterial activity makes alkaloids important in various medical contexts, helping in the control of bacterial infections (Hemmami et al., 2023; Putra & Fitriani, 2018).

Steroid

The phytochemical results on the samples showed that there were 15 plants that contained steroids, namely nahas fern, galenggang, mantal, white bunge, ironwood, bajai atei, hampelas, tolot, yellow root, pahangkat, momong, forest betel, sapapaya, samangkawang and kalue. The results of several studies show that steroids are active components which are thought to have a role as antibacterial and antioxidant agents. Other studies also note that steroid compounds, with their distinctive chemical properties, have the potential to fight the growth of pathogenic bacteria and reduce damage caused by free radicals in the human body. Steroids as antibacterials means that steroids found in plants have the ability of steroid compounds to act as agents that can inhibit or kill the growth of bacteria (Sarasati & Jonarta, 2023). These steroids can have antibacterial properties which have been tested or used in various contexts, including in the treatment of bacterial infections, while steroids as antioxidants are chemical compounds found in these plants which function to protect body cells from damage caused by free radicals and oxidative stress. Free radicals are unstable molecules and can damage body cells by stealing electrons from other molecules in the body. Oxidative stress is an imbalance between the production of free radicals and the body's ability to deal with and eliminate them (Ayu Indarsari et al., 2023).

Tannins

Tannins are polyphenolic compounds that have unique characteristics, providing positive and negative effects on health and various aspects of the products produced. This compound has the ability to influence the color, taste and nutritional quality of seeds and their derivative products. Apart from that, tannins also have an important role as antioxidants which can bind to free radicals, thereby helping protect the body from cell damage and preventing the emergence of various diseases. Tannins are produced by various types of plants, including higher plants such as trees and shrubs, as well as lower plants such as various herbaceous plants. The levels and quality of tannins produced can vary significantly between one type of plant and another. Factors such as plant species, growing environment, and different growing conditions can influence the levels and properties of tannins produced by each plant (Susbandiyah Ifada et al., 2019).

Based on Table 2. Tannin produced by plants also has an important ecological role in the ecosystem. These compounds can influence interactions between organisms in nature, including the relationship between plants and herbivores. The bitter or astringent taste produced by tannins can influence the eating behavior of plant-eating animals, which can help plants protect themselves from excessive plant-eating. Therefore, the production of tannins by plants is an example of how plants adapt to their environment and contribute to the balance of the ecosystem. Apart from that, tannins also have applications in various industries, such as the leather and textile industry, as well as in the manufacture of inks and chemicals (Kamaraj et al., 2023). The use of tannins in this industry reflects the economic value and diversity of applications of these compounds in the human world. In the world of fisheries, tannin compounds can act as antimicrobials and can also help in immunostimulants (Hemmami et al., 2023).

Saponins

Saponins are a unique group of glycoside compounds, found in a variety of natural sources including plants, tuber plants, and even marine fish. They have properties such as forming foam in water, insoluble in fat, and hemolytic activity in high concentrations. In the plant world, saponins play a role in defense against pests, regulation of foam in roots, and ecological interactions. On the human health side, saponins have been researched for their potential anti-inflammatory and anticancer effects, as well as contributing to the health benefits of foods such as nuts. Industry also uses saponins in making detergents, soap, pharmaceutical products and food. Overall, saponins are interesting compounds with a wide range of roles and applications in nature and humans (Zengin et al., 2014).

Research on phytochemicals has many benefits, both in the context of human health, agriculture, pharmacy and other sciences. Phytochemical research can help identify natural compounds in plants that have the potential to be used in the development of new medicines. Some drugs used in modern medicine are derived from plants, and phytochemical research can help explore the potential of these natural medicines. Many phytochemicals have antioxidant, anti-inflammatory, and anti-cancer properties. The study of phytochemicals can help in understanding how these compounds can contribute to human health and can be used in the prevention or treatment of various diseases (B. Luo et al., 2023; Y. Luo et al., 2023).

Phytochemical research is also relevant in the field of food and nutrition. Phytochemical compounds in food can have positive effects on human health and can be used in designing healthier diets. In agriculture, phytochemical research can help in the development of plant varieties that are more resistant to pests and disease, or that have higher nutritional content. This can increase agricultural productivity and agricultural sustainability. The study of phytochemistry can also provide insight into the interactions of plants with their environment, including how chemical compounds produced by plants affect other organisms, such as insects and soil microorganisms. The pharmaceutical and cosmetic industries often use phytochemical compounds in their products. Phytochemical research helps in identifying and understanding the properties of these compounds for use in such products. Research on phytochemicals can also support plant and natural ecosystem conservation efforts. Identification of important compounds in certain plants can help in the protection of those species (Ayu Indarsari et al., 2023; Beridze et al., 2020).

With a deeper understanding of endemic flora and their phytochemical content, it is hoped that this research will provide valuable insights for the conservation of biodiversity, sustainable development of natural resources, and contribution to the development of science. Apart from that, this research also has the potential to provide significant economic benefits for local communities through exploiting the commercial potential of the phytochemical compounds found, especially in Seruya Regency, Central Kalimantan.

This research has several limitations that may impact the interpretation of its findings. Firstly, the limitation of samples in this study might have restricted the variation of plants and phytochemical compounds tested, reducing the representation of the overall diversity present. Secondly, the lack of data from previous studies on phytochemical compounds in specific plants could limit the understanding of the context of new findings. Thirdly, the analytical methods employed might have limitations, such as sensitivity to certain compounds or limited accuracy. Fourthly, challenges in translating phytochemical findings into practical applications in industries or healthcare could constrain the research outcomes. Lastly, the focus on a specific geographical area, namely Seruyan Regency in Central Kalimantan, may limit the generalization of these findings to other regions that might have significant environmental or plant condition differences.

Recommending a comprehensive approach involves broadening sample diversity to encompass various plant varieties and phytochemical compounds for improved representation. Collaboration with prior studies would enrich knowledge and contextual understanding of previously researched phytochemicals. Implementing more sensitive analytical methods ensures precise identification of these compounds. Focusing on practical applications in industries or healthcare can maximize the benefits of these findings. Comparing data across diverse regions allows for a more holistic perspective, while interdisciplinary collaborations involving environmental sciences, biology, and industry would offer insights into both ecological impacts and practical applications of these phytochemical discoveries.

4. CONCLUSION

Research on phytochemicals has many benefits, both in the context of human health, agriculture, pharmacy and other sciences. Phytochemical research can help identify natural compounds in plants that have the potential to be used in the development of new medicines. The endemic plants of Seruyan district that were taken contain active ingredients, namely flavonoids, alkaloids, steroids, tannins and saponins. If we look at the active ingredients in this plant, it can be concluded that this plant can be used in the fields of health, industry, fisheries and others. These plants include fern nahas, galengang, mantal, white bunge, ironwood, bajai atei, hampelas tolot, yellow root, pahangkat, tawas'ud, somboum, janar puti, sunkai, mahambung, forest pandan, sambung maut, momong, forest betel, dragon scales, sapapaya, land workshop, bidarah, samangkawang, sawung angui, river workshop, kalue, jangkut and uboh. By knowing the types of phytochemicals that exist, it is hoped that in the future the use of endemic phytochemical plants in Seruyan district can be maximized.

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