

PERSPECTIVES ON THE DEVELOPMENT OF SIDAGURI-ROSELLA POWDER BEVERAGE FORMULA AS AN ANTIHYPERTENSIVE NUTRACETIC

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ABSTRACT

Hypertension is a major health problem that contributes to an increased risk of cardiovascular disease. The development of local plant-based nutraceuticals is one of the potential complementary therapeutic alternatives to help control hypertension. This study aims to explore the perspective of pharmacists on the development of Sidaguri (*Sida rhombifolia*) and Rosella (*Hibiscus sabdariffa*) powder drink formulas as antihypertensive nutraceuticals. The research uses a qualitative approach with an exploratory study design. The research informants consisted of four pharmacists who were selected purposively based on their competence and experience in the fields of pharmacognosy, pharmaceuticals, pharmaceutical technology, and herbal product development. Data collection was conducted through in-depth interviews using semi-structured interview guidelines. The data was analyzed using thematic analysis. The results showed that all informants assessed that Sidaguri and Rosella had antihypertensive potential because they contained flavonoids, polyphenols, and anthocyanins that act as antioxidants and support the inhibition of angiotensin-converting enzyme (ACE). The informant also assessed that the form of powdered drink preparations has advantages in terms of practicality, stability, and public acceptance. In addition, the standardization of raw materials, evaluation of bioactive activity, product safety, and stability during storage are considered as important components in the development of antihypertensive nutraceuticals. This study concludes that the development of Sidaguri-Rosella powder beverage formula has the potential to be developed as an antihypertensive nutraceutical that requires the support of further research related to bioactivity, safety, and clinical effectiveness.

Keywords: antihypertensive, nutraceutical, rosella, sidaguri, qualitative studies

INTRODUCTION

Hypertension is still one of the major public health problems in the world due to its increasing prevalence and major contributor to the number of illnesses and deaths due to cardiovascular diseases. Hypertension is a major risk factor for stroke, coronary heart disease, kidney failure, and various other metabolic complications (Masenga & Kirabo, 2023). In Indonesia, the prevalence of hypertension shows an increasing trend every year, especially in the adult and elderly age groups (Muharram et al., 2025). The high prevalence of hypertension is influenced by various factors, such as a diet high in sodium, low physical activity, stress, obesity, and changes in modern lifestyles. This condition has led to an increase in the need for hypertension prevention and management strategies that are more effective, safe, easily accepted by the community, and can be used in the long term. The management of hypertension is generally carried out through pharmacological therapy using antihypertensive drugs (Heidari et al., 2022). Although effective in lowering blood pressure, long-term use of drugs often causes various problems, such as side effects, non-adherence to consumption, drug interactions, and relatively high medical costs. In addition, some people are starting to show interest in the use of complementary therapies based on natural ingredients that are considered more natural and have lower side effects. This condition encourages the

development of research on nutraceutical products and functional foods as an alternative to hypertension therapy (Olalekan et al., 2025).

Nutraceuticals are food-based products or natural ingredients that contain bioactive compounds and provide health benefits, including in the prevention and control of chronic diseases. The development of local plant-based nutraceuticals has great potential in Indonesia because it is supported by high biodiversity and hereditary use of herbal plants. One of the plants that has the potential to be developed as an antihypertensive nutraceutical is Sidaguri (*Sida rhombifolia*) (Jiménez-Ferrer et al., 2025). Sidaguri is known to contain various bioactive compounds, such as flavonoids, alkaloids, and polyphenols that have antioxidant activity and have the potential to provide vasodilating effects and protection against oxidative stress. Some studies show that the flavonoid content in Sidaguri can help reduce endothelial damage of blood vessels that play a role in the pathogenesis of hypertension (Niu et al., 2025).

In addition to Sidaguri, Rosella (*Hibiscus sabdariffa*) has also been widely researched because it has strong antihypertensive and antioxidant activity. Rosella contains anthocyanins, flavonoids, as well as phenolic compounds that are known to help lower blood pressure through angiotensin-converting enzyme (ACE) inhibition mechanisms, improved endothelial function, and decreased oxidative stress (Dehkhoda et al., 2024). Several studies report that regular consumption of Rosella can help lower systolic and diastolic blood pressure in people with mild to moderate hypertension. The combination of Sidaguri and Rosella is thought to have a synergistic effect because both are rich in bioactive compounds that have the potential to support antihypertensive activity (Sucipto et al., 2021).

Although various studies on antihypertensive plants have been conducted, most previous studies have focused on the use of single extracts and have not developed many combination formulas in the form of nutraceutical products that are practical and easy to consume. In addition, studies on the perspective of pharmacists on the development of antihypertensive herbal formulas are still very limited. In fact, the perspective of pharmacists is important to evaluate aspects of formulation rationality, stability of active ingredients, safety of use, potential interactions between compounds, product standardization opportunities, and feasibility of developing into nutraceutical products that can be applied more widely in society (Holdford, 2021). An expert-based approach is also important in the development of nutraceutical products because the development of herbal formulas not only considers aspects of bioactivity, but also aspects of pharmaceuticals, safety, stability, product quality, as well as downstream and commercialization opportunities. Through in-depth interviews with pharmacists, this study is expected to obtain scientific input related to the development of Sidaguri–Rosella powder beverage formula as an effective, safe, stable, and potential for further development.

Based on this description, this study was conducted to explore the perspective of pharmacists on the development of Sidaguri-Rosella powder drink formula as an antihypertensive nutraceutical. The results of the research are expected to be a scientific basis in the development of local plant-based

nutraceutical products that have the potential as a complementary intervention in the management of hypertension while supporting the development of functional food innovations in Indonesia.

METHODS

Research Design

This study uses a qualitative approach with an exploratory study design to explore in depth the perspective of pharmacists on the development of Sidaguri (*Sida rhombifolia*) and Rosella (*Hibiscus sabdariffa*) powder drink formulas as antihypertensive nutraceuticals. The qualitative approach was chosen because this study aims to understand the views, scientific considerations, professional experience, and interpretations of experts related to the development of local plant-based herbal formulas. Through this approach, researchers can obtain more comprehensive information regarding formulation aspects, safety, stability, bioactivity potential, development opportunities, and challenges of standardization of antihypertensive nutraceutical products. The research was conducted through in-depth interviews using semi-structured interview guidelines to allow flexible data exploration according to the context of the informant's answers. The research will be carried out in 2026 in several educational institutions and pharmaceutical laboratories that have competence in the fields of pharmacognosy, pharmaceuticals, pharmaceutical technology, and herbal product development.

Research Informant

The informants in this study are pharmacists who have competence and experience in the fields of herbal formulation, pharmacognosy, pharmaceuticals, pharmaceutical preparation technology, or nutraceutical product development. The selection of informants was carried out using purposive sampling techniques based on considerations of suitability of the field of expertise with the purpose of the research. Informants are selected from lecturers, researchers, and pharmacy practitioners who have at least three years of experience in the research or development of herbal products. The criteria for research inclusion include pharmacists who are willing to be research informants, have a minimum master's educational background in a related field, and are willing to participate in the entire interview process. Meanwhile, informants who are not willing to be recorded or do not complete the interview process in full are included in the exclusion criteria. The number of informants is determined based on the principle of data saturation, which is that the data collection process is stopped when the information obtained has been repeated and no significant new themes are found. The number of informants in this study is four pharmacists.

Research Instruments

The main instrument in this study is the researcher himself (human instrument) which plays a role in the process of data collection, interpretation, and analysis. The researcher is responsible for establishing communication with informants, exploring data, understanding the context of the answers, and interpreting the results of the interview in depth. To support the interview process, semi-structured interview guidelines were used based on research objectives and literature review related to the development of herbal antihypertensive nutraceuticals. The interview guidelines cover several key aspects, namely the potential of Sidaguri and Rosella as antihypertensives, rationality

of formula combinations, product safety and stability, bioactive mechanisms, challenges of standardization of herbal ingredients, product downstream opportunities, and prospects for local plant-based nutraceutical development. In addition, the study also used tools in the form of voice recording devices, observation sheets, and field notes to support the data documentation process.

Data Collection Procedure

Data collection is carried out through several stages starting from research preparation, informant recruitment, conducting in-depth interviews, to data transcription. In the preparation stage, the researcher prepares interview guidelines, takes care of the approval of research ethics, and coordinates with institutions or prospective informants who meet the research criteria. Furthermore, informants are recruited purposively based on their areas of expertise and experience in the development of herbal or nutraceutical products. The researcher contacts the prospective informant directly or through an official letter to explain the purpose of the research and ask for willingness to become a research participant.

In-depth interviews are conducted face-to-face or online according to the agreement with the informant. Each interview lasts approximately 30-60 minutes. During the interview process, the researcher explored expert views on the rationality of the Sidaguri-Rosella combination, the potential for antihypertensive activity, the safety of the formula, the stability of the product, the opportunity for nutraceutical development, the challenge of standardizing herbal ingredients, and the possibility of downstreaming the product into a health product that can be applied in the community. In addition to voice recordings, researchers also made field notes to document important information, informant expressions, and interview context. After the interview process is completed, the recordings are transcribed verbatim to maintain the integrity and accuracy of the research data.

Data Analysis

The research data was analyzed using a thematic analysis method. The analysis was carried out in stages, starting with reading the entire interview transcript repeatedly to understand the content of the data thoroughly. Next, the researcher conducts an open coding process by identifying keywords, important statements, and meanings that are relevant to the research objectives. Codes that have similar meanings are then grouped into specific categories. After the categorization process was completed, the researchers compiled the main themes that described the perspective of pharmacists on the development of Sidaguri–Rosella powder beverage formula as an antihypertensive nutraceutical. The themes obtained are then interpreted in depth and associated with theories, previous research results, and the context of the development of herbal and nutraceutical products in Indonesia. To increase the validity of the data, member checking was carried out by asking several informants to review the results of the interview interpretation. In addition, the researcher also conducts discussions between researchers and triangulates sources to increase the credibility of the research results.

Data Validity

The validity of the data in this study is maintained through several strategies, namely credibility, dependability, confirmability, and transferability. Credibility is carried out through in-depth interviews, member checking, and source triangulation to ensure the suitability of the researcher's interpretation with the informant's views. Dependability is carried out by systematically documenting the entire research process so that the research process can be traced back. Confirmability is carried out through trail audit recording and discussions between researchers to minimize the subjectivity of researchers in data interpretation. Meanwhile, transferability is carried out by describing the research context, informant characteristics, and research process in detail so that the research results can be understood and considered for application in similar contexts.

Research Ethics

This research was carried out after obtaining ethical approval from the Health Research Ethics Committee. Before the interview process is carried out, all informants are given an explanation of the purpose of the research, the benefits of the research, the interview procedure, data confidentiality, and the informant's right to stop participation at any time without any consequences. All informants are asked to sign an informed consent sheet as a form of willingness to participate in the research. The identity of the informant is kept confidential by using certain codes in the transcription process and reporting of research results. All data obtained is only used for the purpose of research and scientific publications.

RESULTS AND DISCUSSION

Characteristics of Informants

This research involves four pharmacists who have competence and experience in the fields of pharmacognomy, pharmaceuticals, pharmaceutical preparation technology, and the development of herbal and nutraceutical products. All informants have a minimum educational background of a master's degree in pharmacy and have experience in research or development of herbal products for more than three years. The informants consist of lecturers and pharmacy practitioners who are active in academic activities and research related to the formulation of natural ingredients. Based on the results of the interviews, all informants stated that the development of Sidaguri (*Sida rhombifolia*) and Rosella (*Hibiscus sabdariffa*) powder drink formulas has good potential to be developed as a local plant-based antihypertensive nutraceutical.

Based on Table 1, all informants have a Master's degree in Pharmacy education and experience in the field of herbal and nutraceutical product development. Informants have diverse areas of expertise, including pharmacognomy, pharmaceuticals, pharmaceutical technology, as well as clinical and herbal pharmacy. The length of experience of the informant ranges from 10 to 18 years in the field of research, formulation, and development of herbal products. The variety of areas of expertise and experience provides a comprehensive perspective on the development of Sidaguri-Rosella powder beverage formula as an antihypertensive nutraceutical.

Table 1.
Characteristics of informants

Informant Code	Gender	Age (Year)	Final Education	Areas of Expertise	Jobs	Long Experience	Areas of Experience
Informan 1	Women	45	Master of Pharmacy	Farmakognosi	Pharmacy Lecturer	15 years	Research on herbal plants and bioactive compounds
Informan 2	Women	41	Master of Pharmacy	Pharmaceutical	Pharmacy Practitioner	12 years	Formulation of herbal and nutraceutical preparations
Informan 3	Women	48	Master of Pharmacy	Pharmaceutical Technology	Lecturer and Researcher	18 years	Development of herbal products and functional foods
Informan 4	Man	39	Master of Pharmacy	Pharmacy Clinics and Herbs	Herbal Researcher	10 years	Evaluation of the safety and effectiveness of herbal products

The Potential of Sidaguri and Rosella as Antihypertensive

The results of the interviews showed that all informants assessed that Sidaguri and Rosella have pharmacological potential as antihypertensive because they contain various bioactive compounds that play a role in lowering blood pressure mechanisms. The informant explained that Sidaguri is known to contain flavonoids and polyphenols that have antioxidant activity so that they have the potential to protect the endothelium of blood vessels from oxidative stress. Meanwhile, Rosella is considered to contain anthocyanins and phenolic compounds that play a role in helping blood vessel relaxation and supporting the inhibition of angiotensin-converting enzyme (ACE) activity. According to the informants, the combination of the two plants has the potential to produce synergistic effects in supporting blood pressure control through antioxidant and vasodilation mechanisms.

Most of the informants said that the use of herbal plants as complementary therapy for hypertension is growing because people tend to look for alternatives that are considered more natural and have lower side effects than long-term drug use. In addition, the development of products in the form of powdered drinks is considered more practical, easy to consume, and has a better chance of public acceptance than conventional herbal preparations.

One of the informants said that the flavonoid and polyphenol content in Sidaguri has great potential in helping to reduce oxidative stress related to hypertension.

“Sidaguri is quite potential because it contains flavonoids and polyphenols whose antioxidant activity is quite good. The compound can protect blood vessels from damage due to oxidative stress that often occurs in hypertensive patients.” (Informan 1)

Another informant explained that Rosella has antihypertensive activity related to the anthocyanin content and its ability to help inhibit ACE.

“Rosella has been researched quite a lot as an antihypertensive to my knowledge, because it contains high anthocyanins. Apart from being an antioxidant, Rosella also has the potential to help inhibit ACE activity so that it can support blood pressure reduction.” (Informan 3)

In addition, the informant also assessed that the combination of Sidaguri and Rosella can provide a synergistic effect as a complementary therapy for hypertension.

“I think the combination of Sidaguri and Rosella is quite interesting because they are both rich in bioactive compounds. If formulated properly, it is likely to have a synergistic effect to help control blood pressure.” (Informan 2)

Some informants also said that people today are more open to the use of herbal products that are practical and easy to consume.

“Currently, people tend to look for herbal products that are practical and safe for long-term consumption, right? In my opinion, the form of powdered drinks is easier to accept than ordinary traditional herbal medicine.” (Informan 4)

An Expert's Perspective on Sidaguri-Rosella Powder Beverage Formulation

All informants stated that the form of powdered beverage preparations is the right choice in the development of antihypertensive nutraceutical products because it has ease of storage, distribution, and consumption. The informant explained that the powder formulation allows the product to have a longer shelf life than liquid preparations and is easier to develop into ready-to-brew products that are practically used by the community. Nonetheless, the informants emphasized that the development of herbal formulas requires special attention to the stability of the active compounds, the homogeneity of the mixture, and the organoleptic characteristics of the product. Some informants said that Rosella has a sour taste that is quite dominant so that it is necessary to adjust the formulation so that the taste of the product can still be accepted by consumers. In addition, the addition of supporting ingredients such as maltodextrin and low-calorie sweeteners is considered important to improve powder stability and improve flavor characteristics without reducing the bioactivity potential of the product.

The informant also said that the standardization of raw materials is one of the main challenges in the development of herbal products. Variations in environmental conditions, cultivation methods, and drying processes of plants can affect the content of bioactive compounds in raw materials. Therefore, experts consider that the process of raw material selection, drying, and storage must be carried out in a standardized manner to maintain the consistency of product quality.

All informants assessed that the powdered beverage preparation form has various advantages in the development of antihypertensive nutraceuticals.

“The powder form is more practical for storage and distribution. In addition, the shelf life is also usually longer than liquid preparations.” (Informan 2)

Another informant explained that herbal product formulations need to pay attention to organoleptic aspects so that they can be accepted by the public.

“If rosella is a sour taste, it is quite dominant, so the formula needs to be adjusted so that the final taste is still delicious for people to consume.” (Informan 3)

In addition, the use of additives is considered important to maintain the stability of the product.

“The addition of maltodextrin or other supporting ingredients can actually help maintain the stability of the powder while improving the texture and taste of the product.” (Informan 1)

Experts also emphasized the importance of standardization of raw materials in the development of herbal products.

“The biggest challenge to herbal products is usually in the consistency of the raw materials. The content of active compounds can be different depending on the planting location, drying process, and storage.” (Informan 4)

An Expert's Perspective on Bioactive Activity and Antihypertensive Mechanisms

Based on the results of the interviews, all informants assessed that the evaluation of bioactive activity is an important component in the development of antihypertensive nutraceuticals. The informant explained that analysis of flavonoids and total polyphenols is needed to determine the content of the main active compounds that have the potential to provide antihypertensive effects. According to experts, the content of flavonoids and polyphenols is closely related to antioxidant activity which can help reduce oxidative stress in people with hypertension.

In addition, the informant also assessed that in vitro antioxidant activity and ACE inhibition tests are the right approach to evaluate the antihypertensive potential of the Sidaguri-Rosella formula. Antioxidant activity is considered to provide an overview of the formula's ability to ward off free radicals, while ACE inhibition can illustrate the potential of the formula in helping to inhibit the formation of angiotensin II which plays a role in increasing blood pressure. The informants stated that the combination of bioactive compound analysis and biological activity testing can strengthen the scientific basis of the development of antihypertensive nutraceutical products.

The informant said that the evaluation of bioactive activity is an important basis in the development of antihypertensive nutraceuticals.

“Yes, if the evaluation is flavonoid and polyphenol analysis, it is necessary to find out what MM is, how much bioactive potential the formula has as an antihypertensive.” (Informan 1)

Another informant explained that antioxidant activity is closely related to the protective mechanism of blood vessels.

“Hypertension is closely related to oxidative stress, so testing antioxidant activity is important to see the formula's ability to ward off free radicals.” (Informan 3)

In addition, ACE inhibition tests are considered to strengthen the scientific basis of product development.

“If you want to scientifically demonstrate the antihypertensive potential, the ACE inhibition test is quite important because it can describe the mechanism of inhibition of the formation of angiotensin II.” (Informan 2)

The informant also said that the combination of bioactive and biological testing can improve the scientific validity of the product.

“I think the combination of active compound analysis, antioxidant assays, and ACE inhibition is strong enough to support the early development of antihypertensive nutraceutical products.” (Informan 4)

An Expert's Perspective on Product Safety and Stability

All informants said that the safety aspect is an important factor in the development of herbal and nutraceutical products. The informant emphasized the need for microbiological contamination testing to ensure that products are safe to consume and meet food and herbal product quality standards. In addition, product stability is also considered important because it can affect the quality of active compounds during storage.

Some informants explained that herbal products in powder form have a risk of deteriorating quality if the drying and storage process is not done properly. High humidity can lead to the growth of microorganisms and decrease the stability of bioactive compounds. Therefore, experts recommend the use of airtight packaging and storage in dry conditions to maintain product quality.

The informants emphasized that safety is an important aspect in the development of herbal products.

“Herbal products must still meet the safety aspect, especially related to microbiological contamination so that it is safe for consumption by the wider community.” (Informan 2)

Another informant explained that moisture can affect the stability of powder products.

“If the moisture content is high or the storage is not good, herbal powder can be easily overgrown by microorganisms and the quality of the active compounds decreases.” (Informan 1)

In addition, the use of proper packaging is considered important to maintain product quality.

“Airtight packaging is therefore very important to maintain the stability of the herbal powder product, especially to maintain the quality of bioactive compounds during storage.” (Informan 3)

The informant also emphasized the importance of evaluating stability during the product development process.

“Product stability should be what it is... It is considered from the beginning because it will determine the shelf life and quality of the product when it is later marketed.” (Informan 4)

Expert Perspective on Product Development and Downstream Opportunities

The results of the study showed that all informants had a positive view of the opportunities for the development of Sidaguri-Rosella powder drink formula as an antihypertensive nutraceutical product. The informant assessed that the increasing public interest in herbal products and functional foods is a great opportunity for the development of local plant-based products. In addition, Indonesia has abundant biological resources so that the development of local herbal products is considered to have considerable economic and health potential.

However, experts also said that the development of nutraceutical products requires continuous research support, including raw material standardization, safety testing, bioactivity evaluation, and clinical effectiveness tests. The informant emphasized that herbal products that will be developed widely must have a strong scientific basis so that they can be accepted by the public and health workers. In addition, the downstream opportunity for products is considered to be even greater if the Sidaguri-Rosella formula can be developed into ready-to-consume products with consistent quality and supported by adequate scientific evidence.

All informants have a positive view of the opportunities for the development of the Sidaguri-Rosella formula as an antihypertensive nutraceutical product.

“The opportunity for local plant-based herbal products is actually huge because people are now increasingly interested in functional foods and natural products.” (Informan 3)

Another informant explained that Indonesia has potential herbal resources that strongly support the development of nutraceuticals.

“Indonesia is rich in medicinal plants, so the development of products such as Sidaguri and Rosella has great potential to be developed into superior health products.” (Informan 1)

Nevertheless, the informants assessed that product development requires continuous research support.

“Herbal products are not only good conceptually, but must also be supported by bioactivity, safety, and clinical effectiveness research to be more reliable.” (Informan 2)

In addition, the downstream opportunity of the product is considered to be greater if the product has consistent quality.

“If the formula is standardized and the quality is consistent, the opportunity to be developed into a commercial product is actually quite good in my opinion.” (Informan 4)

This study aims to explore the perspective of pharmacists on the development of Sidaguri (*Sida rhombifolia*) and Rosella (*Hibiscus sabdariffa*) powder drink formulas as antihypertensive nutraceuticals. The results of the study showed that all informants had a positive view of the potential development of a combination of Sidaguri and Rosella as functional herbal products that can be used as complementary interventions in the management of hypertension. This perspective is based on the bioactive compound content of the two plants which are considered to have antioxidant activity and antihypertensive potential through various biological mechanisms.

The informants said that Sidaguri contains flavonoids, alkaloids, and polyphenols that have the potential to provide a protective effect on the cardiovascular system. Flavonoids are known to have the ability to ward off free radicals and reduce oxidative stress which plays a role in endothelial damage of blood vessels in people with hypertension (Zahra et al., 2024). Oxidative stress is one of the important mechanisms in the pathogenesis of hypertension because it can trigger endothelial dysfunction, increased vasoconstriction, and vascular inflammation. With the antioxidant activity of flavonoid compounds and polyphenols, Sidaguri is considered to have the potential to help maintain blood vessel function and support blood pressure control (Mubeen et al., 2025).

In addition to Sidaguri, Rosella is also seen as having strong antihypertensive potential because it is rich in anthocyanins and phenolic compounds. The informant explained that the anthocyanin content in Rosella can help increase blood vessel relaxation and contribute to the inhibition of angiotensin-converting enzyme (ACE) activity (Almajid et al., 2023). ACE inhibition plays an important role in lowering the formation of angiotensin II which leads to vasoconstriction and increased blood pressure. These findings are in line with various previous studies that reported that Rosella consumption can help lower systolic and diastolic blood pressure in people with mild to moderate hypertension. Thus, the combination of Sidaguri and Rosella is considered to have synergistic potential because both plants contain bioactive compounds that support antihypertensive mechanisms (Setiani et al., 2024).

The results of the study also show that pharmacists consider the form of powdered beverage preparations to be the right choice in the development of antihypertensive nutraceutical products. The powder form is considered to have several advantages over liquid preparations, such as a longer shelf life, ease of distribution, and practical public consumption (Jiang et al., 2025). In addition, powdered beverages have a better chance of consumer acceptance because they can be served instantly and are easily combined with additional ingredients that support the organoleptic characteristics of the product. This shows that the technological aspect of preparations is an important component in the development of modern herbal products to be more adaptive to the needs of society (Costa-Font & Sato, 2025).

However, the informants also emphasized that the development of herbal formulas requires special attention to the stability of the active compounds and the consistency of the quality of the raw materials. Variations in the content of bioactive compounds in herbal plants can be influenced by various factors, such as environmental conditions, cultivation methods, harvest time, and drying processes (Zhang et al., 2025). This condition is a challenge in the development of nutraceutical products because it can affect the effectiveness and safety of products. Therefore, experts consider that the standardization of raw materials and formulation processes is an important step to ensure consistent product quality. The standardization includes the process of sorting ingredients, drying, storage, and controlling the levels of bioactive compounds in the formula (Ramachandran et al., 2024).

In addition to the formulation aspect, the results of the study showed that the informants viewed the evaluation of bioactive activity as an important part of the development of antihypertensive nutraceutical products. Flavonoid and polyphenol analysis is considered necessary to identify the content of key active compounds that have the potential to provide antihypertensive effects (Ołędzki, 2025). According to the informants, the high content of flavonoids and polyphenols in the formula can be an early indicator of the potential biological activity of the product. In addition, *in vitro* antioxidant activity and ACE inhibition tests are considered to be able to provide a scientific picture of the antihypertensive mechanism of the Sidaguri-Rosella formula before clinical testing in humans. The views of these experts suggest that the development of herbal nutraceutical products requires a comprehensive scientific approach, not only focusing on the use of natural

ingredients but also supported by evidence of bioactivity and product safety. This is important because herbal products that will be developed widely must have a strong scientific basis so that they can be accepted by the public and health workers. In the context of modern health product development, scientific evidence related to biological activity, safety, and product quality is the main factor that determines the success of downstream herbal products (Wang et al., 2023).

The study also found that informants pay great attention to the safety and stability aspects of the product. According to the informant, herbal products in powder form have a risk of deteriorating quality if the drying and storage process is not carried out properly (Muyumba et al., 2021). High humidity can trigger the growth of microorganisms and accelerate the degradation of active compounds thereby degrading product quality. Therefore, microbiological contamination testing and the use of airtight packaging are considered important to maintain the safety and stability of the formula during storage. These findings show that the development of nutraceutical products not only considers aspects of health benefits, but must also meet food safety standards and the quality of herbal products (Puri et al., 2022).

In addition to discussing scientific and technical aspects, experts also consider that the development of Sidaguri-Rosella powder drinks has considerable downstream opportunities. The increasing public interest in herbal products and functional foods is considered a strategic opportunity for the development of local plant-based products. Indonesia as a country with high biodiversity has great potential in the development of herbal nutraceutical products (Hasyim et al., 2025). However, the informants emphasized that the development of competitive herbal products requires the support of ongoing research, including evaluation of clinical effectiveness, standardization of products, and strengthening of regulatory and safety aspects.

CONCLUSIONS

The results of this study show that the perspective of pharmacists has an important role in supporting the development of local plant-based nutraceutical formulas. This perspective not only provides an overview of the pharmacological potential of Sidaguri and Rosella, but also provides input related to formulation aspects, safety, stability, standardization, and product downstream opportunities. Therefore, this research can be the initial basis for the development of Sidaguri-Rosella powder beverage formula as an antihypertensive nutraceutical that has the potential to be further developed through laboratory research and clinical effectiveness tests in hypertensive patients.

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