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Local Wisdom in Herbal Medicine Processing: The Role of Health Practitioners in Maintaining Tradition and Innovation

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Abstract

This study explores the role of local wisdom in traditional herbal medicine processing among the Sasak community in Lombok, Indonesia. The focus is on the extraction techniques used by traditional healers (belian), especially their selection of specific woods for the heating process to preserve the stability of bioactive compounds. Using a qualitative descriptive method, data were collected through interviews, observations, and documentation involving experienced traditional practitioners. The findings show that belian possess inherited empirical knowledge that integrates technical, ecological, and spiritual considerations. This includes selecting herbal plants based on environmental quality, using sustainable harvesting methods, and applying low-heat boiling techniques to prevent degradation of sensitive compounds such as flavonoids and alkaloids. Additionally, spiritual rituals and intuitive practices accompany the preparation process, reflecting a holistic healing philosophy. The study reveals that these traditional methods align with modern principles of sustainable and effective herbal extraction. The integration of traditional knowledge with scientific understanding presents an opportunity to develop culturally rooted, low-cost, and environmentally friendly healthcare solutions. The preservation and documentation of this local wisdom are essential for future generations and the advancement of ethnopharmacological science.

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INTRODUCTION

In recent decades, diseases caused by microorganisms such as bacteria, viruses, and fungi, as well as metabolic disorders, have increasingly gained global attention. Microbial infections have triggered a variety of diseases ranging from respiratory tract infections, and skin disorders, to chronic illnesses that require serious treatment (Aneja et al., 2012; Babiaka, Ntie-Kang, Lifongo, et al., 2015). On the other hand, metabolic disorders such as diabetes, obesity, and dyslipidemia continue to rise due to unhealthy modern lifestyles. These conditions have driven the search for solutions that are not only effective but also safe for long-term use (Arifin et al., 2020). Synthetic drugs, although effective, often cause undesirable side effects such as

antibiotic resistance, organ damage, or long-term dependency. This has led people to turn back to natural solutions that are more body-friendly, such as herbal medicine.

Herbal remedies have been known and used for centuries to treat various diseases, including those caused by microorganisms and metabolic disorders. Indonesia, as a country rich in biodiversity and herbal medicine traditions, holds great potential in the development of herbal medicines based on local wisdom (Ajose et al., 2022; Aneja et al., 2012). Plants such as turmeric, temulawak (Javanese ginger), ginger, sambiloto (Andrographis paniculata), and pegagan (Centella asiatica) are known to have antimicrobial, antioxidant, and anti-inflammatory properties that help fight infections and support metabolic balance (Babiaka, Ntie-Kang, Ndingkokhar, et al., 2015; Bayani et al., 2024). According to Listantia et al. (2024) and Nazara et al. (2024), traditional herbal processing techniques based on local wisdom not only preserve cultural values but also enhance efficacy.

Innovation in processing methods that integrate tradition and modern technology is key to producing herbal products that are more effective and suited to today's societal needs. The specifications of tools, techniques, processing time, and traditional practices affect the preservation of bioactive compounds in plants from damage during herbal medicine preparation (Alkafafy et al., 2015; Babiaka, Ntie-Kang, Ndingkokhar, et al., 2015; Nazara et al., 2024). Therefore, it is crucial to explore further the potential of herbal medicine as a natural and effective solution for treating microbial infections and metabolic disorders, while also supporting sustainable public health.

Herbal medicine has been widely used across various cultures as an alternative or complement to modern medicine. The success of herbal remedies in delivering therapeutic effects largely depends on the stability of bioactive compounds that remain undegraded during processing. Hence, the specifications of equipment, processing techniques, processing duration, and traditional practices used in herbal preparation are vital factors to consider (Latifah et al., 2022; Pitâ et al., 2019). This study aims to analyze how these factors influence the stability of bioactive compounds in medicinal plants.

Alamgir (2018) and Azmir et al. (2013) state that the equipment used in herbal processing plays a critical role in maintaining the quality of bioactive compounds. The use of certain metal-based equipment can trigger oxidation reactions that damage bioactive compounds, while glass or stainless steel equipment is recommended. Heating devices such as ovens and extractors must have good temperature control to prevent thermal degradation of bioactive compounds. Extraction methods that neglect the preservation of bioactive plant compounds underline the importance of analyzing local wisdom in herbal medicine preparation.

Air drying, sun drying, and freeze-drying have different effects on the stability of bioactive compounds, with freeze-drying generally being superior in preserving active ingredients. Maceration, percolation, and Soxhlet extraction vary in their efficiency to extract bioactive compounds without degradation (Alamgir, 2018; Klein-Junior et al., 2021). Some traditions use fermentation to increase the bioavailability of active compounds in herbal medicine. The duration of processing also affects the content of bioactive compounds in medicinal plants. Excessive heating can reduce phenolic and flavonoid content. Optimal extraction duration must be determined to avoid degradation due to oxygen and light exposure. Long-term storage requires appropriate conditions to prevent oxidation and the loss of active compounds (Nazara et al., 2024).

Traditional herbal processing methods have proven effective in preserving bioactive compound efficacy. Practices such as using coconut water or honey as extraction media can enhance the stability of active compounds (Ajogun et al., 2020; Rethinam & Krishnakumar, 2022). Adjustments to the process based on ancestral experience are often more effective than modern

methods that overlook the holistic preservation of bioactives. According to Bayani et al. (2024), synthetic drugs have become an integral part of modern medicine in treating various diseases. However, over time, continuous consumption of synthetic drugs can lead to adverse health effects, including drug resistance, organ dysfunction (such as liver and kidney problems), and long-term side effects such as hormonal and metabolic imbalances. These concerns have grown in public awareness regarding the safety of long-term synthetic drug use (Wang et al., 2022).

Recent research and practices in herbal medicine processing have increasingly focused on the stability and effectiveness of bioactive compounds contained in medicinal plants. Various drying methods, such as air drying, sun drying, and freeze-drying, have been evaluated in terms of their ability to preserve the content of active compounds. Among these, freeze-drying has proven to be the most effective in maintaining the stability of bioactive compounds due to minimal degradation caused by heat and oxidation (Alamgir, 2018; Klein-Junior et al., 2021).

In addition, the process of extracting bioactive compounds plays a crucial role. Methods such as maceration, percolation, and Soxhlet extraction vary in their efficiency to extract active compounds without causing degradation. Processing duration and temperature are critical factors, as excessive heating and exposure to light and oxygen can reduce the levels of important compounds such as phenolics and flavonoids. Therefore, determining the optimal extraction time is essential to maximize the extract yield while preserving the quality of the active compounds.

Storage aspects must also be considered. To maintain the long-term stability of active compounds, storage conditions must prevent oxidation and loss of bioactive constituents (Nazara et al., 2024). In addition to modern approaches, various local traditions significantly contribute to the effectiveness of herbal medicine processing. Traditional practices, such as using coconut water or honey as extraction media, have been shown to enhance the stability of active compounds (Ajogun et al., 2020; Rethinam & Krishnakumar, 2022).

Traditional fermentation has also emerged as a promising method to improve the bioavailability of active compounds. This approach not only aligns with cultural heritage but also offers a natural solution to enhance the efficacy of herbal medicine. Generational knowledge and traditional experience in adjusting processing methods often yield better results than modern techniques that may overlook the complex nature of bioactive compounds.

On the other hand, growing public concern over the long-term use of synthetic drugs has driven a shift toward herbal medicine. Side effects such as drug resistance, liver and kidney dysfunction, as well as hormonal and metabolic disturbances, are the main reasons behind this concern (Bayani et al., 2024; Wang et al., 2022). As an alternative, herbal medicine is considered safer and more natural due to its content of bioactive compounds, which not only act as therapeutic agents but also support the body's metabolic balance.

Thus, current approaches in herbal medicine processing emphasize the importance of synergy between modern scientific methods and traditional knowledge. Optimizing the production process—from drying and extraction to storage—must focus on maintaining the stability of bioactive compounds to ensure the maximum therapeutic efficacy of herbal medicine.

In response to these concerns, people are increasingly turning to alternatives perceived as more natural and low-risk, such as herbal medicine. Herbal remedies offer advantages through their natural bioactive compounds, which not only act as therapies for various diseases but also support metabolic balance. Additionally, the use of herbal medicine is often based on traditions and local wisdom that have proven effective through generations. Herbal remedies thus represent a solution for those seeking treatment with fewer side effects, while also offering opportunities to integrate traditional heritage with modern innovations. With the growing support of scientific research, the potential of herbal medicine to provide safe, effective, and

sustainable solutions continues to attract the attention of healthcare practitioners and researchers. Therefore, it is essential to further study the role of herbal medicine as an alternative therapy that focuses not only on curing diseases but also on prevention and improving the overall quality of life.

METHOD

This study employed a qualitative descriptive research method to analyze the local wisdom of traditional health practitioners in Lombok in processing herbal medicines. This design was chosen as it allows for an in-depth exploration of traditional practices carried out by health practitioners in the preparation of medicinal plants. The research was conducted in Lombok, West Nusa Tenggara, a region known for its strong tradition of herbal medicine. The study population consisted of traditional health practitioners, including shamans, healers, and herbal artisans with extensive experience in herbal medicine processing (Bayani et al., 2024; Kim et al., 2017).

A purposive sampling method was used, with criteria including practitioners who have more than 10 years of experience in processing herbal medicines, use raw materials sourced from nature, and apply traditional techniques. Additionally, participants must possess inherited knowledge passed down through generations regarding herbal medicine preparation. The sample size was determined based on the principle of data saturation, where sampling was discontinued once no new information was being uncovered (Doyle et al., 2020; Koh & Owen, 2000).

The instruments used in this study included a semi-structured interview guide aimed at gathering information related to processing methods, materials used, and the philosophy behind certain techniques. Researchers also directly observed the herbal medicine preparation process, including extraction, drying, and storage techniques. Photo and video documentation were used to support observational findings and strengthen data validity.

Data were analyzed using a thematic analysis approach, with steps including filtering relevant data from interviews, observations, and documentation, categorizing the data based on key themes such as processing techniques, raw materials, and healing philosophies, and interpreting the meaning of each finding in connection with existing theories and previous research. Validation was carried out by comparing results from interviews, observations, and documentation to ensure the accuracy of findings.

Research Limitations

This study focuses solely on herbal medicine processing practices in Lombok; therefore, the findings may not be fully generalizable to other regions. The data relies on the experiences and perspectives of practitioners, which may introduce bias in the information presented. The research was conducted within a limited time frame, thus seasonal variations in medicinal plant use could not be captured. Additionally, some processing techniques may be considered family or community secrets, which could limit the researcher's access to complete information.

RESULTS AND DISCUSSION

This study aims to explore in-depth information regarding the methods of herbal medicine processing, the materials used, and the underlying philosophy behind the application of certain techniques in the preparation process. To achieve this goal, a semi-structured interview approach was employed, allowing the researcher to obtain richer and more detailed data. In addition to interviews, direct observation of the herbal medicine processing practices was also

conducted. These observations covered various stages, such as extraction techniques, drying methods, and storage of herbal materials. Documentation in the form of photographs and videos was used to support the observations and enhance the validity of the data collected.

For data analysis, a thematic analysis approach was applied through several key steps. Data collected from interviews, observations, and documentation were first filtered to ensure relevance. The data were then categorized into main themes such as processing techniques, raw materials, and treatment philosophy. Further analysis was carried out to interpret the meaning of each finding by linking it to existing theories and previous research. To ensure the validity of the research findings, data triangulation was conducted by comparing data from multiple sources, including interviews, observations, and documentation. Therefore, this study is expected to provide a more comprehensive understanding of herbal medicine processing and the underlying values. The results of the interviews with health practitioners are presented in Table 1.

Table 1. The results of the interviews with health practitioners

No	Question	Resource Person's Answer
1	What does "local wisdom" mean to you in the context of herbal medicine processing?	Local wisdom in processing herbal medicine is how traditional knowledge and practices are passed down from generation to generation by rural communities here to process natural ingredients into medicines that include the selection of medicinal plants, simple processing methods, use of the right dosage (regular) and the principle of sustainability, which are often combined and associated with the cultural values of rural communities here who have knowledge and are usually rooted in life experiences, observations of nature, and the cultural heritage of the local community.
2	How do you utilize local wisdom in selecting raw materials? Are there any traditions or customs that you follow in processing herbal medicines?	➢ Use of Leaves for Medicine: The leaves of the Jack In The Bush (Chromolaena Odorata) plant are used to treat various diseases such as: Treating Wounds and Infections, Treating Bleeding and Leucorrhea as well as Hemorrhoids and Vomiting Blood. ➢ Traditional Processing Method: In using the Jack In The Bush plant or in the Sasak language known as Kesubong, the leaves and stems are used to make a herbal tea. ➢ Utilizing local wisdom in selecting herbal raw materials from the Jack in the Bush (Chromolaena Odorata) plant can be done by considering traditional knowledge, sustainable practices, and community relations with the surrounding environment.
3	What factors do you consider in selecting herbal raw materials? (e.g., type of plant, growing location, harvest season, part of the plant used, position of the leaves, stems or roots of the plant) and Is there a certain time that is considered better	1. Selecting Jack In The Bush (Chromolaena Odorata) herbal raw materials requires attention to several important factors to ensure the effectiveness, safety, and sustainability of its use. There are several factors to consider such as: Plant Quality Leaf Condition, Choose leaves that are healthy, fresh, and free from damage such as insect holes, stains, or wilting. Avoid leaves that are too old (yellowing) or too young (not yet ripe).Color and Aroma, Good leaves have a bright green color and a distinctive aroma that is not too pungent or foul-smelling.

No	Question	Resource Person's Answer
	(effective) to harvest the herbal plants?	2. Location and Growth Environment Plants that grow in fertile soil with clean water tend to have better active compound content. Pollution-Free, Avoid plants that grow near highways, industrial areas, or places exposed to pollutants such as heavy metals and pesticides. Natural Ecosystem, It is better to choose plants that grow wild in their natural habitat, because they are usually richer in bioactive compounds than cultivated plants. 3. Picking Technique Pick-up Method, Use clean tools to pick leaves or cut the necessary parts without damaging the entire plant. Make sure not to pull the plant from the roots so that the plant can grow back. Amount Taken, Take enough as needed to avoid over-exploitation.Waktu 4. Plant Collection Harvesting Season, Harvesting is done during the active growing season, usually before the plant flowers to obtain a high concentration of active compounds. Time of Day, Pick the leaves in the morning after the dew has evaporated to obtain fresh and not too wet raw materials.
4	Are the raw materials obtained from the wild, cultivated or market? And How to ensure the quality of raw materials?	Jack In The Bush Plant (Chromolaena Odorata) or Sasak people often know as Kesubong, which is a type of plant that I get from the wild (growing wild) and how I ensure the quality of raw materials from the Kesubong Plant, of course plants that grow in the wild (growing wild) are plants that are very fertile and richer in natural resources because they grow directly from nature without human assistance and of course the efficacy is higher and more powerful which is guaranteed quality after use will be very effective and efficacious. And the active biochemicals are more.
5	What are the usual steps in drying, pounding, or boiling and do you use any special tools or methods passed down from generation to generation? herbal management?	The steps for using herbal medicine from the Kesubong Plant (Local/Sasak Name) that I usually do, first I take the plant from the wild which does grow freely in the wild, even this plant is often thought of as a weed even though its efficacy is very high for health. After I take (pick) and I usually pick it together with the stem but not to the roots because if it is together with the roots it can inhibit the growth of the Kesubong plant. Then later, I wash it first so that it is more hygienic and free from dust that settles on the leaves of the plant. Then after I wash it I add a little water for the boiling process of the plant, then I boil it which is initially with High Fire for 5-7 minutes, then after boiling I move to Low Fire for about 5-10 minutes, then after the extraction boils, I provide a tool in the form of 2 clear glass cups to carry out the filtering process, because here what I take is only water from the boiling results to make Herbal Tea and then the remaining leaves are thrown away.

No	Question	Resource Person's Answer
6	What techniques are commonly used to extract active ingredients from herbal plants? Does location or time matter in determining which extraction method to use? And do you use wood or a specific container to perform the extraction?	The technique I use in making this herbal tea is the leaf washing and leaf boiling technique, which of course both techniques must also be done regularly and in detail so that the efficacy of the herbal tea is not reduced. There is no influence of location and time in determining how to make this herbal tea, because it is very practical to make at home or outside the home as long as the tools and materials are available, the time to make it is also not an obstacle because it is very flexible, it can be morning, afternoon or evening and time is not a reference for making herbal tea. Then I use simple tools such as a teflon, rice lid, stove and 2 glass cups for the serving process, a short answer from Mrs. Nurhayati as a resource person in an interview on the use of herbal medicine by health practitioners.
7	How do you determine the dosage and how to use herbal medicine for patients? Are there any special rituals or treatments before giving medicine to patients?	The first thing I do to give a dose of herbal medicine extracted in the form of tea is to determine how much plant is taken. For example, taking 1 stalk of the plant, then wanting to boil it, then the dose for adults around (17-18) years old, the dose for drinking herbal tea is 1 full glass measuring 250ml, different from the dose for children who are still (10-13 years old) given a dose of 1 glass but a glass measuring 90ml. And for a special ritual before giving medicine to the patient there is no, but more to the treatment, namely the treatment of drinking the herbal tea before eating, why is that? Because usually before eating the stomach is still empty (empty) which will automatically make it easier for the medicine to enter the patient, different from the treatment after eating, when the stomach is full (full) then excessive nausea will be experienced by the patient, so it is better and more effective to give the herbal tea treatment before eating.
8	How do you evaluate the effectiveness of herbal medicine? Do you receive feedback from patients regarding the results of using the medicine?	I evaluate the effectiveness of this herbal tea medicine with several steps to ensure that the Jack In The Bush (Chromolaena Odorata) plant is truly beneficial for health and safe to use. The evaluation that I involve is the local wisdom, traditional and practical approach. How is that? Evaluation through the local wisdom approach: Using knowledge that has been applied for years by local people who are accustomed to using this plant as medicine. The experience of traditional herbal users can provide insight into the benefits of this plant for various health problems, such as skin infections, inflammation, or digestive problems. Then effectiveness based on experience: I collect testimonials from patients who have tried this plant can provide information about how effective this herbal medicine is in curing certain complaints. For example, I have treated several patients who have Hemorrhoids (bloody bowel movements) then Vomiting Blood (Phlegm) and Leucorrhea in Women, and thank God the reaction of the concoction and extraction using the herbal tea method was successful, there have been several patients who have recovered

No	Question	Resource Person's Answer
		when using the herbal tea that I made for them, and of course their feedback to me is very positive. My patients are interested and more excited to use herbal medicines because my patients said that in addition to the plants being easy to find and the way to use them being very easy and practical, it also minimizes spending money, which is very helpful for high economic expenses, which is different from having to go to the doctor because in addition to the distance to the hospital being far, the payment at the hospital is also 10 times more expensive than making your own herbal medicine at home, which is practical and easy.
9	What are the biggest challenges in maintaining local wisdom in herbal medicine processing? Are there any obstacles in accessing raw materials Processing techniques?	The biggest challenge in my opinion in maintaining local wisdom in the management of herbal medicine Jack in the Bush (Chromolaena Odorata) and other herbal medicines is because of the loss of traditional knowledge why do I say that? because the current generation is less interested, the current generation of young people are more often interested in modern medicine which tends to ignore or not learn about the tradition of herbal medicine from their ancestors. In addition, the stigma against herbal medicine, some young generations and the community consider traditional medicine less scientific, old-fashioned or irrelevant compared to technology-based medicine. On the other hand, Deforestation and Land Conversion are also major challenges because these actions can result in the loss of many natural habitats and many herbal plants are damaged due to land clearing for corn farming such as in my village, land has begun to be converted for oil palm plantations and illegal mining, even infrastructure development. This is what can cause the extinction of natural habitats in nature. Excessive exploitation also results in herbal plants being harvested excessively until their populations can decrease and can even be said to be almost extinct due to excessive exploitation. My personal obstacle in accessing raw materials for the Jack in the Bush (Chromolaena Odorata) herbal plant processing technique is that the distance from home is too far to get the herbal plant, besides that, harvesting must also be extra careful because of fear that the Kesubong plant (Local/Sasak Name) will disturb its habitat.
10	Do you have a message or advice for the younger generation regarding the preservation of local wisdom in herbal medicine?	My message to the younger generation to preserve local wisdom in herbal medicine is Herbal medicine is part of our rich cultural identity. Do not think of it as something old or outdated. Instead, see it as a valuable heritage that needs to be preserved and passed on. Herbal plants also come from natural resources. By preserving the environment, you are also preserving herbal medicine resources that are beneficial for the health of future generations. Use technology to document, promote, and develop herbal medicine based on local wisdom. This innovation will make herbal medicine more relevant and widely accepted. And young

No	Question	Resource Person's Answer
		people as Agents Of A Change: Build awareness in your environment about the importance of herbal medicine. Educate the community that traditional medicine can be an alternative or complement to modern medicine. My advice to the young generation, as the young generation, as agents of change towards Indonesia Emas 2050, is it necessary to have collective action to be able to maintain ancestral heritage (local wisdom) especially in the use of herbal medicine starting from small things by studying local knowledge such as learning and finding out from parents about the use of herbal medicinal plants and documenting starting from recipes, processing techniques, and their benefits in the form of writing, photos or videos so that they are easy to remember. Then my advice is to preserve the natural environment around us, for example, avoid excessive exploitation of plants so that wild herbs are maintained. Increase scientific knowledge such as studying biology, chemistry and physics or pharmacy to understand how herbal medicinal plants work in the human body and what their benefits are. Then the most impactful (potentially great) is to promote through social media, in this era social media is a platform that is very popular with everyone from children to adults and the elderly, with social media everything can be published and promoted by creating interesting content about herbal plants or other visuals such as photos and designs or infographics. With this, there is automatically a change in promoting herbs.

(Latifah et al., 2022; Pitâmay et al., 2019) reported that local wisdom is knowledge and practices that have developed and been passed down through generations within a community, reflecting human adaptation to their natural and social environments. In the Sasak community of Lombok, the figure of the *belian* (traditional healer) holds an important position in preserving and transmitting this knowledge, especially in the field of traditional medicine. The practice of Sasak *belian* in preparing herbal remedies is not merely a medical activity, but rather a fusion of empirical knowledge, spiritual values, and ecological harmony (Tohri et al., 2022).

Sasak *belian* are known to be meticulous in determining the time and place for gathering materials, as well as in the techniques used to prepare the remedies. The timing of ingredient collection is not arbitrary—factors such as the moon's position, the time of day, and the season are all considered. For example, certain leaves may only be harvested at dawn, just before sunrise, as they are believed to possess the purest natural energy at that time. This reflects a profound understanding of natural rhythms, which in turn mirrors the cosmological system of the Sasak people (Bayani et al., 2024; Tohri et al., 2022).

The choice of location is also deliberate. *Belian* typically gather ingredients from places considered sacred or spiritually significant. This reflects an ecological and spiritual awareness that plants are not merely inanimate objects but are believed to possess a life force (animism) that must be respected (Ruangsan et al., 2021). The techniques for preparing medicine are not limited to mixing ingredients, but are accompanied by various rituals, such as the recitation of mantras or prayers. These are not merely symbolic, but are integral parts of a belief system in which the success of the treatment relies not only on material aspects but also on spiritual elements (Wahyudiati, 2022).

The rituals accompanying the preparation process are not simply mystical acts. Behind them lies a complex structure of empirical knowledge. The combination of ingredients, dosages, and the sequence of mixing are based on long-standing experience passed down through generations. This practice can be viewed as a unique form of ethnobotany—the study of how indigenous communities use plants for health and medicinal purposes (Ajose et al., 2022; Wahyudiati, 2022).

These rituals not only strengthen the spiritual dimension but also function as a form of social control and discipline, ensuring that the preparation process is carried out with full attention and mindfulness. This indirectly ensures the quality and effectiveness of the remedies produced. Unfortunately, as mentioned in the text, many people are unaware that aspects such as timing, location, techniques, and rituals have a direct impact on the efficacy of the medicine. In the modern medical paradigm, which often neglects spiritual and cultural dimensions, *belian* practices are frequently deemed unscientific. However, upon closer examination, these practices contain scientific principles that have yet to be formally documented.

(Tohri et al., 2022; Wahyudiati, 2022) reported that Sasak *belian* practices can be seen as a form of cultural capital that deserves recognition and preservation. In an era of ecological and global health crises, holistic approaches that integrate science, spirituality, and local wisdom are highly relevant. The recognition and preservation of *belian* knowledge are not only vital for the cultural identity of the Sasak people, but also serve as an alternative source of knowledge for the development of more contextual and sustainable herbal medicine. The local wisdom of the Sasak *belian* in preparing herbal medicine shows that traditional healing is not merely a medical practice, but the result of a deep relationship between humans, nature, and spirituality. A more serious and participatory study of this practice is needed so that this valuable heritage is not lost to modernization, but instead becomes part of the solution to future health challenges. Initial observation results from interviews and documentation of health practitioners (belian) show that local wisdom is still maintained but some have begun to erode the development of the times. The time of taking medicine still pays attention to the local wisdom of the Sasak community but the ritual before taking medicine has begun to decrease. The technique of processing medicine also mostly uses the maceration technique as presented in Figure 1.

Figure 1. Sasak people's herbal medicine extraction techniques

The use of herbal medicine as an alternative treatment has become a widespread practice, both in modern and traditional contexts. One important aspect in the effectiveness of herbal medicine is the extraction technique used in the processing process. The extraction technique greatly determines the content of pharmacologically active compounds in the concoction. Excessive or inappropriate heating can cause degradation of the active compounds, thereby reducing or even eliminating the efficacy of the drug (Al-Whaibi, 2011; Montevecchi et al., 2022). In this context, the local wisdom of the Sasak people in Lombok shows a deep

understanding of the importance of proper processing of herbal ingredients. They have traditionally used certain woods in the heating or boiling process of medicinal ingredients. The selection of wood is not only based on availability, but also considers the nature of the heat produced, aroma, and the content of natural elements in the wood which are believed to affect the quality of the medicine. Based on the findings of researchers, most people and belian pay little attention to the selection of extraction techniques and the wood used. The extraction techniques used by Sasak health practitioners are presented in Figure 2.

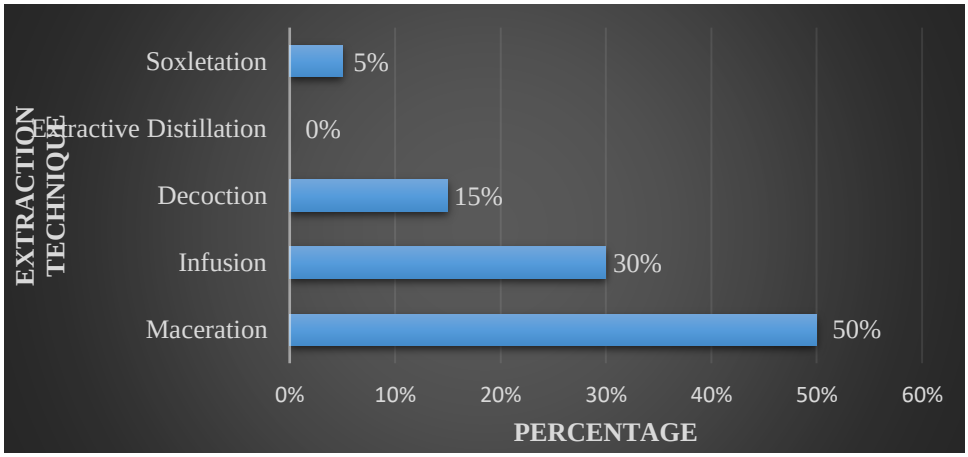

Figure 2. Medicinal plant extraction techniques.

Extraction is the process of separating active compounds from plant matrices using solvents and/or heat. Common techniques include *infusion* (light boiling), *decoction* (prolonged boiling), *maceration* (soaking), *Soxhlet extraction* (gradual heating), and modern methods such as *ultrasonic* or *microwave extraction*. Each technique yields different results in terms of the stability and concentration of active compounds. High temperatures and prolonged heating are known to degrade components such as flavonoids, alkaloids, and saponins, which are sensitive and easily broken down. Therefore, temperature control is a critical element in maintaining the effectiveness of active substances.

According to Tohri et al. (2022) and Wahyudiati (2022), the *belian Sasak*, or traditional healers, have their own methods for extracting herbal medicine ingredients—methods that have been empirically proven and passed down through generations. One form of traditional technology that reflects their deep knowledge is the selection of specific types of wood for the heating or boiling process. The woods used, such as teakwood, agarwood, or hibiscus wood, are chosen not only for their availability but also for their natural properties—producing stable and moderate heat, emitting natural aromas believed to enhance the medicinal efficacy, and not producing smoke or toxic compounds when burned.

This selection demonstrates local knowledge that indirectly takes into account the chemical stability of medicinal compounds. In modern terminology, this practice aligns with the principle of *low-heat extraction* used in the herbal pharmaceutical industry to preserve the stability of active compounds (Bayani et al., 2024). Although not based on modern laboratory tests, the practices of the *belian Sasak* are formed from accumulated empirical experience. The effectiveness of the resulting remedies serves as the main indicator of the success of the extraction techniques used. Long-term observation of treatment outcomes acts as a traditional form of verification for their methods.

Field studies on the practices of *belian* show consistency in the use of specific types of wood across generations, as well as knowledge of the precise timing and duration of boiling for each plant type. The combination of natural observations (such as changes in the color and aroma of the decoction) and spiritual intuition serves as a guide in the preparation process (Pitâ€TMay

et al., 2019). The local wisdom of the Sasak people contributes significantly to contemporary understanding of natural, sustainable extraction methods. In situations where access to modern technology is limited, these practices serve as real-world examples of effective low-tech solutions.

Furthermore, this approach aligns with current trends in the development of ethnobotanical and pharmacognostic herbal medicines, which emphasize the importance of cultural and ecological context in traditional healing (Latifah et al., 2022; Nazara et al., 2024). Extraction techniques have a significant influence on the quality and efficacy of herbal medicines. Through the practices of *belian*, the Sasak community has developed a system of medicinal processing that takes into account not only technical aspects but also spiritual and ecological dimensions. The use of specific wood types during the heating process reflects a deep concern for maintaining the stability of active compounds in herbal formulations. Empirical studies of these practices demonstrate that local wisdom has great potential to be integrated into sustainable and scientifically supported healthcare systems.

CONCLUSION

This study concludes that the herbal medicine processing practices of the Sasak community, particularly those carried out by traditional healers (belian), demonstrate a sophisticated integration of technical, ecological, and spiritual knowledge. These practices prioritize the preservation of bioactive compounds through methods such as low-heat extraction and the careful selection of heating materials, notably specific types of wood that support stability and efficacy. The use of natural indicators, sustainable harvesting techniques, and intuitive processing rituals further reflect the community's deep-rooted local wisdom. Empirical evidence gathered through interviews and observations confirms that these traditional methods are not only effective but align closely with modern scientific principles in pharmacognosy and ethnobotany. Therefore, the documentation and preservation of this indigenous knowledge are vital steps toward developing sustainable, culturally appropriate, and scientifically validated herbal medicine systems.

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