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Original Article

Exploring the Therapeutic Potential of *Mimosa pudica L.* in Indonesian Traditional Medicine

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Abstract

Background: Traditional medicine and healers have a long history of treating diseases in Indonesia. One plant that has been used by traditional healers (*battra*) is *Mimosa pudica L.*, which is easily found throughout Indonesia. This study aimed to explore the therapeutic potential of traditional herbal medicine containing *Mimosa pudica L.* by *battra* in Indonesia.

Methods: This study used a descriptive method using secondary data from the Research on Medicinal Plants and Herbal Medicine (*Riset tumbuhan obat dan jamu/RISTOJA*), which was conducted in 2012, 2015, and 2017 by the Ministry of Health Indonesia. This study analyzed the utility of *Mimosa pudica L.* from 106 concoctions made by 90 *battras*, from 80 ethnic groups in 23 provinces of Indonesia. Concoctions were categorized based on the parts used, and the herbs' composition, including preparation and administration.

Results: *Mimosa pudica L.* in 106 concoctions divided into 48 single-plant uses and 70 multi-plants uses, to treat 38 diseases. The most concoctions were for skin diseases (10 concoctions), followed by rheumatism and gout (9), tumor/cancer and cough (8), haemorrhoids (7), diabetes (6), low back pain (4), and jaundice (4). The most common administration was orally (65.1%). The leaves were the most widely used in herbal medicine, by drinking after being boiled in water.

Conclusion: *Mimosa pudica L.* has a variety of pharmacological activities that are consistent with its use in traditional medicine, even potentially addressing age-related diseases such as antidiabetic, anticholesterol, and antihyperlipidemic. Further studies are needed to evaluate the effectiveness and efficiency of multi-ingredient herbal medicines, as well as its preparation and administration in relation to hygiene.

Keywords: *Battra,* concoctions, *Mimosa pudica L.*, traditional herbal medicine

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Introduction

Traditional herbal medicine is an important part of health services that has a long history in health maintenance, prevention, and treatment of diseases in Indonesia. Medicinal plants have been the most important means for traditional communities to treat diseases and maintain health since the 5th century to the 19th century. Many plants are used singly or in multi-plants, which have been proven to be health-preserving ingredients. Knowledge of medicinal plants comes from a legacy of knowledge passed down from generation to generation and continues to be enriched with knowledge from outside, especially from China and India.[1] Nature has been a source of medicinal products for thousands of years, with many beneficial medicines developed from plant sources.[2,3]

Many studies have been published by scientists to discuss the role of traditional, complementary, and alternative medicine in preventing, treating, and managing diseases and attach importance to the development, research, and application of traditional

medicine.[4] Ethnomedical knowledge has brought major developments in health services. Rapid industrialization and the fading of ethnic' cultures and customs mean that this information is slowly being lost. One of the proposed approaches to selecting plants as new drug candidates and developing drugs with the greatest chance of success is the role of information from various traditional herbal medicinal systems and their uses. Ethnomedical information is often found in the scientific literature, but little has been compiled into a usable form. Phytochemical research based on ethnopharmacology is an effective approach to discovering new chemical entities that have the potential to become major drug sources.[5,6] This patient data-driven approach requires standardization of ethnopharmacology and the design and reporting of clinical observational studies that ultimately initiate chemical and pharmacological extraction of promising sources.[5,6]

One of the plants used by various ethnic groups in Indonesia is *Mimosa pudica L.* (*Putri malu*, touch me not plant), from the Fabaceae family. This herb grows on roadsides, fields, and empty land. This plant is often found especially in rural areas, where there is more vacant land than urban areas. It grows quickly, has a round, hairy, and spiny stems. The leaves are small, compound, oval with a sharp tip, green or reddish in color. When touched, the leaves will close (sensitive). The flowers and stems are round and pink.[1] This plant is efficacious in treating insomnia, bronchitis, high fever, skin diseases, rheumatism, and worms. Leaves, roots, and whole plant can be consumed fresh and dried.[1,7] This plant contains alkaloids, flavonoids, steroids, tannins, and phenolics.[8] Mimosine, an important alkaloid found in all parts of the plant, has been isolated and identified at 20 mg/g dry powder.[9,10] Worldwide, *Mimosa pudica L.* has recently been included in the International Union for Conservation of Nature's (IUCN) red list of threatened species, listed as a least concern.[11] Meanwhile, *Mimosa pudica L.* is abundant, easy to find, and is a wild plant that thrives throughout all areas in Indonesia. Indonesia with its various ethnic groups and cultures has traditional medicines. *Mimosa pudica L.* is one of the traditional herbal medicines used by traditional healers (*pengobat tradisional/battra*) to treat their patients in the community. This study aimed to explore the therapeutic potential of traditional herbal medicines containing *Mimosa pudica L* in various concoctions by battras in Indonesia.

Methods

This study used a descritiptive method, using secondary data from the Research on Medicinal Plants and Herbal Medicine (*Riset tumbuhan obat dan jamu/RISTOJA*), which was conducted in 2012, 2015, and 2017 by the Ministry of Health of the Republic of Indonesia. Until 2017, RISTOJA had never been done again so there was no current data. RISTOJA was conducted with ethical approval from the Ministry of Health Republic of Indonesia in 2012 (LB.02.01/2/KE.286/2012), 2015 (LB.02.01/5.2/KE.318/2015) and 2017 (LB.02.01/2/KE.107/2017).

RISTOJA was the first research carried out throughout Indonesia, and samples were selected using a methodology that can describe local knowledge about ethnomedicine and community-based medicinal plants in Indonesia. Several researchers, including botanists (biology, agriculture, forestry), anthropologists (anthropology, sociology), and medical experts (physicians, chemists, public health, nurses), participated in the RISTOJA data collection. Observations were made at the locations where medicinal plants were collected for making concoction and how

A **B**

Figure 1 *Mimosa pudica Linn.*, A= RISTOJA, B= Plant of the World Online (POWO)[7]

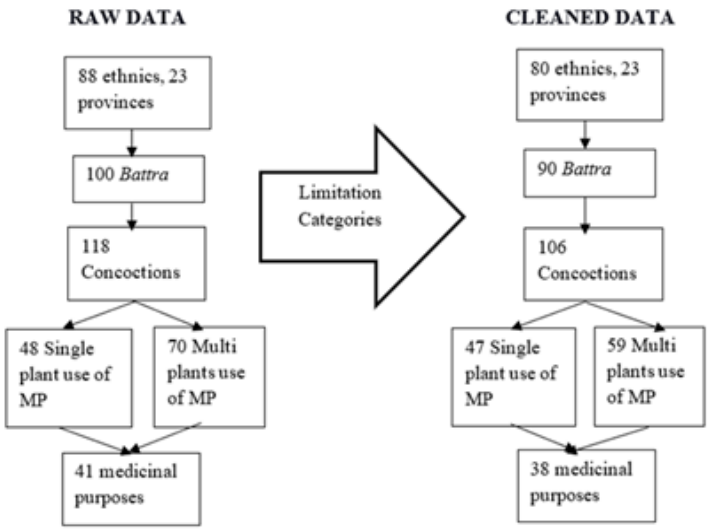

Figure 2 Data Classifications and Categorie

to treat it.

In the research, participants were battra from selected ethnic groups in Indonesia who had knowledge and practice of utilizing plants used as medicine. Battra had knowledge and expertise in healing and treating diseases using medicinal plants in their concoctions and were recognized by their community. Interviews were conducted using structured and free techniques questionnaires. Information about the composition of the concoctions collected included the name and symptoms of the diseases known to the informant, the part of the plant used, processing and method of administration, frequency, and duration of treatment.[12]

Data on the utility of *Mimosa pudica L.* plant as a traditional herbal medicine were analyzed. *Mimosa pudica L.* was classified from 118 concoctions by 100 battra, from 88 ethnic groups in 23 provinces of Indonesia. Of the 118 concoctions made from MP (48 single-plant, 70 multi-plant), it had been used for 41 medicinal purposes. There were two medicinal purposes that were not identified in the classifications, so these two unidentified classifications were excluded from the analysis, leaving 38 medicinal purposes with 106 concoctions divide into 47 single-plant use and 59 multi-plants use. These 106 concoctions came from 90 battras (80 ethnics in 23 provinces of Indonesia) (Figure 2). The concoctions were categorized based on the parts used, and the herbs' composition, including preparation and administration. Only mixtures in which *Mimosa pudica L.* was the primary ingredient and whose presence could not be substituted by other compounds were chosen for this study. Single-plant (only MP) or multi-plants (with other plants) can make up the concoctions.

This study obtained specific data set series about Battra who used MP, MP concoctions and its utilities were obtained from the Health Research and Development Agency, Ministry of Health Republic of Indonesia, with certain procedures and had been approved for the data set utilization in 2023 (Letter No. IR.03.01/H.I/2340/2023, March, 29th, 2023), and the data were analyzed for 8 months from March to October 2023.

Results

Many *battra* and ethnicity spread across provinces indicated a diversity of concoctions containing *Mimosa pudica L.* and their intended uses. Of the 106 concoctions containing *Mimosa pudica L.*, there were eight health problems with the highest number of concoctions including skin diseases (n=10), followed by rheumatism and gout (n=9), tumours and cancer (n=8), coughs (n=8), haemorrhoids (n=7), diabetes (n=6), back pain (n=4), and jaundice (n=4). Other health problems had 1 to 3 kinds of concoctions. Nearly 56% of *Mimosa pudica L.* was used as a mixed concoction combined with other plants (multi-plant use) (Figure 3).

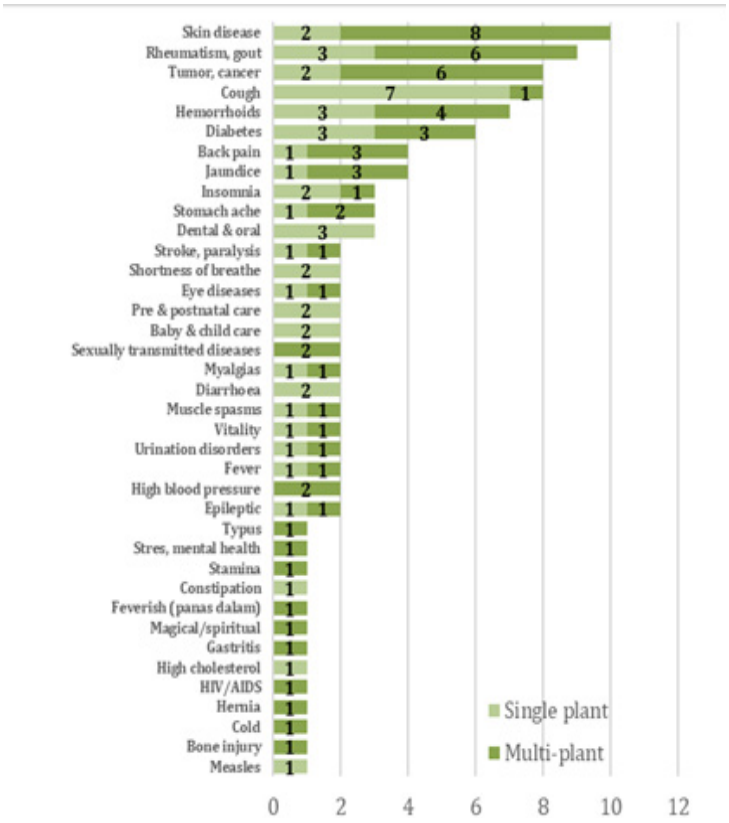

Figure 3 Medicinal Purposes and the Amount of Concoctions

To treat patients, battra usually gave concoctions with a composition of medicinal plants alone or a mixture with other non-medicinal ingredients, such as minerals or animal parts. The types of plants used could be single-plants or multi-plants (with other plants). Before being utilized as medicine, this combination of substances was treated in a certain way. This customary wisdom was typically passed down from generation to generation to Battra.

The amount of plant material in the concoction that would be developed more modernly was very important. The more types of plants in one concoction, the more costs for testing and production. Indonesian authorities in the field of natural medicine recommended that natural medicine candidates that would be referenced for efficacy testing should preferably be made from single ingredients. If necessary, it consisted maximum of 5 ingredients, each of which ingredients had known properties.[13]

When divided from 23 provinces and 80 ethnic groups into 7 regions of Indonesia, namely Sumatra, Kalimantan, Java, Sulawesi, Maluku, and Papua, it could be seen that *Mimosa pudica L.* was commonly used for the treatment of skin diseases, rheumatism, and gout. *Mimosa pudica L.* was utilized for skin disease in 4 regions (Sumatra, Kalimantan, Java, and Maluku), for rheumatism and gout in 4 regions (Sumatra, Sulawesi, Maluku, and Papua). Only in Nusa Tenggara *Mimosa pudica L.* was used for different functions (Table 1).

All parts of the *Mimosa pudica L.* plant were used in concoctions. The most commonly used *Mimosa pudica L.* plant parts were leaves (37.7%), followed by the whole plant (20.8%), aerial parts (18.9%), roots (16.0%), stems (5.7%), and flowers (0.9%) (Figure 3). Regarding conservation efforts, the leaves were the part of the plant that was considered the safest to use. Leaves were the most abundant part of plant, were available throughout the season, and did not have much influence on plant survival.

There were seven regions in Sumatera that used the flower part of *Mimosa pudica L.* as medicine. However, there were also regions in Sumatra that used other parts of *Mimosa pudica L.*, most of which used the leaves. Meanwhile, the Nusa Tenggara region only used the roots for treatment, not using other

Table 1 Regions Division of Medicinal Plant of *Mimosa pudica L.* and Its Utilization in Indonesia

Region	Total Provinces	Total Ethnics	Utilization (number of concoction)
Sumatra	7	21	Skin diseases (4); Rheumatism, gout (5); Tumor, cancer (3); Hemorrhoids (3); Cough (2); Cold (1); Fever (1); Dental & oral (2); Stroke, paralysis (1); High blood pressure (1); Stomach ache (1); Gastritis (1); Diabetes (1); Hernia (1); Muscle spasm (1); Epileptic (1)
Kalimantan	4	14	Skin diseases (2); Tumor, cancer (2); Jaundice (2); Urination disorders (2); Pre & post natal care (1); High cholesterole (1); High blood pressure (1); Stress, mental health (1); Insomnia (1); Diabetes (1); Bone injury (1); Vitality (1)
Java	3	4	Skin diseases (1); Back pain (1); Vitality (1); Feverish (Panas dalam) (1); Eye disease (1)
Sulawesi	4	12	Cough (2); Tumor, cancer (2); Hemorrhoids (2); Jaundice (2); Rheumatism, gout (1); Insomnia (1); Eye disease (1); Fever (1); Diabetes (1); Stomach ache (1)
Nusa Tenggara	1	3	Sexually transmitted diseases (1); Thypus (1); Epileptic (1)
Maluku	2	13	Skin diseases (2); Cough (2); Rheumatism, gout (1); Stamina (1); Muscle spasm (1); Diabetes (1); Shortness of breath (1); Pre & post natal care (1); Baby & child care (1); Sexually transmitted diseases (1); HIV/AIDS (1); Constipation (1); Magical/spiritual (1)
Papua	2	13	Cough (2); Rheumatism, gout (2); Hemorrhoids (1); Stomach ache (1); Diarrhea (2); Diabetes (1); Back pain (1); Stroke, paralysis (1); Baby & child care (1); Tumor, cancer (1); Shortness of breath (1); Myalgias (1); Measles (1)
Total	23	80	

parts of *Mimosa pudica L.* (Table 2).

From every major island in Indonesia, suach as Java, Kalimantan, Sulawesi, Maluku, and Papua, there were battra that used medicinal concoctions containing *Mimosa pudica L.*. The spread throughout the islands proved that there was a diversification of plants and medicinal herbs across Indonesia and good local knowledge about traditional medicine. Based on the ingredients, 47 (44.3%) of the concoctions came from a single plant, 42 (39.6%) of the concoctions consisted of 2–5 ingredients, and the remaining 17 (16.0%) of the concoctions had six or more ingredients. The use of combination concoctions (multi-plant) was likely to increase the potential of the main plants. Using ingredients in large quantities (more than five ingredients) required attention, such as whether each ingredient has known benefits or whether the combination of these ingredients provides the benefits as expected.

In terms of concoctions preparation, there were four concoctions whose ingredients were dried before being mixed 3.8%). The rest, or more than 90% of the ingredients, were made directly from fresh ingredients. One concoction was made into a pill preparation (0.9%). Reducing the size of the ingredients before extracting the juice was done by grinding,

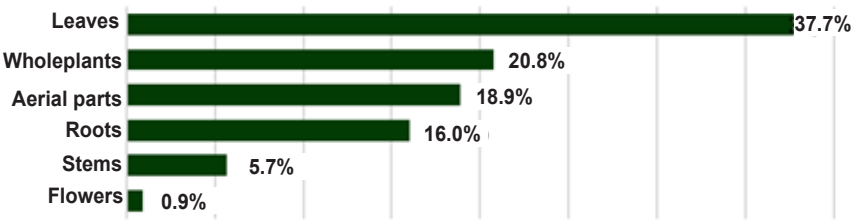

Figure 4 Proportion of *Mimosa pudica L.* Parts Used in the Concoction

Table 2 Regions Division of *Mimosa pudica L.* and Parts of the Plant Used

Region	Total Provinces	Total Ethnic Groups	Parts of the plant used (%)					
			Flowers	Leaves	Stems	Roots	Aerial parts	Whole Plant
Sumatra	7	21	100	34.1	40.0	29.4	15.8	33.3
Kalimantan	4	14	0	24.4	0	23.5	10.5	0
Jawa	3	4	0	2.4	0	0	10.5	4.8
Sulawesi	4	12	0	17.1	40.0	23.5	10.5	9.5
Nusa Tenggara	1	3	0	0	0	17.7	0	0
Maluku	2	13	0	17.1	0	5.9	15.8	23.8
Papua	2	13	0	4.9	20.0	0	36.9	28.6
Total	23	80	100	100	100	100	100	100

chewing, cutting, chopping, pounding, crushing, and kneading. Extracting compounds considered useful (the ingredients's essence) was done by taking the liquid essence after the ingredient were ground, boiled, heated over a fire until the ingredient wilted, or soaked in hot water. Water was the solvent that was usually used. However, some herbs used other than water as solvents or to help stick ingredients together, for example, vegetable oil and coconut milk (3 of 106).

Most of these concoctions were administered orally (internal use), namely 69 concoctions (65.1%). The rest was for external use, for example, by applying it to the skin, for bathing, dropping it, and inserting it into certain parts of the body. External use was predominantly used as a skin treatment. Some concoctions were prepared by being chewed by the battra before being given to the patient (3 of 106). This procedure was certainly unhygienic and risky if the battra had infectious conditions. This study also found several concoctions that were at risk of being unclean in their administration, such as inserting the ingredients into the rectum to treat haemorrhoids (1 of 106), inserting the ingredients into the cavity (1 of 106), and dropping them into the eyes (2 of 106).

Discussion

The results showed that the top ten utilisation of *Mimosa pudica L.* for skin diseases are rheumatism/gout, tumour/cancer, cough, haemorrhoids, diabetes, back pain, jaundice, insomnia, and stomach ache. In line with the results study, several previous studies about pharmacological activity of *Mimosa pudica L.* had been proven to have various health benefits, use as antibacterial,[14] antimicrobial,[15] antidermatoheliotic and skin reinstating potential[16] for skin diseases, antidiabetic,[17–19] sedative[20] for insomnia, anticancer,[21] antihyperbilirubinemia,[22] and hepatoprotector[23,24] for jaundice treatment, and mucolytic,[25] for cough treatment. Although in this study *battra* in several ethnic groups in 7 regions in Indonesia empirically stated that the *Mimosa pudica L.* plant can be used as a concontion to treat rheumatism/gout, haemorrhoids, back pain, and stomach ache, previous studies have not found similiarities in pharmacological activity for these diseases.

Several studies have confirmed that all parts of the *Mimosa pudica L.* plant have health benefits that could be utilized for traditional herbal medicine, such as whole parts,[15] roots,[22] aerial parts,[25] leaves,[27] stems,[29] and flowers.[30] Previous studies have stated that *Mimosa pudica L.* leaves are the most popular part that could be used for many pharmacological activities, such as antibacterial,[14] antidiabetic,[17–19] sedative,[20] hepatoprotector,[23,24] anthelmintic,[26] anticholesterol,[27] and antihyperlipidemia.[28]

Antioxidant compounds such as flavonoids and phenolics found in *Mimosa pudica L.* play an important role in reducing oxidative stress, which is known to accelerate cell aging and increase the risk of degenerative diseases. *Mimosa pudica L.*, which has antidiabetic, antihyperlipidemic, and anticholesterol effects, can support the management of chronic diseases that often occur in the elderly. Compounds such as alkaloids and mimosine in this plant can inhibit the inflammatory process that worsens cell damage in the brain and other tissues associated with aging. The sedative effect of *Mimosa pudica L.* can also help with insomnia, the prevalence of which increases with age, mainly due to physiological changes in the nervous system and disturbed sleep patterns in the elderly. This condition can be exacerbated by other health disorders such as chronic diseases, depression, or neurodegenerative disorders, which are also

common in the elderly.

The limitation of this study is that the use of concoctions for various treatments by battra is still empirical data, so this is a step to facilitate the mapping of the potential of *Mimosa pudica L.* as a cheap and effective natural medicine raw material. Not all battra clearly mention the benefits of herbs, for example for the use of diseases that cannot be translated medically, it is only justified as "other health disorders".

In conclusion, this study shows that *Mimosa pudica L.* has various pharmacological activities that are in line with its use in traditional medicine, including wound healing, antibacterial, antimicrobial, antidiabetic, sedative, anticancer, and more. In addition, *Mimosa pudica L.* has the potential to overcome ageing-related diseases due to its antioxidant and anti-inflammatory properties, which may contribute to delaying cell aging and managing chronic conditions commonly associated with aging, such as antidiabetic, anticancer, anticholesterol and antihyperlipidemia. Further studies are needed to evaluate the effectiveness and efficiency of multi-ingredient herbal medicine, as well as preparation and administration related to hygiene.

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