

Herbal medicines sold in Wonosobo Traditional Markets, Indonesia

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Abstract. Tsurayya DA, Saleh DA, Renaldi DR, Rizka DR, Widyaningyas R, Yasa A, Iskandar J, Saensouk S, Setyawan AD. 2025. Herbal medicines sold in Wonosobo Traditional Markets, Indonesia. *Asian J Ethnobiol* 8: 13-25. Medicinal plants hold a significant role in the field of medicine, health, and cultural preservation and are generally available at traditional markets. This study aims to document the species and the utilization of medicinal plants sold at traditional markets, in Wonosobo District, Central Java, Indonesia. The study employed a descriptive qualitative method through observations and direct interviews with 100 medicinal plant vendors. The results show that the total number of medicinal plants sold in Wonosobo's traditional markets, namely, Kertek Market and Wonosobo Induk Market, reached a total of 70 species with 34 families, i.e., 59 species at Kertek Market and 66 species at Wonosobo Induk Market, with 51.4% of suppliers coming from Wonosobo and 48.6% from Yogyakarta, dominated by the Zingiberaceae family. The most commonly used parts of medicinal plants for consumption are leaves and seeds, with boiling being the most common preparation method. The most expensive plant found is the jasmine flower, with a price of IDR 400,000/kg (1 USD = 15,500 IDR). As developments progress, traditional markets offer easy consumption of medicinal plants in the form of medicinal concoctions such as *jamu*, *wedang uwuh*, and *kembang sawanan*.

Keywords: Health, *jamu*, medicinal plants, traditional market

INTRODUCTION

The relationship between humans and plants is recognized as an important factor in human civilization's development, especially in medicine (Jadid et al. 2020). According to the World Health Organization, traditional medicine derived from medicinal plants encompasses all skills, knowledge, and practices based on theories, beliefs, and experiences from various cultures, whether scientifically explainable or not. However, it's important to note that many of these traditional practices have been found to have a scientific basis, with active compounds in plants being used in modern medicine (Che et al. 2024). The use of medicine to treat and prevent various diseases has a long history. It was first discovered when archaeologists found engravings on Sumerian clay tablets, dating back about 5000 years, depicting the use of medicinal plants for treatment. This discovery was followed by various other documents that recorded the use of natural products over time. The use of herbal medicine varies depending on the historical era, as recorded in the "Ebers Papyrus" from ancient Egypt, the *Materia Medica* from China, *Ayurveda* from India, and many others (Elkordy et al. 2021). In ASEAN countries, especially in

Indonesia, indigenous communities have learned how to use herbal plants to treat various diseases and wounds, knowledge that has been passed down from generation to generation (Liu 2021).

2020). Herbal medicine, also known as traditional medicine, includes various parts of plants, the top parts of the plant such as flowers, fruits, leaves, seeds, and stems, as well as underground parts like roots, tubers, bulbs, and rhizomes (Muyumba et al. 2021). Medicinal plants can be found in traditional markets. Traditional markets serve as a meeting place for traders and buyers, where supply and demand activities are carried out through buying and selling interactions (Iskandar et al. 2018). Medicinal plants are highly sought after in traditional markets due to their availability at affordable prices (Silalahi et al. 2015). In addition to the affordability of medicinal plants, the potential for fewer side effects compared to synthetic drugs has attracted the attention of health enthusiasts (Liu et al. 2020). Traditional herbal medicine is constructive, and optimal results are achieved when the concoction is consumed regularly. The side effects of traditional medicine are not the same as synthetic drugs because medicinal plants have mechanisms to counteract or neutralize those side effects. Medicinal plants encompass

all species of plants known to contain beneficial and therapeutic compounds that can prevent, reduce, or cure diseases (Nursamsu et al. 2024). These plants also generate a variety of organic compounds thought to possess medicinal properties (Mais et al. 2018; Diniz et al. 2020).

One of the places where the diversity of medicinal plant species is traded is the traditional market in Wonosobo. This study uses Kertek Market (*Pasar Kertek*) and Wonosobo Induk Market (*Pasar Induk Wonosobo*) as the main locations. These markets are important points for biodiversity and knowledge research because they originate from areas that are ecologically, culturally, and geographically diverse (Santana et al. 2024). In addition, Kertek Market and Wonosobo Induk Market are considered the study areas because both are thriving economic hubs that are accessible and open on a daily basis. The trade of medicinal plants is not only essential for health purposes but also economic development of the area (Ahmad et al. 2018). Suppliers from both markets generally come from local farmers or outside the area. Local farmers, as suppliers, will provide information about quality, including prices, to other actors (producers, collectors, processors, wholesalers, and retailers) to understand their target market (Palash et al. 2021). Besides local farmers, suppliers can also come from other regions and send their products to traditional markets. It means there is a cross-regional trade distribution network, reflecting market dynamics and the increasing consumer demand for medicinal plants. The trade of herbal plants is part of the traditional healthcare system, where indigenous communities share valuable traditional and biological knowledge (Nguyen et al. 2019).

This study aims to document the diversity, uses, suppliers, prices, and health benefits of medicinal plants sold in traditional markets in Wonosobo, Central Java, Indonesia. The need for an inventory of medicinal plants is also intended to disseminate local knowledge to a broader community, thereby maximizing its benefits.

MATERIALS AND METHODS

Study area

The study area consists of the two biggest traditional markets in Wonosobo District, Central Java, Indonesia, namely Kertek Market (*Pasar Kertek*) and Wonosobo Induk Market (*Pasar Induk Wonosobo*) (Figure 1). Kertek Market is located on Parakan Street No. 105A Kertek, Wonosobo, with coordinates $-7^{\circ}.38'98.99''$ S, $109^{\circ}.96'34.36''$ W. The Kertek traditional market serves as a trading center for agricultural commodities and occupies a strategic location along the Banyumas-Magelang distribution route. (Wungo et al. 2024). Besides that, Wonosobo Induk Market is located at Serayu Street No. 2, Wonosobo, with coordinates $-7^{\circ}.36'26.12''$ S, $109^{\circ}.90'12.01''$ W. The market's location in an urban area makes it a node of the transportation network, the center of population activity, and the main service point in infrastructure in the Wonosobo District (Widayat and Purwanto 2020).

Data collection

The primary data collected in this research were obtained through plant surveys and interviews. Surveys were conducted primarily to determine the diversity of medicinal plants. In contrast, interviews with a semi-structured system were conducted mainly to assess their use as medicinal components, as well as local diversity and names (Igustita et al. 2023). The interview technique was carried out using purposive sampling with 100 respondents using the criteria of herbal medicine traders at Kertek Market and Wonosobo Induk Market. The data collected includes local names, parts of plants used, basic ingredients for herbal medicines, benefits, manufacturing processes, supplies, and prices of medicinal plants. The information collected from the survey is entered into a tally sheet to facilitate data recapitulation after the field survey is completed and then processed through data analysis to conclude.

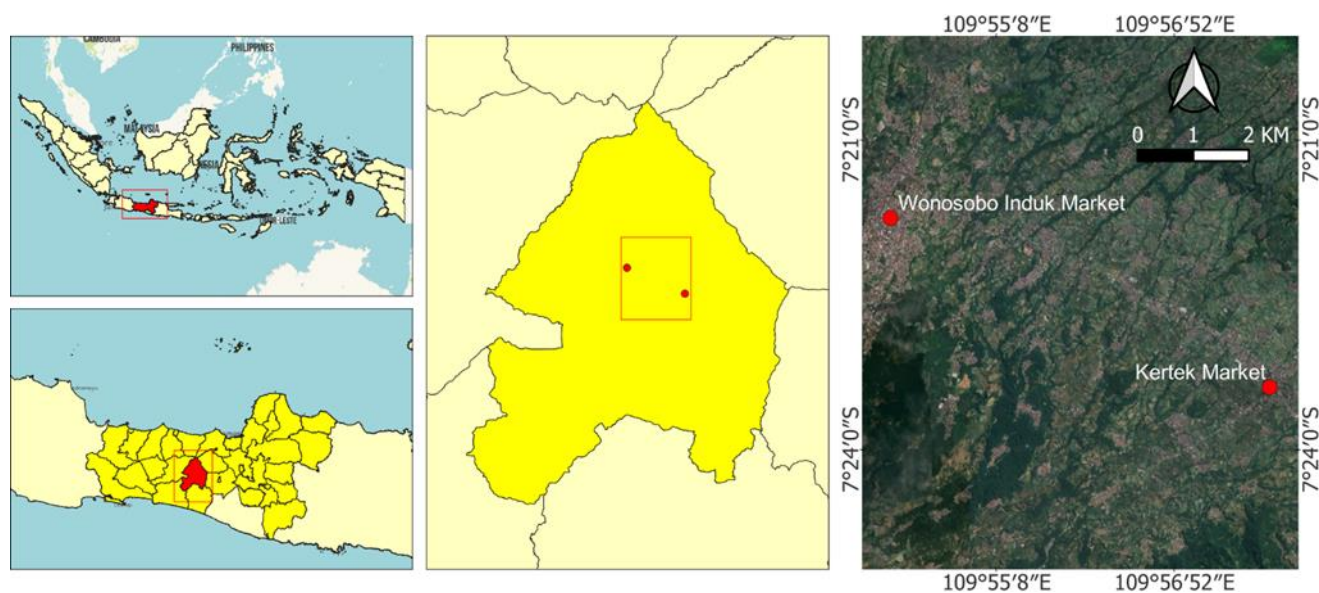


Figure 1. Map of study area in Kertek Market and Wonosobo Induk Market, Wonosobo District, Central Java, Indonesia

Data analysis

This research used a qualitative descriptive approach to gain an in-depth understanding of the diversity of medical plants and the social, economic, and cultural impacts of trading practices at Kertek Market and Wonosobo Induk Market. Data analysis was done by identifying medicinal plants to obtain their scientific names, followed by a descriptive explanation of the data. The data analysis was then presented in tables, figures, and graphs (Fakchich and Elachouri 2021).

RESULTS AND DISCUSSION

Wonosobo's traditional market profile

Wonosobo District has several traditional markets that still exist today despite the rapid development of the times. The existence of traditional markets is a symbol of the continuation of tradition as well as a driver of the local economy that is attractive and able to adapt to changing times. These traditional markets include Kertek Market and Wonosobo Induk Market, which open daily and are the two largest traditional markets in Wonosobo District. Both markets have striking similarities, especially in the diversity of medicinal plants sold. Wonosobo Induk Market provides a complete range of medicinal plants for the community's needs, ranging from *jahe* (*Z. Officinale*) and *kunir* (*C. longa*) to herbal concoctions (Khasanah and Hermawan 2020). Similarly, Kertek Market provides other medicinal plants such as *bangle* (*Z. purpureum*), *kunir* (*C. longa*), and *sambiroto* (*A. paniculata*). The diversity of medicinal plants available in Kertek Markets and Wonosobo Induk Market is a clear indication of the stability of the market. This stability is supported by the fact that many people in Wonosobo District still believe in the efficacy of medicinal plants for consumption as an alternative natural treatment (Pratama and Lestarini 2021). The use of medicinal plants for various daily needs is still closely related to traditions in Wonosobo District. The use of medicinal plants as herbal medicine continues to develop, and they are used for healing and maintaining the health of local communities, as the research conducted by Supriyani et al. (2019), which stated that the tradition of employing traditional medicine remains robust in Wonosobo. The high demand for medicinal plants ensures their availability remains stable in Kertek Market and Wonosobo Induk Market, providing a reliable source for these traditional remedies.

Respondent characteristics

The respondents in this study were herbal medicine and spice traders from Kertek Market and Wonosobo Induk Market, totaling 100 people aged 25-80 years. The respondents obtained from each market consisted of 50 respondents (Table 1). The majority of the respondents were women because the trader of herbal medicine and

spices in both markets was dominated by women because women dominated the trading of herbal medicine and spices in both markets. According to Silalahi et al. (2015), the dominance of female sellers is due to differences in knowledge between men and women in medicinal plants, which is closely related to family traditions, where this knowledge is generally inherited from women, such as mothers or grandmothers. In addition, the trade of medicinal plants benefits women because this profession allows them to earn a living while also engaging in parenting. Based on the data in the table, the distribution of respondents' education levels shows variations that reflect their different educational backgrounds. Education is commonly considered crucial for boosting the quality of business practices among traders (Babajide et al. 2023). However, according to Pant et al. (2015), education has little influence on individuals' decisions to use traditional medicine. Instead, family traditions, habitual practices, and guidance from ancestors play a more dominant role.

Diversity of medical plants in Kertek Traditional Market and Wonosobo Induk Traditional Market

The results of the identification of medicinal plant diversity found in Kertek Traditional Market and Wonosobo Induk Market include local names, Latin names, and the family of each plant. These data present information on the availability of plants, commonly used parts, processing methods, prices, and their benefits, as shown in Table 2.

Table 1. Characteristics of herbal medicine seller in Traditional Market Wonosobo, Central Java, Indonesia (n=100)

Information	Count	Percentage
Traditional Seller		
Kertek Market	50	50%
Wonosobo Induk Market	50	50%
Age		
20-30	7	7%
31-40	13	13%
41-50	26	26%
51-60	28	28%
61-70	19	19%
71-80	7	7%
Gender		
Male	19	19%
Female	81	81%
Education		
Uneducated	18	18%
Elementary	37	37%
Junior High School	25	25%
Senior High School	18	18%
University	2	2%

Table 2. Diversity of medicinal plants at the Traditional Market, Wonosobo, Central Java, Indonesia

Family	Scientific name	Indonesian name [common name]	Part used	Making process	Benefit	Availability		Supply	Price (IDR)
						KM	IM		
Acanthaceae	<i>Strobilanthes crispera</i> (L.) Bremek.	<i>Keji Beling</i> (Glass Splinter)	Leaf	Boiled	Facilitates urination	-	●	Yogyakarta	25,000/kg
Acanthaceae	<i>Andrographis paniculata</i> (Burm.f.) Wall. ex Nees	<i>Sambiroto</i> (Green Chiretta)	Leaf	Boiled	Reduces fever, treats diabetes	●	●	Yogyakarta	20,000/kg
Achariaceae	<i>Pangium edule</i> Reinw ex Blume	<i>Kluwek</i> (Pangium edule)	Seed	Soaked for 3 days then boiled	Reduces the risk of cardiovascular diseases such as stroke and heart disease	●	-	Wonosobo	2,000/seed
Acoraceae	<i>Acorus calamus</i> L.	<i>Dlingo</i> (Sweet Flag)	Root	Pounded	Reduces muscle pain and treats epilepsy, relieves headaches, gout, and migraines	●	●	Wonosobo	35,000/kg
Annonaceae	<i>Cananga odorata</i> (L.) Hook.f & Thomson	<i>Kenanga</i> (Ylang-ylang)	Flower	Boiled	Helps relieve anxiety and stress, supports skin health	-	●	Yogyakarta	50,000/kg
Apiaceae	<i>Anethum Graveolens</i> L.	<i>Adas Sowa</i> (Fennel Sowa)	Leaf	Boiled	Increases breast milk production, relieves bloating	●	●	Yogyakarta	55,000/kg
Apiaceae	<i>Foeniculum vulgare</i> Mill.	<i>Adas Pulowaras</i> (Fennel)	Root	Boiled	Boosts stamina and improves digestion	-	●	Yogyakarta	50,000/kg
Apiaceae	<i>Cuminum cyminum</i> L.	<i>Jinten</i> (Cumin)	Seed	Pounded, then boiled	Helps with bloating, reduces inflammation in the body, and relieves digestive issues and	●	●	Yogyakarta	100,000/kg
Apiaceae	<i>Coriandrum sativum</i> L.	<i>Ketumbar</i> (Coriander)	Seed and Leaf	Pounded, then boiled	Anti-inflammatory properties, improves digestion and lowers cholesterol levels	●	●	Wonosobo	30,000/kg
Apocynaceae	<i>Alyxia Stellata</i> (JRForst. & G. Forst.) Roem. & Schult.	<i>Adas Pulosari</i> (Maile)	Bark	Brewed	Treats asthma, cough, overcome irregular menstruation, and improves digestion	●	●	Yogyakarta	90,000/kg
Apocynaceae	<i>Parameria laevigata</i> (Juss.) Moldenke.	<i>Kayu Rapet</i> (Rapet Wood)	Bark	Dried, then boiled	Heals postpartum wounds, treats vaginal discharge	●	●	Yogyakarta	50,000/kg
Arecaceae	<i>Areca catechu</i> L.	<i>Pinang</i> (Areca Nut)	Seed	Boiled	Helps improve oral health	●	●	Wonosobo	10,000/kg
Asparagaceae	<i>Agave amica</i> (Medik.) Thiede & Govaerts	<i>Bunga Sedap malam</i> (Sedap malam flower)	Flower	Pounded, then infused	Keeps blood pressure stable, and maintains blood vessel health	●	-	Yogyakarta	200,000/kg
Asteraceae	<i>Chrysanthemum morifolium</i> L.	<i>Kembang Seruni</i> (Chrysanthemum Flower)	Flower	Soaked, then boiled	Improves the immune system supports eye and mouth health, treats high blood pressure.	-	●	Yogyakarta	60,000/kg
Clusiaceae	<i>Garcinia mangostana</i> L.	<i>Kulit Manggis</i> (Mangosteen peel)	Peel	Dried, then boiled	Antioxidant, good for boosting the immune system, protecting skin, and lowering cholesterol	-	●	Yogyakarta	100,000/kg
Euphorbiaceae	<i>Aleurites moluccanus</i> L.	<i>Kemiri</i> (Candlenut)	Seed	Pounded, then boiled	Help lower cholesterol levels, supports hair and skin health.	●	●	Wonosobo	60,000/kg
Fabaceae	<i>Tamarindus indica</i> L.	<i>Asam Jawa</i> (Tamarind)	Fruit	Boiled	Improves digestion and relieves constipation	●	●	Wonosobo	25,000/kg

Fabaceae	<i>Clitoria ternatea</i> L.	<i>Bunga telang</i> (Telang flower)	Flower	Boiled	Enhances memory, maintains eye health	-	●	Yogyakarta	300,000/kg
Fabaceae	<i>Psophocarpus tetragonolobus</i> (L.) DC	<i>Cipir</i> (Winged Bean)	Seed	Boiled	Help in weight loss programs and relieves inflammation and sprains, strengthens the immune system	-	●	Yogyakarta	80,000/kg
Fabaceae	<i>Parkia timoriana</i> (DC.)Merr	<i>Dawung</i> (Tree bean)	Seed	Pounded, then boiled	Accelerates skin healing, heals wounds	●	●	Yogyakarta	70,000/kg
Fabaceae	<i>Senna Alexandrina</i> Mill.	<i>Jati Cina</i> (Chinese teak)	Leaf	Brewed	Improves bowel movements	●	●	Yogyakarta	50,000/kg
Fabaceae	<i>Trigonella foenum-graecum</i> L.	<i>Klabet</i> (Fenugreek)	Seed	Soaked, then boiled	Lowering blood sugar levels, increases breast milk production, and supports digestive health	-	●	Yogyakarta	200,000/kg
Fabaceae	<i>Biancaea sappan</i> (L.) Tod.	<i>Secang</i> (Caesalpinia Sappan)	Bark	Boiled	improves blood circulation, is an antioxidant, refreshes the body	●	●	Yogyakarta	40,000/kg
Fagaceae	<i>Quercus infectoria</i> Olivier.	<i>Manjakani</i> (Oak Galls)	Gall	Boiled	Helps tighten the vaginal area and heal wounds	●	●	Yogyakarta	300,000/kg
Lamiaceae	<i>Ocimum basilicum</i> L.	<i>Biji selasih</i> (Basil seed)	Seed	Soaked	Improves digestion, relieves constipation	●	●	Wonosobo	70,000/kg
Lamiaceae	<i>Orthosiphon aristatus</i> (Blume)Miq.	<i>Kumis kucing</i> (kidney tea plants)	Leaf	Boiled	facilitates urination, treats urinary tract infections	●	●	Yogyakarta	20,000/kg
Lauraceae	<i>Litsea cubeba</i> (Lour.) Press.	<i>Krangean</i> (Pheasant pepper tree)	Seed and Stem	Boiled	Reduces fever, treats diarrhea	●	●	Yogyakarta	50,000/kg
Lauraceae	<i>Cinnamomum zeylanicum</i> Blume.	<i>Manis janggan</i> (Cinnamon)	Stem	Boiled	Treats cough, nausea, and stomach disorders	●	●	Yogyakarta	100,000/kg
Lauraceae	<i>Cryptocarya massoia</i> (Oken) Kosterm.	<i>Mesoyi</i> (Massoia)	Stem	Boiled	Calms nerves, relieves ulcers	●	●	Yogyakarta	300,000/kg
Malvaceae	<i>Hibiscus sabdariffa</i> L.	<i>Rosela</i> (Roselle)	Flower	Brewed	Lowering blood pressure, improves the immune system, and supports heart health	-	●	Yogyakarta	30,000/kg
Meliaceae	<i>Swietenia mahagoni</i> (L.) Jacq.	<i>Mahoni</i> (Mahogany tree)	Seed	Pounded, then boiled	Lowers blood pressure	●	●	Yogyakarta	45,000/kg
Menispermaceae	<i>Tinospora cordifolia</i> (Willd.) Miers	<i>Brotowali</i> (Bittervine)	Stem	Boiled	Increases appetite, reduces fever, treats diabetes	●	●	Wonosobo	10,000/kg
Moringaceae	<i>Moringa oleifera</i> L.	<i>Daun kelor</i> (Moringa leaf)	Leaf	Boiled	Containing antioxidants, helps lower blood sugar, and strengthens the immune system	●	●	Wonosobo	7,500/kg
Myristicaceae	<i>Myristica fragrans</i> Houtt.	<i>Pala</i> (Nutmeg)	Seed	Pounded, then brewed	Improves digestion, increases appetite, and relieves insomnia	●	●	Wonosobo	130,000/kg
Myrtaceae	<i>Syzygium aromaticum</i> (L.) Merr. & Perry	<i>Cengkeh</i> (Cloves)	Flower	Boiled	Treats toothache, serves as a natural antiseptic	●	●	Wonosobo	160,000/kg
Myrtaceae	<i>Eucalyptus alba</i> Reinw. ex Blume	<i>Cepliksari</i> (White gum)	Flower	Boiled	Maintains liver health relieves menstrual pain, treats gout	●	●	Wonosobo	30,000/kg
Myrtaceae	<i>Syzygium polyanthum</i> (Wight) Walpers.	<i>Daun salam</i> (Bay Leaf)	Leaf	Boiled	has antioxidant and anti-inflammatory properties, improves digestion, lowers blood sugar levels	●	●	Wonosobo	10,000/kg
Myrtaceae	<i>Melaleuca leucadendra</i> (L.) L.	<i>Kayu Putih</i> (Eucalyptus)	Leaf	Boiled	Treats colds, headaches, and is anti-inflammatory	●	●	Wonosobo	20,000/kg

Oleaceae	<i>Jasminum sambac</i> (L.) Aiton	<i>Melati</i> (Jasmine Flower)	Flower	Dried, then brewed	Calms the mind, relieves stress	●	●	Wonosobo	400,000/kg
Pandanaceae	<i>Pandanus amaryllifolius</i> Roxb	<i>Pandan</i> (Screwpine)	Leaf	Boiled	Serves as an antioxidant to optimize organ functions	●	●	Wonosobo	10,000/kg
Phyllanthaceae	<i>Phyllanthus urinaria</i> L.	<i>Meniran</i> (Gale of the wind)	Leaf	Boiled	Acts as an anti-inflammatory, boosts immunity	●	●	Yogyakarta	60,000/kg
Piperaceae	<i>Piper retrofractum</i> Vahl	<i>Cabe Jawa</i> (Java Chili)	Fruit	Pounded, then boiled	Solves digestive problems, stimulates appetite	●	●	Yogyakarta	180,000/kg
Piperaceae	<i>Piper cubeba</i> L.fil.	<i>Kemukus</i> (Cubeb)	Seed	Brewed	Solves digestive problems, stimulates appetite, treats asthma or respiratory issues	●	●	Yogyakarta	300,000/kg
Piperaceae	<i>Piper nigrum</i> L.	<i>Merica</i> (Pepper)	Seed	Pounded	Boosts metabolism, and fights infections, improves digestion	●	●	Wonosobo	90,000/kg
Piperaceae	<i>Piper betle</i> L.	<i>Sirih</i> (Betel Pepper)	Leaf	Boiled	Eliminates bad breath, serves as a natural antiseptic	●	●	Wonosobo	20,000/kg
Poaceae	<i>Imperata cylindrica</i> (L.) P. Beauv.	<i>Alang-alang</i> (Reeds)	Root	Boiled	Lowers blood pressure, reduces fever	●	●	Wonosobo	60,000/kg
Poaceae	<i>Cymbopogon citratus</i> (DC). Stapf	<i>Sereh</i> (Lemongrass)	Stem and Leaf	Boiled	Help digestion, lowers blood pressure, and relieves inflammation	●	●	Wonosobo	4,000/kg
Rosaceae	<i>Rosa damascena</i> Mill.	<i>Mawar</i> (Rose Flower)	Flower	Dried, then brewed	Relieves stress, treats skin irritation	●	●	Wonosobo	50,000/kg
Rutaceae	<i>Citrus limon</i> (L.) Osbeck	<i>Jeruk Lemon</i> (Lemon)	Fruit	Squeezed	Increase immunity, maintain body weight, and helps overcome coughs	●	●	Wonosobo	20,000/kg
Rutaceae	<i>Citrus aurantiifolia</i> Swingle.	<i>Jeruk Nipis</i> (Lime)	Fruit	Squeezed	Boosts the immune system, helps overcome coughs, and supports skin health	●	●	Wonosobo	7,000/kg
Rutaceae	<i>Citrus hystrix</i> DC.	<i>Daun Jeruk wangi</i> (Fragrant Orange)	Leaf	Boiled	Help sleep disorders and supports the immune system	●	●	Wonosobo	20,000/kg
Santalaceae	<i>Santalum album</i> L.	<i>Kayu Cendana</i> (Sandalwood)	Stem	Dried, then boiled	Calms the mind, treats skin infections	●	●	Yogyakarta	25,000/kg
Schisandraceae	<i>Illicium verum</i> hook. fil.	<i>Pekak</i> (Star Anise)	Fruit	Boiled	Acts as an antibacterial, solves stomach disorders	●	●	Yogyakarta	160,000/kg
Solanaceae	<i>Physalis angulata</i> L.	<i>Ceplukan</i> (Ground cherry)	Leaf	Boiled	Treats diabetes, reduces inflammation	●	●	Yogyakarta	70,000/kg
Thymelaeaceae	<i>Aquilaria malaccensis</i> Lamk.	<i>Kayu Gaharu</i> (Aloes Wood)	Wood	Brewed	Has antibacterial properties, helps relieve stress, and improves sleep quality	-	●	Yogyakarta	200,000/kg
Thymelaeaceae	<i>Phaleria macrocarpa</i> (Scheff.) Boerl.	<i>Mahkota Dewa</i> (Crown of God)	Fruit	Brewed	Boosts immunity, lowers blood sugar levels	●	●	Yogyakarta	60,000/kg
Usneaceae	<i>Usnea</i> sp.	<i>Rasuk Angin</i> (Beard Lichen)	Root	Boiled	Treats colds, strengthens the digestive system	●	●	Yogyakarta	70,000/kg
Zingiberaceae	<i>Zingiber purpureum</i> Roxb.	<i>Bangle</i> (cassumunar ginger)	Root	Boiled	Anti-inflammatory, helps with digestive problems, and reduces muscle and joint pain	-	●	Wonosobo	20,000/kg
Zingiberaceae	<i>Zingiber officinale</i> Rosc.	<i>Jahe</i> (Ginger)	Root	Boiled	Prevents heart disease, relieves joint and muscle pain, treats nausea	●	●	Wonosobo	35,000/kg
Zingiberaceae	<i>Elettaria cardamomum</i> (L.) Maton	<i>Kapulaga</i> (Cardamom)	Seed	Boiled	Antioxidant, improves blood circulation, lowers cholesterol, prevents cancer and canker sores	●	●	Yogyakarta	120,000/kg

Zingiberaceae	<i>Etingera elatior</i> R.M.Sm.	<i>Kecombrang</i> (Torch Ginger)	Flower and Stem	Boiled	Act as an antioxidant and helps protect body cells from damage	●	-	Wonosobo	30,000/kg
Zingiberaceae	<i>Kaempferia galanga</i> L.	<i>Kencur</i> (Aromatic Ginger)	Root	Pounded, then boiled	Boosts stamina, treats cough.	●	●	Wonosobo	28,000/kg
Zingiberaceae	<i>Curcuma longa</i> L.	<i>Kunir</i> (Turmeric)	Root	Pounded	Helps smooth digestion, increases immunity, and treats inflammation	●	●	Wonosobo	15,000/kg
Zingiberaceae	<i>Curcuma zedoaria</i> (Christm.) Roscoe	<i>Kunir putih</i> (White Turmeric)	Root	Pounded	Antioxidant and anti-inflammatory properties, and good for treating digestive issues	●	●	Wonosobo	22,000/kg
Zingiberaceae	<i>Zingiber zerumbet</i> (L.) Roscoe ex Sm.	<i>Lempuyang</i> (Bitter ginger)	Root	Shredded, then boiled	Helps lower blood sugar, relieves fever, prevents ulcers	●	●	Wonosobo	7,000/kg
Zingiberaceae	<i>Alpinia galanga</i> (L.) Willd.	<i>Lengkuas</i> (Galangal)	Root	Crushed	Antioxidants that are beneficial for skin health, improves the digestive system, and relieves joint pain.	●	●	Wonosobo	10,000/kg
Zingiberaceae	<i>Curcuma aeruginosa</i> Roxb.	<i>Temu ireng</i> (Blue Turmeric)	Root	Boiled	Increases appetite, treats diabetes	●	●	Wonosobo	30,000/kg
Zingiberaceae	<i>Boesenbergia Rotunda</i> (L.) Mansf.	<i>Temu Kunci</i> (Fingerroot)	Root	Boiled	Acts as a tonic to strengthen the body and increases appetite.	●	●	Wonosobo	25,000/kg
Zingiberaceae	<i>Curcuma mangga</i> Roxb.	<i>Temu mangga</i> (Mango Ginger)	Root	Boiled	Help digestion, has anti-inflammatory properties, and supports liver health.	●	-	Wonosobo	20,000/kg
Zingiberaceae	<i>Curcuma zanthorrhiza</i> Roxb.	<i>Temulawak</i> (Curcuma)	Root	Boiled	Boosts immunity, treats inflammation, improves liver function,	●	●	Wonosobo	10,000/kg

Notes: ● : available, -: not available, KM: Kretek Market, IM: Wonosobo Induk Market



Figure 2. Various plants are used as herbal medicine at the Kertek Traditional Market and Wonosobo Induk Traditional Market, Wonosobo, Central Java, Indonesia. A. Kulit Manggis (*G. mangostana*); B. Bangle (*Z. purpureum*); C. Klabet (*T. foenum-graecum*); D. Secang (*B. sappan*); E. Jati Cina (*S. Alexandrina*); F. Pulosari (*A. Stellata*); G. Bunga Telang (*C. ternatea*); H. Jinten (*C. cyminum*); I. Cengkeh (*S. aromaticum*); J. Manis Jagan (*C. zeylanicum*); K. Mahkota Dewa (*P. macrocarpa*); L. Manjakani (*Q. infectoria*); M. Kapulaga (*E. cardamomum*); N. Cabe Jawa (*P. retrofractum*); O. Mesoyi (*C. massoy*); P. Brotowali (*T. cordifolia*); Q. Mahoni (*S. mahagoni*); R. Kembang Seruni (*C. morifolium*); S. Pinang (*A. catechu*); T. Kemukus (*P. cubeba*)

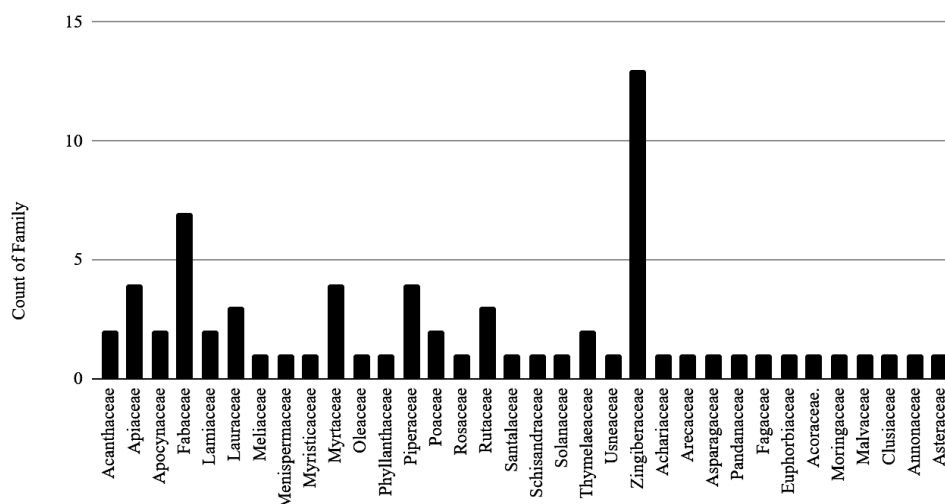


Figure 3. Family of medicinal plants

Research on the diversity of medicinal plants in the traditional markets of Wonosobo District showed that 59 species of medicinal plants were discovered in Kertek Traditional Market and 66 species in Wonosobo Induk Market. Documentation of various plants used as herbal medicine in Kertek Traditional Market and Wonosobo Induk Market can be seen in Figure 2. The identification of families from all species of medicinal plants resulted in 34 families, as shown in Figure 3. The diversity of medicinal plants traded in the traditional markets of Wonosobo District is consistent with the research conducted by Deanova et al. (2021), who found 28 families and 105 species of medicinal plants in the Ir. Soekarno Market in Sukoharjo. Another study by Nguyen et al. (2019) found 57 families and 99 species of medicinal plants in traditional markets of Son La province, Vietnam. Meanwhile, a study by Iskandar et al. (2020) found 23 families and 35 species of medicinal plants in the traditional village markets of Karangwangi Village, Southern Cianjur, West Java, Indonesia. This diversity reflects the important role of traditional markets in providing the necessary medicinal plant materials to the community and serving as a center for the exchange of culture and knowledge about natural medicine.

Based on Table 2, Zingiberaceae is the family with the highest number of medicinal plant species in Kertek Traditional Market and Wonosobo Induk Market. This family consists of various species that are widely used as medicinal plants. Zingiberaceae is a perennial herbaceous plant with rhizomes containing volatile oils with a strong aroma. According to research conducted by Tran-Tung et al. (2024) in Vietnam, Zingiberaceae is one of the families that contain many essential oils, such as ginger with monoterpenes and sesquiterpenes derivatives, which are widely used in medicine, food, and flavor industries. The dominance of Zingiberaceae family medicinal plants sold by traders in the Wonosobo Traditional Market is supported by the ease of cultivation, especially in the Wonosobo District.

Part of the medicinal plants used

Based on Figure 4, the most commonly used parts of medicinal plants sold at the Kertek Traditional Market and Wonosobo Induk Market are leaves, seeds, and roots which is 15 species each. According to Acharya et al. (2015), leaves are the easiest part of medicinal plants to find. Leaves are also easy to find because almost every medicinal plant has plant parts (Wubu et al. 2023). Leaves are easy to harvest without special techniques (Valdez et al. 2024). This is due to their easy accessibility in the surrounding environment (Ayele et al. 2024). The leaves have a soft texture and are easily extracted for use as medicine (Khan et al. 2014). According to the research by Constantine et al. (2024), leaves are the most commonly used plant part for making medicine by traditional healers in Kyerwa District. These healers, with their deep understanding of the local flora, have identified the seeds as the dominant use of other parts of medicinal plants is the seeds. These seeds are used in traditional medicine to strengthen the immune system and promote general health. Seeds also contain bioactive compounds, including alkaloids, flavonoids, and essential oils that act as anti-inflammatory, antibacterial, or anticancer agents (Sharma et al. 2021). In many cultures, medicinal plant seeds are also considered an important source of nutrients, providing essential vitamins and minerals for good health. In addition, roots are also a part of the plant that is often utilised as medicine. This is because the roots contain active compounds such as alkaloids, phenolics, glycosides as anti-bacterial immunomodulators. These components are useful for maintaining body freshness, improving blood circulation, preventing and healing diseases and restoring health (Adriadi et al. 2022).

Making process of medicinal plants

Based on Figure 5, the use of medicinal plants for consumption involves several processing methods. Observations of 70 species of medicinal plants identified 14 processing methods. Research findings indicate that

boiling is the most common method, accounting for 55.7% of all processes. According to Ssenku et al. (2021), boiling is the most commonly used method in the preparation of medicinal plants. Boiling increases the extraction and the concentration of active compounds from medicinal plants. In addition, boiling helps to preserve herbal medicines for a longer time. Boiling also makes the active compounds more easily absorbed by the body, thereby increasing the effectiveness of the medicine.

Medicinal plant suppliers

Based on Figure 6, the suppliers of medicinal plants in Wonosobo Induk Market and Kertek Market come from two areas, namely Wonosobo District (51.4%) and Yogyakarta Province (48.6%). Wonosobo District can serve as a supplier of medicinal plants due to its high and evenly distributed rainfall throughout the year, a crucial factor for plant growth. This is especially true for rhizomatous plants such as *empon-empon* (Nurhayati and Yusof 2022). According to research by Musa et al. (2023), in developing countries, medicinal plants have an important role in sustaining rural livelihoods. By cultivating medicinal plants, people can use them for medicinal purposes but also sell them to generate additional income. In addition, medicinal plants can be processed into products such as sachet drinks, increasing their commercial value. In addition to Wonosobo District, 48.6% of the medicinal plants in Wonosobo Induk Market and Kertek Market come from Yogyakarta Province.

Yogyakarta is known as one of the provinces in Indonesia rich in *empon-empon* or medicinal plants. One factor that supports Yogyakarta as a supplier of medicinal plants is its geographical conditions. In general, the soil conditions in Yogyakarta are fertile, making it suitable for the cultivation of various agricultural and plantation crops, including medicinal plants. This can be demonstrated through soil samples taken from agricultural land in the vicinity of Mount Merapi, a rural area influenced by volcanic ash deposits (Ramdhani et al. 2024.). Not only for shipment to other cities, but the people of Yogyakarta also have a long tradition of using medicinal plants for traditional medicine (Laplante 2016). The Yogyakarta government often conducts programs to support the development of medicinal plant cultivation, such as providing seeds, training, and processing facilities (Widowati and Wakid 2024). As a result, Kulon Progo is known as the "herbal medicine regency," where its residents regularly consume traditional herbal remedies (Arifin et al. 2021). It also encourages people to plant and develop medicinal plants in their respective areas. For example, Kiringan Herbal Tourism Village, located in Kiringan Hamlet, Canden Village, Jetis Subdistrict, Bantul Regency, Yogyakarta Province, plays a significant role in promoting herbal medicine and regional development. It is a center for herbal medicine in Bantul Regency with 132 herbal craftsmen, and it also serves as a tourist attraction, showcasing the rich tradition of herbal medicine in the region (Dewi et al. 2022).

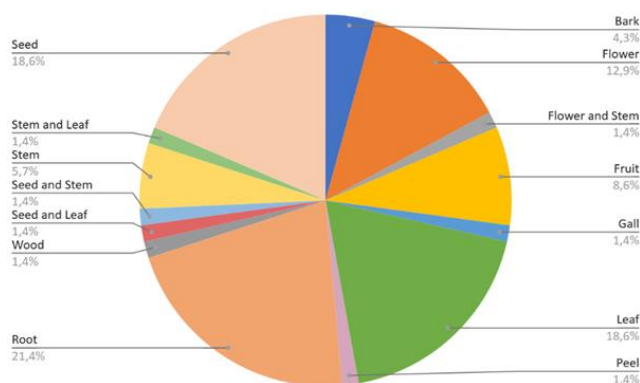


Figure 4. Used parts of medicinal plants

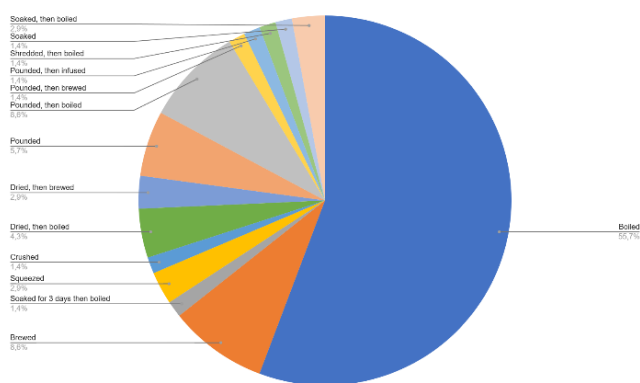


Figure 5. The making process of herbal medicine

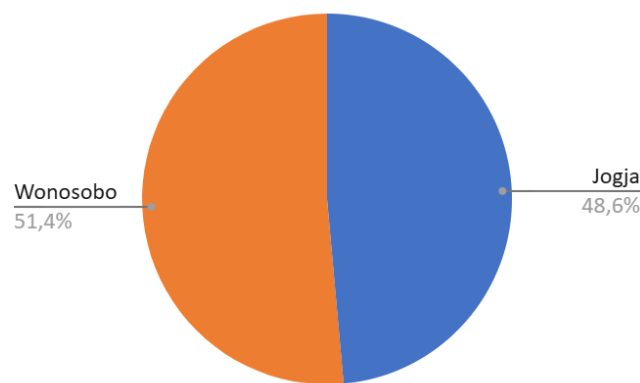


Figure 6. Medicinal plant suppliers

Price of medicinal plants

Based on Figure 6, the selling prices of medicinal plants in the Wonosobo Traditional Markets vary widely, ranging from IDR 2,000 to IDR 400,000/kg (1 USD = 15,500 IDR). The presence of suppliers from Yogyakarta influences the market prices in the Wonosobo area. This is because medicinal plants vary from one place to another due to the influence of local plant species, which affect the medicinal properties of the plants due to the complexity of their components and different characteristics (Wei et al. 2020).

In addition, some medicinal plants are difficult to find in Wonosobo, necessitating supplies from outside the area. As a result, plants sourced from outside regions, such as Yogyakarta, tend to have higher market values. For example, jasmine flowers are among the most expensive plants, with a price tag of IDR 400,000/kg. In addition to its aesthetic value and medicinal properties, the price of jasmine is high due to transportation costs and the specific cultivation techniques practiced in Yogyakarta. *kemukus* (*P. cubeba*), sold at IDR 300,000/kg, is also classified as an expensive plant; this spice has significant health benefits, especially in traditional medicine, and requires optimal growing conditions, which are difficult to find in Wonosobo. Another example is *cengkeh* (*S. aromaticum*), which is sold at IDR 160,000/kg; this spice has health benefits, and its superior quality is often sourced from Yogyakarta, where it is grown with appropriate techniques and climate. The high price also reflects distribution costs that are added when the product reaches Wonosobo. *biji selasih* (*O. basilicum*), at IDR 70,000/kg, and *cabe jawa* (*P. retrofractum*), at IDR 180,000/kg, are also imported from other regions and command relatively high prices due to quality factors and high demand.

In contrast, some medicinal plants that are easily found in Wonosobo are sold at much lower prices. For example, *sereh* (*C. citratus*), sold at only IDR 4,000/kg, and *daun kelor* (*M. oleifera*), at IDR 7,500/kg, are affordable plants that can be easily grown in Wonosobo without the need for distribution from outside the area. *Jahe* (*Z. officinale*), priced at IDR 35,000/kg, and *temu ireng* (*C. aeruginosa*), priced at IDR 10,000/kg, are also very affordable as both can thrive in the surrounding areas of Wonosobo. The cool highland geography makes this area ideal for the cultivation of various medicinal plants (Suhesti et al. 2021). These price variations show that while many high-value products are sourced from Yogyakarta, Wonosobo still offers a variety of locally available plants at budget-friendly prices. This range of price options allows consumers to choose plants according to their budget and needs, whether from high-value or affordable categories readily available in the local market (Putri and Mariana 2022).

Benefits of medicinal plants

Medicinal plants have significant health benefits that are often used in traditional medicine for various diseases and provide a natural alternative. The results of this study indicate that 70 species of medicinal plants sold at Kertek Market and Wonosobo Induk Market have various health benefits, as shown in Table 2. Medicinal plants that have properties for women are *kayu rapet* (*P. Laevigata*), to treat postpartum wounds, overcome vaginal discharge, and *adas pulowaras* (*F. Vulgare*) to increase breast milk production. *das pulowaras* (*F. Vulgare*) is rich in organic acids, proteins, choline, trigonelline, and antioxidants, especially flavonoids (Agarwal et al. 2018). *sambiroto* (*A. Paniculata*), *temu ireng* (*C. aeruginosa*), and *brotowali* (*T. Cordifolia*) have antipyretic properties and help control blood sugar levels in the body, making them beneficial for people with diabetes. *Jati cina* (*C. ternatea*), *keji beling* (*I.*

cylindrica), and *kumis kucing* (*P. angulata*), can help overcome problems in the urinary system, such as urinary tract infections and facilitate urination. According to research conducted by Muliana (2024), the *kumis kucing* (*O. Aristatus*) plant can treat high blood pressure and is used to treat heart and liver diseases.

Plants that can be used to overcome respiratory problems such as cough, asthma, and other problems related to the respiratory system are *cabe jawa* (*C. cyminum*), *cipir* (*T. cordifolia*), *manis jangan* (*P. tetragonolobus*), *mahkota dewa* (*A. moluccanus*), *meniran* (*C. hystrix*), and *pulosari* (*A. Stellata*) have immunomodulatory properties that help strengthen the immune system and fight inflammation. In addition, *C. longa* can also help overcome inflammation and maintain immunity. In research by Alburyhi and El-Shaibany (2023), *C. longa* is used as a remedy for various diseases and conditions, including problems related to the skin, respiratory system, and digestive system, as well as to treat pain, wounds, sprains, and liver problems. Plants that help smooth digestion or treat constipation and other health problems related to the digestive system is *ketumbar* (*C. sativum*). This is shown in research conducted by Shahrabajian and Sun (2023) *ketumbar* (*C. sativum*) have been used as a remedy for digestive issues and rheumatism, as well as for treating worm infestations and joint pain. *Kayu cendana* (*S. album*) can threaten skin infections, and *cengkeh* (*S. aromaticum*) is a natural antiseptic for threatening toothache.

Plants that help lower high blood pressure, maintain heart health, and improve blood vessel function are *mahoni* (*S. mahagoni*), *alang-alang* (*I. cylindrica*), and *rosela* (*H. sabdariffa*). Plants that have anti-inflammatory properties that help relieve inflammation in joints and muscles are *bangle* (*Z. purpureum*), *jahe* (*Z. officinale*), and *lempuyang* (*Z. zerumbet*). Some plants also have a relaxing effect that helps calm the mind and overcome stress and anxiety, such as *melati* (*J. sambac*), *kenanga* (*C. odorata*), and *kayu gaharu* (*A. malaccensis*). Finally, some plants contain antioxidants that can help protect the body's cells from oxidative damage and maintain the body's health, such as *secang* (*B. sappan*), *kulit manggis* (*G. mangostana*), and *kecombrang* (*E. elatior*).

Medicinal plant traders at Kertek Market and Wonosobo Traditional Market not only sell medicinal plants separately, but some offer herbal concoctions in packaged form to be brewed into herbal drinks. These herbal concoctions (*jamu*), which include remedies for diabetes, hypertension, cholesterol, rheumatism, and rheumatic pain, are a practical solution. They not only combine ease of use but also provide significant health benefits, reassuring our well-being.

Wedang uwuh is a traditional beverage made from a blend of natural ingredients, including wood shavings, twigs, rhizomes, or dried leaves, along with ginger, clove leaves, cloves, cinnamon, cardamom, sappan wood shavings, and sugar crystal, providing beneficial properties; it tastes delicious and health benefits (Syamsuri et al. 2020). According to Setyowati et al. (2023), *wedang uwuh* is a drink rich in antioxidants, which helps to fight free

radicals, strengthen the immune system, and assist in overcoming various diseases such as influenza, colds, digestive problems, diabetes, and hypertension. It reflects the wealth of local knowledge and biodiversity of medicinal plants in Wonosobo District.

The role of medicinal plants in the daily lives of the Wonosobo people is reflected in their use as part of an ancestral tradition that is still preserved, namely the *kembang sawanan*. The use of flower concoctions in Javanese society is rooted in mythology and spiritual beliefs, continuing to this day. It has evolved into knowledge about health remedies, including the use of fruits for nutrition, phytochemicals, pharmacological benefits, and ethnomedicinal practices (Nardiati et al. 2023). According to Fadhillah (2022), the *sawan* phenomenon in Javanese culture is considered to be the result of interference from spirits who are healed through bathing using a mixture of several medicinal plants. The composition of the mixture for bathing *kembang sawanan*, which consists of *boreh bubuk* (made from *C. zanthorrhiza* and *O. sativa*), *bangle* (*Z. purpureum*), *bunga kanthil* (*M. alba*), *daun pandan* (*P. ammaryllifolius*), *daun sirih* (*P. betle*), *dlingo* (*A. calamus*), *jahe* (*Z. officinale*), *kunir* (*C. longa*), *mawar merah* (*R. multiflora*), and *mawar putih* (*R. alba*). From a health perspective, the *Sawanan* flower tradition has benefits such as aromatherapy, which helps improve or maintain health, raise the spirit, refresh and calm, and rejuvenate the body and mind. The combination of the aroma of these medicinal plants will cause a reaction to human feelings because the aroma sends certain signals to the part of the brain that regulates emotions. Inhaling essential oils from aromatic plants can directly stimulate the olfactory system and send signals to the brain (Cui et al. 2022).

Research on the diversity of medicinal plants in the Wonosobo Traditional Markets revealed 70 species with 34 families, i.e. 59 species at Kertek Market and 66 species at Wonosobo Induk Market, with the dominant family being Zingiberaceae. The most commonly used parts of medicinal plants for consumption are leaves and seeds, with boiling being the most common preparation method. The most expensive plant found is the jasmine flower, with a price of IDR 400,000/kg (1 USD = 15,500 IDR). As developments progress, traditional markets continue to offer these economically accessible resources of medicinal plants in the form of medicinal concoctions such as *jamu*, *wedang uwuh*, and *kembang sawanan*.

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