

## Diversity of edible plants traded in Legi Market, Surakarta, Indonesia

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**Abstract.** Nurshillah C, Anggorowati D, Putri ER, Balgis M, Nurwulandari M, Murtiningsih, Agustina N, Wulandari P, Liza N, Himawan W, Setyawan AD. 2022. Diversity of edible plants traded in Legi Market, Surakarta, Indonesia. *Asian J Ethnobiol* 5: 52-61. A traditional market is used to conduct buying and selling transactions conducted by direct bargaining. The market is used as a center of socioeconomic activities and a social heritage representation. Many commodities are commonly traded in traditional markets, such as staple foods and other edible plant products such as vegetables, spices, tubers, and fruits. Some of them also have additional functions as herbal remedies. This research aims to inventory edible and medicinal plant species traded in the traditional market in Surakarta, Central Java, Indonesia, namely Legi Market. The method used in this research is the qualitative descriptive method. Direct research observations, including plant surveys and in-depth interviews with Legi Market traders, are used to collect the data. The results showed that the Legi Market plays a vital role in the availability of the crops produced by village farmers. There are 92 species of edible plants recorded in the Legi Market, predominately with the Fabaceae group. Furthermore, leaf products were identified as the most commercialized plant parts. In terms of medicinal purposes, 17 species were listed to be used as treatment agents, with the rhizome being the most functioned part.

**Keywords:** Edible plant, food diversification, Surakarta, traditional market

### INTRODUCTION

Market is defined as a place for trading activities to meet people's daily needs. Indonesia's number of traditional markets still dominates due to many people on lower middle incomes, even below the poverty line. In addition, traditional markets are much preferable to modern shopping centers because customers can buy their needs at lower prices. Therefore, the presence of conventional markets is significant because it is used as the foundation or economic basis of a region (Tambunan 2020). Based on this reason, local markets are still sustained in this modern era where modern retail, e-commerce and supermarkets offer much more convenience.

According to Aliyah (2020), a traditional market in Indonesia's oldest kind of market. Individuals from ancient times gathered in a certain location to offer and seek goods. It was the only place for people to do trading activities in the past (Andriani and Ali 2013). Subsequently, this tradition is passed to the next generations as social heritage. Mostly, the traders usually sell their commercial goods in a simple stall in the local market or sit on the mat (*lesehan*) with their commodities displayed in front of them (Ariyani and Nurcahyono 2018). In addition to providing goods for buyers, the traditional market also has a significant function in providing jobs for the local community (Malano 2011).

Many commodities are commonly offered in traditional markets, including household utensils, clothes, and agricultural products. Regarding diet components, traditional markets sell various kinds of edible plants. Many kinds of plant products can be found in the traditional markets, such as vegetables, fruits and staple foods. In addition, many parts of the plants are offered, such as leaves, fruits, rhizomes, and bulbs. The plant commodities commonly are cultivated by the seller or reselling the product from the local farmers (Posthouwer et al. 2018). Additionally, the traditional market offers goods collected from the surrounding areas. Thus, this place encourages the local community's economy while strengthening food security and diversification.

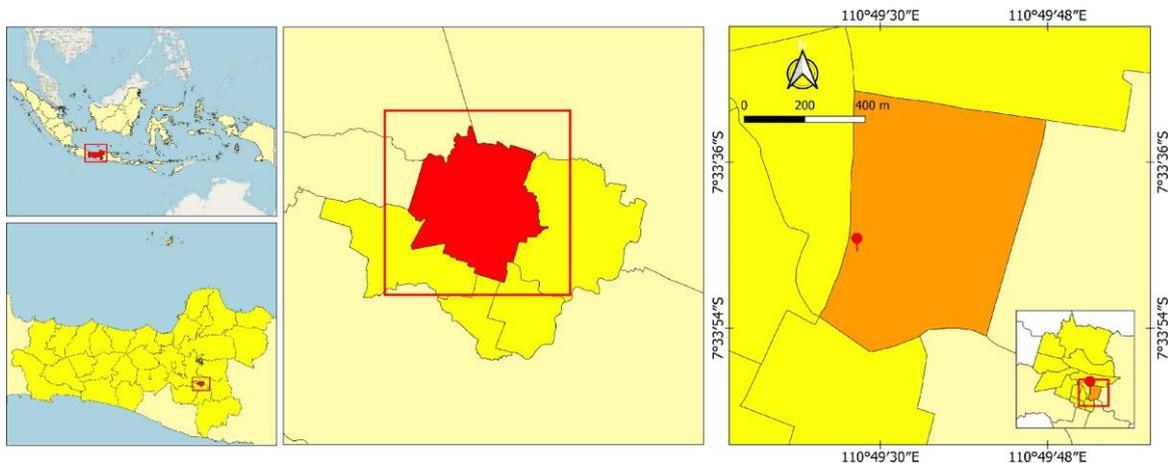
Several types of edible plants sold belong to medicinal plants. Society is currently keen on natural products, not only for daily food but also to maintain their wellbeing. People usually prefer to consume herbal remedies to prevent and heal ailments than conventional medicines. As mentioned by van Wyk and Prinsloo (2020), herbal medicines are believed by many to have natural ingredients that have few or without side effects because they come from natural sources. The use of plants as herbal medicine is suggested to have been practiced since ancient times. Therefore, traditional markets have a big role in providing medicinal plants and preserving cultural heritage between generations (Uzun and Koca 2020).

Surakarta is one of the big and famous cities on the island of Java which still highly upholds its culture. Some people prefer herbal remedies because they are more natural and safer than modern medicine. Furthermore, traditional markets are still crucial for society when modern retail has developed and e-commerce has begun to dominate the shopping system. One of the traditional markets in Central Java, Indonesia, is Legi Market (an Indonesian typical of traditional market). It is situated in Banjarsari Sub-district, Surakarta, in a quite strategic location. According to Arifin et al. (2021), this market is the most important place for selling agricultural materials in the south of Central Java Province, Indonesia. It consists of approximately 1900 vendors and operates between 6 am and 6 pm. The name of Legi Market is derived from the day name according to Javanese folk called '*legi*', which is when numerous visitors gather in the local market. This research aims to inventory various edible species of plants believed in providing health benefits offered in Legi Market, Surakarta, Central Java, Indonesia.

## MATERIALS AND METHODS

### Study area

This research was carried out in Legi Market in Setabelan Village, Banjarsari Sub-district, Surakarta, Central Java, Indonesia (Figure 1) between December 2020 and January 2021. This market is situated on Letjen S. Parman Street and is quite accessible from surrounding public places. Legi Market is located only 2,8 km (about 11 minutes) and 1,4 km (4 minutes) from Tirtonadi terminal and Balapan station, respectively. In addition, this market is also situated nearby to the modern shopping center, called Luwes Kestalan, which is only 1,6 km away. This market can be reached using public transportation, such as buses or private vehicles. Many purchasers always visit Legi Market because this market provides various needs, mainly foodstuffs, and local cuisines. Usually, the food commodities are still in good condition since they are provided by the local farmers surrounding the market. According to the sellers, the operational time of Legi Market is 24 hours, but the peak hour usually occurs in the morning to the mid-day.



**Figure 1.** Location of Legi Market in Setabelan Village, Banjarsari Sub-district, Surakarta City, Central Java, Indonesia. Source: UO Kelurahan Survey, Google Earth, Bakosurtanal



**Figure 2.** Legi Market building, Surakarta, Central Java, Indonesia in 2020

Based on Aliyah et al. (2007), Legi Market was constructed during the reign of Mangkunegoro I and had renovated in 1992. The name 'Legi' is derived from ancient Javanese culture that divided days into a five-day market week. *Legi* was the day that people in the past usually conducted the transaction. This culture inspired the naming of local markets based on historical events. In 2007, the total trader in this market was 1290 (Aliyah et al. 2007). However, the current number of the trader was unclear. Unfortunately, Legi Market was fired in 2018. This accident led the movement of IKKAPAGI (*Ikatan Keluarga Pedagang Pasar Legi*) and Department of Trade Service to revitalize this market (Arifin et al. 2021). It is mentioned that the alteration was to make Legi Market more modern by adding several facilities, such as Tap Reader Machine (TRM) to pay e-retribution, surveillance cameras and adopting the green building concept. Additionally, some regulations have been applied, such as not littering and each trader has to clean the stall after selling time. The physical distancing rules are also practiced in Legi Market to avoid virus transmission during the Covid-19 pandemic. Based on the study conducted by Khomah and Harisudin (2016), Legi Market's advantages compared to the other markets in Surakarta include the low prices, the longer operational hours, and the variety of products it offers.

### Procedures

The qualitative descriptive method was carried out in this study. The primary data were collected through direct observation and in-depth interviews with the market vendors. Twenty-eight traders who offered various kinds of plant commodities were selected and mostly, they were more than 30 years old. Information about plant products traded, the part of the plant consumed, the vernacular names, medicinal purposes and the list of diseases being treated were collected.

### Data analysis

The edible plant data obtained were categorized after being identified using journals and other supportive sources. First, the online source <http://www.plantsoftheworldonline.org/> was used to identify the plant species. Then, the plant data were classified based on their family group, category of products, and part of the plant utilized. Regarding plants for medicinal reasons, the information about the ailments list was added to the table. Both food and medicine plants were analyzed descriptively.

## RESULTS AND DISCUSSION

### Food plants diversity

Based on this study, 92 species were sold in Legi Market (Table 1). The plant's family varies from 35 groups, with profound domination of Fabaceae, followed by Zingiberaceae, Solanaceae, and Brassicaceae (Figure 3).

On the contrary, Agaricaceae, Amaryllidaceae, Annonaceae, Asteraceae, Cactaceae, Caricaceae, Gnetaceae, Lamiaceae, Leguminosae, Moraceae, Myristicaceae, Oxalidaceae, Pandanaceae, Piperaceae, Ranunculaceae, Sapindaceae, and Vitaceae were only represented by one species per family.

### Vegetable

The vegetable was the biggest crop commodity traded in the Legi Market. It accounted for 36% of the entire plant's trade (Figure 4) with the domination from Fabaceae. This family was reported as the most encountered group in Ir. Soekarno Market, Central Java, Indonesia with 13 species (Deanova et al. 2021) and 16 species were traded in Beringharjo Market, Yogyakarta, Indonesia (Iskandar et al. 2021). At the same time, herbal medicine markets in South Africa mostly offered Fabaceae plants at about 11% of the total commodities (Rasethe et al. 2019). Those findings have a similar result with this study, which listed ten species belonging to the Fabaceae group. All of them were categorized as vegetables, with *Pachyrhizus erosus* being the only exception because it was considered a fruit. This species is locally known as *bengkuang* and is commonly eaten raw. In Indonesia, *bengkuang* is a raw material in the making *rujak*, which is fruits-based food with peanut sauce. Lim (2014) reported that *P. erosus* is similar to white potato in terms of food value. However, *P. erosus* contains fewer calories, so it is not a staple food.

Seven species were recorded from the Brassicaceae family, with *Brassica* being the common genus. Species in this family mainly were leafy vegetables supplied from the sellers from outside Surakarta city, such as Boyolali, Sragen, Purwodadi, and Karanganyar, Central Java, Indonesia (Gama et al. 2018). The locals commonly grow leafy vegetables through intercropping with other valued plants, such as chili and another annual crop (Mariyono et al. 2010). Ease of cultivation and process, many edible parts, and the abundance encourage people to grow these plants (Konsam et al. 2016). The diversity of botanical foods traded in the Legi Market is not limited to the species level. Those are intra-species commodities that belong to this family, such as *Brassica oleracea* var. *italic* (broccoli), *B. oleracea* var. *botrys* (cauliflower), and *B. oleracea* var. *capitata* (cabbage) (Table 1).

### Spice

Spice products took 34% of the total plant commodities provided in Legi Market. Zingiberaceae is regarded as the most common species in the spice category. Almost all species in this family were considered spices, with the rhizome as the most utilized part. However, *Elettaria cardamomum* Maton was the only species from Zingiberaceae that seeds are used for cooking and medicinal purposes. Hence, the customers seek this species to give a unique fragrance and flavor for dishes in a cooking recipe. Therefore, the spice commonly known as cardamom is sold at a high price and is regarded as the 'queen of spices' internationally (Ashokkumar et al. 2019).

**Table 1.** List of edible plants commodities that are commonly traded in Legi Market, Surakarta, Central Java, Indonesia

Family	Scientific name	Common name	Local name	Category	The part used
Achariaceae	<i>Pangium edule</i> Reinw.	Football fruit	Keluwek	Spices	Fruit
Alliaceae	<i>Allium cepa</i> var. <i>aggregatum</i> G.Don	Shallot	Bawang merah	Spices	Bulb
Alliaceae	<i>Allium cepa</i> L. var. <i>cepa</i> L.	Onion	Bawang bombay	Spices	Bulb
Alliaceae	<i>Allium sativum</i> L.	Garlic	Bawang putih	Spices	Bulb
Amaranthaceae	<i>Amaranthus hybridus</i> L.	Spinach	Bayam	Vegetable	Leaf
Amaranthaceae	<i>Amaranthus tricolor</i> L.	Chinese spinach	Bayam merah	Vegetable	Leaf
Amaryllidaceae	<i>Allium ramosum</i> L.	Chinese chives	Kucai	Vegetable	Leaf
Anacardiaceae	<i>Mangifera indica</i> L.	Mango	Mangga	Fruit	Fruit
Anacardiaceae	<i>Spondias dulcis</i> Parkinson	Ambarella	Kedondong	Fruit	Fruit
Annonaceae	<i>Annona muricata</i> L.	Soursop	Sirsak	Fruit	Fruit
Apiaceae	<i>Apium graveolens</i> L.	Celery leaves	Seledri	Vegetable	Leaf
Apiaceae	<i>Coriandrum sativum</i> L.	Coriander	Ketumbar	Spices	Fruit
Apiaceae	<i>Cuminum cyminum</i> L.	Cumin	Jintan putih	Spices	Seed
Apiaceae	<i>Daucus carota</i> L.	Carrot	Wortel	Vegetable	Tuber
Arecaceae	<i>Cocos nucifera</i> L.	Coconut	Kelapa	Spices	Fruit
Arecaceae	<i>Salacca zalacca</i> (Gaertn.) Voss	Snakefruit	Salak	Fruit	Fruit
Asteraceae	<i>Cosmos caudatus</i> Kunth	Wild cosmos	Kenikir	Vegetable	Leaf
Brassicaceae	<i>Brassica juncea</i> (L.) Czern	Mustard	Sawi	Vegetable	Leaf
Brassicaceae	<i>Brassica oleracea</i> var. <i>italic</i> Plenck	Broccoli	Brokoli	Vegetable	Leaf
Brassicaceae	<i>Brassica oleracea</i> var. <i>botrytis</i> L.	Cauliflower	Kembang kol	Vegetable	Leaf
Brassicaceae	<i>Brassica oleracea</i> var. <i>capitata</i> L.	Cabbage	Kubis	Vegetable	Leaf
Brassicaceae	<i>Brassica juncea</i> (L.) Czern	Mustard	Sawi	Vegetable	Leaf
Brassicaceae	<i>Nasturtium officinale</i> R.Br.	Watercress	Selada air	Vegetable	Leaf
Brassicaceae	<i>Raphanus sativus</i> L.	Radish	Lobak	Vegetable	Tuber
Cactaceae	<i>Hylocereus costaricensis</i> (F.A.C.Weber) Britton & Rose	Dragon fruit	Buah naga	Fruit	Fruit
Caricaceae	<i>Carica papaya</i> L.	Papaya	Pepaya	Fruit	Fruit, leaf
Convolvulaceae	<i>Ipomoea aquatica</i> Forssk.	Water spinach	Kangkung	Vegetable	Leaf
Convolvulaceae	<i>Ipomoea batatas</i> (L.) Lam.	Sweet potato	Ubi jalar	Staple	Tuber, leaf
Cucurbitaceae	<i>Citrullus vulgaris</i> Schrad.	Watermelon	Semangka	Fruit	Fruit
Cucurbitaceae	<i>Cucumis melo</i> L.	Melon	Melon	Vegetable	Fruit
Cucurbitaceae	<i>Cucumis sativus</i> L.	Cucumber	Mentimun	Vegetable	Fruit
Cucurbitaceae	<i>Cucurbita moschata</i> Duchesne	Butternut squash	Labu kuning	Vegetable	Fruit
Cucurbitaceae	<i>Sechium edule</i> (Jacq.) Sw.	Chayote	Labu siam	Vegetable	Fruit
Euphorbiaceae	<i>Aleurites moluccanus</i> (L.) Wild.	Candlenut	Kemiri	Spices	Fruit
Euphorbiaceae	<i>Manihot esculenta</i> Crantz	Cassava	Singkong	Staple	Tuber, leaf
Fabaceae	<i>Arachis hypogaea</i> L.	Peanut	Kacang tanah	Vegetable	Seed
Fabaceae	<i>Archidendron pauciflorum</i> (Benth) I.C.Nielsen	Jengkol	Jengkol	Vegetable	Fruit
Fabaceae	<i>Glycine max</i> (L.) Merr.	Soya bean	Kacang kedelai	Vegetable	Fruit
Fabaceae	<i>Leucaena leucocephala</i> (Lam.) de Wit	Lead tree	Petai Cina	Vegetable	Fruit
Fabaceae	<i>Pachyrhizus erosus</i> (L.) Urb.	Jicama	Bengkuang	Fruit	Tuber
Fabaceae	<i>Parkia speciosa</i> Hassk.	Stink bean	Petai	Vegetable	Fruit
Fabaceae	<i>Phaseolus vulgaris</i> L.	Bean	Buncis	Vegetable	Fruit
Fabaceae	<i>Phaseolus vulgaris</i> L.	Kidney bean	Kacang merah	Vegetable	Fruit
Fabaceae	<i>Vigna radiata</i> (L.) R.Wilczek	Mungbean	Kacang hijau	Vegetable	Fruit
Fabaceae	<i>Vigna unguiculata</i> (L.) Walp.	Long bean	Kacang panjang	Vegetable	Fruit
Gnetaceae	<i>Gnetum gnemon</i> L.	Melinjo	Melinjo	Vegetable	Fruit, leaf
Lamiaceae	<i>Ocimum basilicum</i> L.	Basil	Kemangi	Vegetable	Leaf
Lauraceae	<i>Cinnamomum burmannii</i> (Nees & T.Nees) Blume	Indonesian cinnamon	Kayu manis	Spices	Bark
Lauraceae	<i>Persea americana</i> Mill.	Avocado	Alpukat	Fruit	Fruit
Leguminosae	<i>Tamarindus indica</i> L.	Tamarind	Asam Jawa	Spice	Fruit
Moraceae	<i>Artocarpus heterophyllus</i> Lam.	Jackfruit	Nangka	Fruit	Fruit
Musaceae	<i>Musa X paradisiaca</i> L.	Mas banana	Pisang mas	Fruit	Fruit
Musaceae	<i>Musa X paradisiaca</i> L.	Plantain	Pisang raja	Fruit	Fruit
Musaceae	<i>Musa X sapientum</i> L.	Cavendish	Pisang ambon	Fruit	Fruit
Myristicaceae	<i>Myristica fragrans</i> Houtt.	Nutmeg	Pala	Spices	Seed
Myrtaceae	<i>Syzygium aqueum</i> (Burm.f) Alston	Watery rose- apple	Jambu air	Fruit	Fruit
Myrtaceae	<i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry	Clove	Cengkeh	Spices	Fruit

Myrtaceae	<i>Syzygium polyanthum</i> (Wight) Walp.	Bay leaf	Salam	Spices	Leaf
Oxalidaceae	<i>Averrhoa carambola</i> L.	Star fruit	Belimbing	Fruit	Fruit
Pandanaceae	<i>Pandanus amaryllifolius</i> Roxb.	Pandanus	Pandan wangi	Spices	Leaf
Piperaceae	<i>Piper nigrum</i> L.	Pepper	Lada	Spices	Seed
Poaceae	<i>Cymbopogon nardus</i> (L.) Rendle	Citronella grass	Serai	Spices	Leaf
Poaceae	<i>Oryza sativa</i> L.	Rice	Beras	Staple	Seed
Poaceae	<i>Zea mays</i> L.	Corn	Jagung	Staple	Fruit
Ranunculaceae	<i>Nigella sativa</i> L.	Black cumin	Jintan hitam	Spices	Seed
Rosaceae	<i>Fragaria ananassa</i> (Duchesne ex Weston) Duchesne ex Rozier	Strawberry	Strawberry	Fruit	Fruit
Rosaceae	<i>Pyrus communis</i> L.	Pear	Pir	Fruit	Fruit
Rosaceae	<i>Pyrus malus</i> L.	Apple	Apel	Fruit	Fruit
Rosaceae	<i>Malus domestica</i> Borkh.	Red apple	Apel merah	Fruit	Fruit
Rutaceae	<i>Citrus × aurantiifolia</i> (Christm.) Swingle	Lime	Jeruk nipis	Fruit	Fruit, leaf
Rutaceae	<i>Citrus hystrix</i> DC.	Kaffir lime	Jeruk purut	Fruit	Fruit, leaf
Rutaceae	<i>Citrus limon</i> (L.) Osbeck	Lemon	Jeruk lemon	Spices	Fruit, leaf
Rutaceae	<i>Citrus sinensis</i> (L.) Osbeck	Sweet orange	Jeruk manis	Fruit	Fruit
Sapindaceae	<i>Dimocarpus longan</i> Lour.	Longan	Kelengkeng	Fruit	Fruit
Solanaceae	<i>Capsicum annuum</i> L.	Green chili	Cabe kriting hijau	Spices	Fruit
Solanaceae	<i>Capsicum annuum</i> L.	Red chilli	Cabe kriting merah	Spices	Fruit
Solanaceae	<i>Capsicum annuum</i> L.	Chili	Cabe	Spice	Fruit
Solanaceae	<i>Capsicum frutescens</i> L.	Chilli padi	Cabe rawit	Spices	Fruit
Solanaceae	<i>Lycopersicon esculentum</i> Mill.	Tomato	Tomat	Vegetable	Fruit
Solanaceae	<i>Solanum melongena</i> L.	Green eggplant	Terong hijau	Vegetable	Fruit
Solanaceae	<i>Solanum melongena</i> L.	Purple eggplant	Terong ungu	Vegetable	Fruit
Solanaceae	<i>Solanum tuberosum</i> L.	Potato	Kentang	Vegetable	Tuber
Vitaceae	<i>Vitis vinifera</i> L.	Red grape	Anggur merah	Fruit	Fruit
Zingiberaceae	<i>Alpinia galanga</i> (L.) Willd.	Galangal	Lengkuas	Spices	Rhizome
Zingiberaceae	<i>Curcuma aeruginosa</i> Roxb.	Pink and blue ginger	Temu ireng	Spices	Rhizome
Zingiberaceae	<i>Curcuma longa</i> L.	Turmeric	Kunir	Spices	Rhizome
Zingiberaceae	<i>Curcuma zanthorrhiza</i> Roxb.	Curcuma	Temu lawak	Spices	Rhizome
Zingiberaceae	<i>Curcuma zedoaria</i> (Christm.) Roscoe	White ginger	Temu putih	Spices	Rhizome
Zingiberaceae	<i>Elettaria cardamomum</i> L. Maton	Cardamom	Kapulaga	Spices	Seed
Zingiberaceae	<i>Kaempferia galanga</i> L.	Aromatic ginger	Kencur	Spices	Rhizome
Zingiberaceae	<i>Zingiber officinale</i> Roscoe	Ginger	Jahe	Spices	Rhizome
Zingiberaceae	<i>Zingiber officinale</i> var. <i>rubrum</i>	Red ginger	Jahe merah	Spices	Rhizome

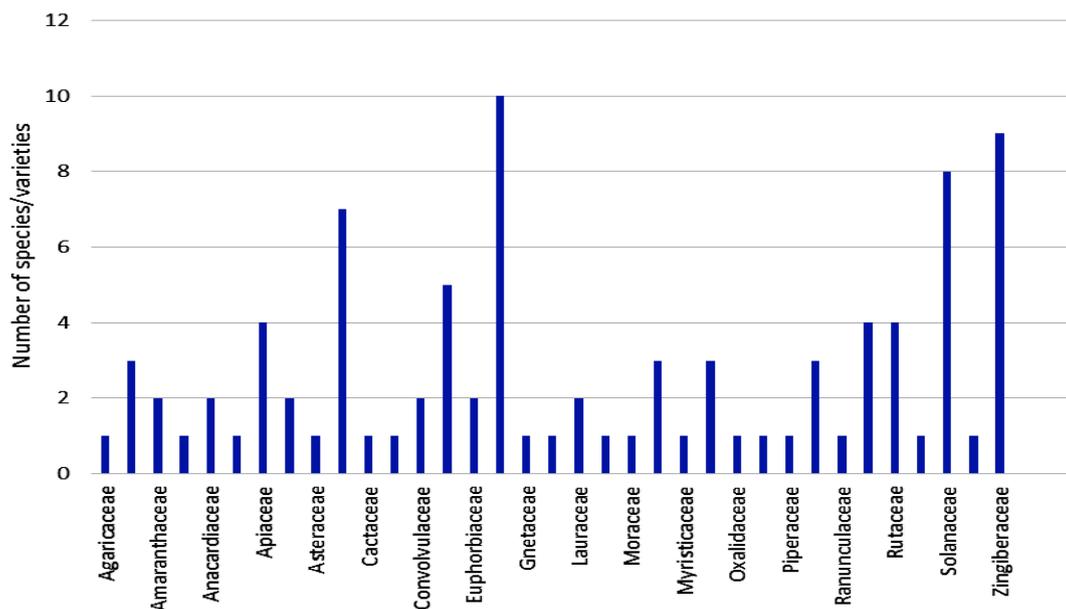
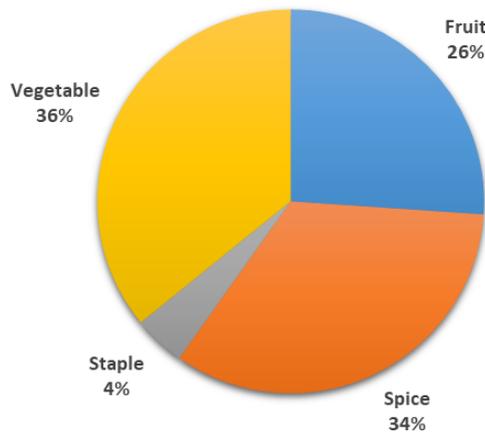


Figure 3. Families of edible plants traded in Legi Market, Surakarta, Central Java, Indonesia



**Figure 4.** Categories of edible plants traded in Legi Market, Surakarta, Central Java, Indonesia

In this market, Solanaceae also predominantly the spice trade. Based on the interview, the Legi Market is the center of *Capsicum annuum* (chili) sales in the Surakarta residency area. The biggest suppliers come from Boyolali, Klaten, Wonogiri, Sukoharjo and Karanganyar. Meanwhile, from outside Surakarta including Lumajang, Mojokerto, Pemekasan, Sumenep, Pare, Madura, Banyuwangi (Soepatini et al. 2018). In addition, Yamamoto et al. (2014) mentioned that *Capsicum* has four species growing in Indonesia, indicating this country has a profound potential to breed *Capsicum* compared to other Southeast and East Asia regions. This study agrees with Mariyono et al. (2010) that Indonesia has a significant role in international chili trade that estimated 5% of the total market share. According to Table 1, various types of chili are traded in Legi Market, including *cabai kriting hijau*, *cabai kriting merah*, and *cabai rawit*. Both *C. annuum* and *C. frutescens* were also frequently encountered in Tamian Tribe, Aceh, as the raw ingredients for hot sauces in traditional cuisines (Navia et al. 2020). In general, chili is usually grown in the home garden and dry land agroforestry areas by the locals, not only for the market sale but also to meet everyday needs.

#### Fruit

In terms of edible plants as fruit, this study listed 24 species belonging to this group. Rosaceae made up the most considerable proportion with four species, followed by Musaceae, mainly comprised of intra-species. Commonly, the fruits are consumed fresh or processed into other products to increase the selling value and maintain their durability. *Fragaria ananassa* was the major fruit commodity in this market. Even though strawberry is not native to Indonesia, it can thrive in Tawangmangu, Central Java. This location is a highland area that provides the ideal strawberry condition to grow well. Furthermore, Tawangmangu was the only place to cultivate strawberries in the Karanganyar District near Surakarta (Rizka 2018). Thus, the harvest productions usually are distributed to the markets close to this area. Another fruit offered in Legi

Market was banana, which has various kinds, including *pisang mas*, *pisang raja* and *pisang ambon*. Those species have a profound role in Javanese culture, as Hapsari et al. (2017) mentioned. Thus banana cultivars can usually be found abundantly in traditional markets. Another fruit traded in Legi Market that significantly correlates with the local culture is *Artocarpus heterophyllus*. The fruit, commonly known as jackfruit, can be eaten raw or the young fruit as a major ingredient in making *gudeg*. This is the local cuisine from Yogyakarta that is made from the young jackfruit cooked with coconut milk, chicken, and egg (Nurhayati et al. 2016).

#### Staple

Staple plant sales contributed only 4% to the total edible plant trading in Legi Market. It is predominately by *Oryza sativa* and *Zea mays*, followed by *Ipomoea batatas* and *Manihot esculenta*. Indonesian people are very dependent on rice as their staple food, leading almost all local markets to supply numerous rice varieties. However, some indigenous tribe was reported has more diverse in terms of the staple diet. As Saragih et al. (2021) mentioned, most Dayak Tribe in Kalimantan consumes *M. esculenta* in their everyday diet. The consumption rate will be higher if the locals experience rice scarcity.

Conversely, *I. batatas* have the least attention in terms of staple food. This is because it used to be associated with food for low-income societies. But, it has gained great attention as the people's perception has shifted to a healthy lifestyle (Mwanga et al. 2017). Additionally, *I. batatas* were regarded to help combat the malnutrition food scarcity by providing excellent nutritional values.

#### Part of the plants consumed

Consumers tend to use the specific part of the edible plants for daily use. Therefore, the number of the plant's part usage displays the local knowledge about edible plants (Manzanero-Medina et al. 2020). This research identified seven parts of the edible plants traded in the Legi Market (Figure 5). The fruit was a part that was highly changed in this market and comprised more than half of the total plant commodities (51 species). It followed by leaf at 23%, while the rest parts accounted for less than 10% each.

#### Fruit

The most common fruit part traded in Legi Market belonged to the Solanaceae family. From the vegetable category, it consisted of *Solanum melongena* and *Lycopersicon esculentum*. The former, commonly known as eggplant, is usually consumed by cooking as a vegetable. However, in West Java, this plant generally consumes fresh and other raw vegetables, fried foods, and traditional sauce as dressing (Mulyanto et al. 2018). Many of the fruit found sold in this market was utilized as a spice or gives additional flavor in processed food, such as *Pangium edule* (*keluwak*), *Coriandrum sativum* (*ketumbar*), *Cocos nucifera* (*kelapa*), *Aleurites moluccanus* (*kemiri*), *Tamarindus indica* (*asam Jawa*), and *Syzygium aromaticum* (*cengkeh*). Additionally, some species in Rutaceae have several parts for different purposes. For

instance, the leaves of *Citrus × aurantiifolia*, *Citrus hystrix*, and *Citrus limon* are commonly used for food preparation, apart from their fruits utilization for the same function.

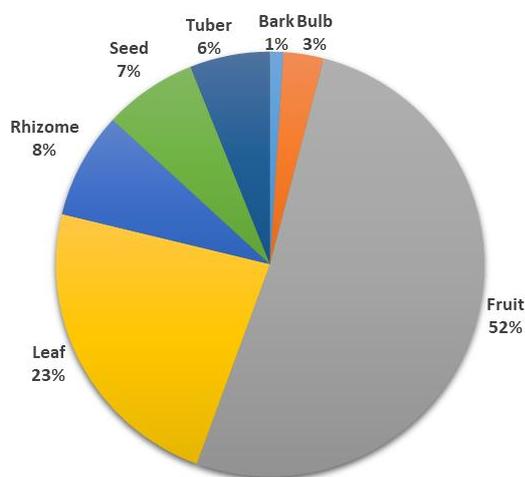
#### Leaf

Plant's leaves trading comprised almost a quarter of the total plant sale. Leaves are also part of the highly available plants in the local market in North Sumatra and Mexico (Silalahi et al. 2015; Manzanero-Medina et al. 2020). The presence of leafy vegetables, such as *Amaranthus hybridus*, *Amaranthus tricolor*, *Cosmos caudatus*, and *Ipomoea aquatica* was quite high, indicating those plants were in great demand by the consumers. Additionally, many individuals cultivated the plants with edible leaves to fulfill their daily diets in their home gardens. However, if the products exceed the daily needs, some of the harvests will be traded in the local market. The abundance of these items leads to a low price.

Nevertheless, other leaves utilized for spice are usually offered at a higher charge. This fact is supported by Arellanes et al. (2013) that *Lippia graveolens* and *Thymus vulgaris* were marketed as more expensive than greenery vegetables. Leaves used for spice in Legi Market include *Syzygium polyanthum*, *Pandanus amaryllifolius*, and *Cymbopogon nardus*.

#### Rhizome

The marketing of the rhizome organ contributed about 8% in Legi Market, consisting of the Zingiberaceae group. The shape of a rhizome sometimes is similar from one to another. In order to differentiate them, the trader usually uses the morphology characteristic, such as the texture, color, and shaper, as well as the scent. The colors to characterized rhizome are *Curcuma aeruginosa* is blue, *Curcuma longa* is orange, *Curcuma zanthorrhiza* is dark orange, *Curcuma zedoaria* and *Kaempferia galanga* are white, *Zingiber officinale* is cream, and *Z. officinale* var. *rubrum* has a reddish color (Jalil et al. 2021).



**Figure 5.** Parts of edible plants traded in Legi Market, Surakarta, Central Java, Indonesia

#### Seed

Legi Market traders sold seed products at 7% of the plant's part selling like the rhizome. Most seeds were utilized for spice, except *Arachis hypogaea* as a vegetable, and *O. sativa* is a staple food. One of the native species found in this market is *Myristica fragrans* or nutmeg (Kuete 2017). It requires a tropical climate that provides humid and warm conditions to thrive. Still citing Kuete (2017), nutmeg's numerous functions for dishes preparation and as the herbal plant for various ailments, nutmeg also contains toxic effects. Myristicin oil was the compound responsible for nutmeg toxicity.

Conversely, *Nigella sativa* was reported to have a low level of toxin (Dubey et al. 2016). The locally called *jintan hitam* has an excellent trade prospect that is forecasted to continue to increase (Dessie et al. 2020). The high demand for this plant is due to its profound role in the culinary and pharmaceutical industries.

#### Tuber and bulb

Tuber and bulb categories had 6% and 3% part of the plants trading, respectively. Both *I. batatas* and *M. esculenta* are not only consumed by the tubers but the leaves can also be processed into vegetables and have commercial value. In addition, another tuberous plant provided was *Raphanus sativus* which could be eaten raw or cooked in advance. In terms of bulb part, all of the species came from Alliaceae, such as *Allium cepa* var. *aggregatum* (*bawang merah*), *A. cepa* var. *cepa* (*bawang bombay*), and *A. sativum* (*bawang putih*). These components were frequently sold in local markets because of the high demand for food processing as flavoring food. The distinctive scent makes *Allium* species are essential in the food industry (Aremu and van Staden 2013).

#### Bark

The bark part was the least traded as plants commodity in Legi Market. The low percentage means few consumers utilized this part plant for daily purposes. The only bark plant recorded in this market was *Cinnamomum burmannii*. This plant is native to Indonesia and has been widely cultivated by smallholder farmers in Jambi (Menggala and Damme 2021). Currently, Sri Lanka is the biggest producer of cinnamon worldwide (Sarma et al. 2014).

#### Medicinal plants diversity

Apart from their function as food commodities, the plant products available in Legi Market are also categorized as herbal remedies. Based on the interview, it is known that there are 17 types of diseases, and common disorders can be healed using various herbal medicines. It is recorded that most plants are functioned to treat stomach-related pains. It is followed by other ailments, such as cardiovascular-related diseases, inflammation, and immune booster (Table 2).

This finding is similar to Petrakou et al. (2020) study on the herbal market in Greece that stated most of the medicine plants recorded were used for digestive ailments. At the same time, the biggest proportion of plants traded in China and West Java, Indonesia, markets functioned for

stomach-related diseases (Gu et al. 2020; Iskandar et al. 2020).

Based on Table 3, it is clear that 17 types of medicinal plants sold in Legi Market were categorized as multi-function plants. It means a kind of plant has more than one purpose used by society. The data obtained in Legi Market were classified into three groups, namely as 'medicine and spices' consisting of 13 types of plants (76%), 'medicine and vegetables' consisting of three types of plants (18%), and as medicine and fruit which consists of a type of plant (6%). This grouping pattern adopts the research performed by Iskandar et al. (2020) in West Java market. However, the medicine and vegetables dominated the result by consisting of more than ten species compared to only three species in this study.

The medicine and vegetables are the greatest groups in Legi Market. The popular usage of medicinal plants, especially in Java, is the main ingredient for *Jamu*. It is a traditional herbal drink made from spices for curing disease and maintaining healthy conditions (Elfahmi et al. 2014). Types of spices in making *Jamu* include galangal, turmeric, ginger, and *temu ireng*. The traditional herbal drink is believed could improve the immune system and prevent diseases when consumed regularly. Mathai et al. (2022) also stated that some medicinal plants contain natural compounds to control viral infection, especially plants with

anti-inflammatory effects. Thus, it is necessary to do further research on plants with medicinal properties to develop a promising and safe treatment method to cure ailments (Jabbar et al. 2019). Community experience and knowledge regarding all uses of medicinal plants can be collected to be used as a basis for the development of research using medicinal plants (Muadifah et al. 2019).

The use of herbal medicines is mostly made from the plant's part; for instance, fruits, leaves, stems, and rhizomes (Jabbar et al. 2019). In this study, the most frequently used plant parts are rhizome (35%), followed by seed, leaf, fruit (18%), and bulb (11%) (Table 4).

Rhizome is a type of spice that has many types. Rhizomes tend to be non-perishable and are widely used fresh and dry. Rhizome spices usually contain many complex carbohydrate compounds, which can be in the form of starch or fiber. Rhizome-type plants can also be easily preserved by drying or processing them into dried slices (Putri and Fibrianto 2018). The majority of people use rhizome-type spices because they are considered to have a more sharp taste and aroma sensation, even though many studies mentioned that leaves were the highest utilized part. For example, the herbal market in Morocco, Turkey, and Subang, West Java, commonly offer leaves that are believed to have medicinal usage (Putri et al. 2016; Awan et al. 2021; Chaachouay et al. 2021).

**Table 2.** Various medicinal plants traded in Legi Market, Surakarta, Central Java, Indonesia

Common name	Scientific name	Category	Parts used	Uses
Aromatic ginger	<i>Kaempferia galanga</i>	Medicine, spices	Rhizome	Fix menstruation cycle
Black cumin	<i>Nigella sativa</i>	Medicine, spices	Seed	Inhibit bacterial growth
Ginger	<i>Zingiber officinale</i>	Medicine, spices	Rhizome	Nausea relief
White ginger	<i>Curcuma zedoaria</i>	Medicine, spices	Rhizome	Treat stomach pain
Turmeric	<i>Curcuma longa</i>	Medicine, spices	Rhizome	Inflammation
Curcuma	<i>Curcuma zanthorrhiza</i>	Medicine, spices	Rhizome	Overcome indigestion
Pink and blue ginger	<i>Curcuma aeruginosa</i>	Medicine, spices	Rhizome	Improve digestion process
Clove	<i>Syzygium aromaticum</i>	Medicine, spices	Fruit	Overcome flatulence
Coriander	<i>Coriandrum sativum</i>	Medicine, spices	Fruit	Maintain heart condition
Nutmeg	<i>Myristica fragrans</i>	Medicine, spices	Seed	Against free radicals
Shallot	<i>Allium cepa</i>	Medicine, vegetables	Bulb	Fight cancer cells
Garlic	<i>Allium sativum</i>	Medicine, vegetables	Bulb	Cold relief
Lime leaves	<i>Citrus × aurantiifolia</i>	Medicine, spices	Leaf	Relieve inflammation
Lime	<i>Citrus × aurantiifolia</i>	Medicine, fruit	Fruit	Boost immune system
Bay leaf	<i>Syzygium polyanthum</i>	Medicine, spices	Leaf	Maintain digestion process
Pepper	<i>Piper nigrum</i>	Medicine, spices	Seed	Heal constipation
Celery leaves	<i>Apium graveolens</i>	Medicine, vegetables	Leaf	Lower blood pressure

**Table 3.** The traded plants usage in Legi Market, Surakarta, Central Java, Indonesia

The plant's function	Total	Percentage (%)
Medicines and spices	13	76
Medicine and vegetables	3	18
Medicine and fruit	1	6
Total species	17	100

**Table 4.** The part plants sold in Legi Market, Surakarta, Central Java, Indonesia

Plant parts	Total	Percentage
Rhizome	6	35
Seed	3	18
Leaf	3	18
Bulb	2	11
Fruit	3	18
Total species	17	100

In conclusion, the study found 92 total species traded in Legi Market, including vegetables, spices, fruits, and carbohydrate staple food. The portion of the plant used varies, but the most part traded at 52% was the fruit. Moreover, Legi Market provides profound support to the locals by supplying nutritious food products and strengthening the local economy. Regarding medicinal purposes, those are 17 plant species that have medicinal value for numerous diseases, and the rhizome is the highest used part. This fact leads to the idea that Legi Market also serves natural products as an alternative treatment for curing ailments in society.

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