

# Ethnoveterinary study of medicinal plants used for cattle treatment in Bojonegoro District, East Java, Indonesia

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<sup>2</sup>Department of Microbiology, Faculty of Veterinary Medicine, Universitas Gadjah Mada. Jl. Fauna No. 2, Caturtunggal, Sleman 55281, Yogyakarta, Indonesia

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**Abstract.** Pratama AM, Herawati O, Nabila AN, Belinda TA, Wijayanti AD. 2021. Ethnoveterinary study of medicinal plants used for cattle treatment in Bojonegoro District, East Java, Indonesia. *Biodiversitas* 22: 4236-4245. Bojonegoro is a rural district in Indonesia's East Java Province where farming and cattle rearing are the main economic activities. The Bojonegoro District's cattle producers employ some medicinal plants specifically for the treatment of bovine illnesses. However, no data has been reported thus far. The goal of this research was to find and document ethnoveterinary medicinal herbs for cattle cures in the Bojonegoro District. A total of 41 cattle breeders were interviewed for the study. To collect demographic and ethnoveterinary medicinal plant data, each informant was interviewed using a semi-structured questionnaire in the native language of each informant. The statistical analysis in this study include informant consensus (Fic), Fidelity Level (FL), and Plant Part Frequency (PPF). Approximately 78.00% of the respondents are between the ages of 30 and 50, with 36.59% having only graduated from senior high school. The *Peranakan Ongole* (PO) is the most common breed preserved by cattle breeders. In the study area, 41 ethnoveterinary medicinal plants were mentioned by male respondents to cure cattle health problems. Digestive illnesses are the most frequent ailments in cattle treated with medicinal plants. *Curcuma longa* L. was the most commonly mentioned medicinal plant. A majority of the source ethnoveterinary medicinal plants were cultivated on-site and the leaves of these plants were most often used.

**Keywords:** Bojonegoro, cattle, cattle breeders, ethnoveterinary, medicinal plants

## INTRODUCTION

Ethnoveterinary medicinal plant systems are widely practiced in cultures around the world, and they are affected by the community or ethnic group cultural traditions (Teka et al. 2020; Xiong and Long 2020). Knowledge of therapeutic plant techniques for both animals and humans is a precious asset for indigenous people in developing countries (Bakare et al. 2019). The World Health Organization (2010) estimated that Traditional medicine is used by 60.00% of the world's population to regulate and treat various diseases. Rural communities adopt traditional plant practices for a variety of reasons, including the local availability of native medicinal plants, absence of side effects, ease of usage, and poor access to costly pharmaceuticals by rural people (Raza et al. 2014; Xiong and Long 2020). Medicinal plants are an invaluable resource for a country's human and animal health care systems, which can help to improve people's lives and livelihoods (Tolossa et al. 2013). Medicinal plants can play a potential role in the treatment of a variety of animal diseases (Dassou et al. 2020).

In Indonesia, medicinal plants play a major role in primary healthcare practices, particularly in rural areas (Jadid et al. 2020). When producing medicines, Indonesians use either a single plant or a mix of plants

known as *jamu*, including minerals added on occasion (Rahayu et al. 2020). Traditional medicine in Indonesia has a long history, involving a wide diversity of plants, animal products, and minerals. After the Amazon rainforests, Indonesia has the world's second-highest level of biodiversity, as evidenced by a large variety of indigenous medicinal plants. Indonesian tropical forests span around 143 million hectares and are home to approximately 80.00% of the world's medicinal plants. There are over 2500 medicinal plant species (Elfahmi et al. 2014; Sujarwo et al. 2015; Jadid et al. 2020).

For many generations, the cattle breeders community in Bojonegoro District, East Java province, Indonesia, has used ethnoveterinary medicinal plants. This information was passed down to them from their forefathers. Traditional medicines for treating cattle have been used in these cultures for a long time. The community only consumes a variety of herbal plants that may be easily found in the area where they live. Unfortunately, indigenous knowledge of the use of herbal medicines to treat cattle has never been recorded. Until now, only a few people in the community had access to this knowledge. Nowadays, however, sharing ethnoveterinary medicinal plant information is uncommon, and fewer young people are engaged in this profession.

In light of this current situation, it is important to record the various kinds of medicinal plants being used by the cattle breeding community for the treatment of cattle diseases. This research aims to provide recommendations for the conservation of local medicinal plants widely used, resulting in increased availability in nature and providing a scientific foundation for the perpetuation of research on local medicinal plants in the Bojonegoro District.

## MATERIALS AND METHODS

### Study area

Bojonegoro is a district in East Java, Indonesia (Figure 1), located 110 kilometers from Surabaya, the provincial capital, situated between 60 59' and 70 37' S and 1120 25' and 1120 09' E, and around 115 meters above sea level. The area is characterized by a lowland plain with two seasons: a wet season from October to March and a dry season from April to September. The average annual rainfall is 1716 mm, with humidity ranging from 60.00 to 90.00 percent and temperatures ranging from 24 to 32 degrees Celsius (Badan Pusat Statistik Kabupaten Bojonegoro, 2015). The district of Bojonegoro consists of 28 sub-districts and 430 villages. With a total area of 2,198.79 km<sup>2</sup> and a population density of 912 people per km<sup>2</sup>, the Bojonegoro District has 1,313,722 people. The animal populations in the Bojonegoro District, according to Badan Pusat Statistik Kabupaten Bojonegoro (2016), include 201,953 cattle, 19,000 dairy cows, 105,013 goats, and 129,990 sheep. Around 39.52% of residents over 15 work in the agricultural-livestock sector, followed by 38.31% in services and 22.17% in industry (Badan Pusat Statistik Kabupaten Bojonegoro 2018).

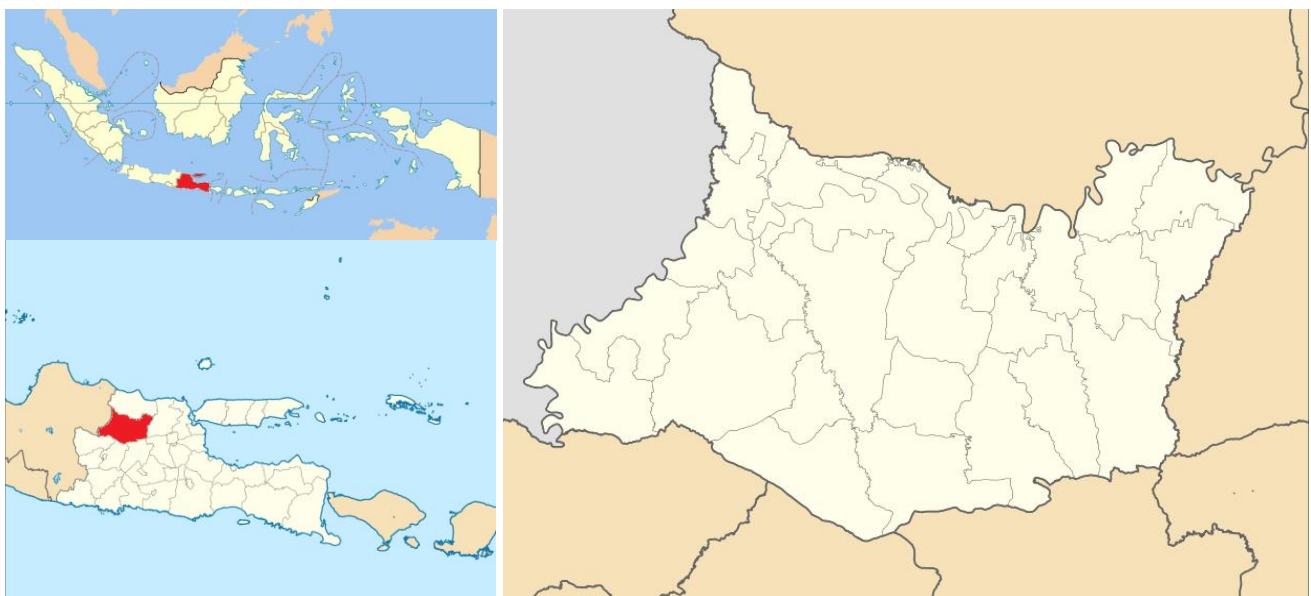
### Procedures

#### *Study design and sampling methods*

Interviews with cattle breeder communities in the Bojonegoro District area were conducted from July 6 to July 26, 2020. Data of cattle breeders were collected from the Department of Animal Husbandry and Fisheries in Bojonegoro. Because the respondents are from the Javanese community, the interviews were conducted in English and then translated into Indonesian and Javanese using semi-structural questionnaires and a random sampling method for informants who represent members of a cattle breeders group that has been in existence for more than three years. This activity necessitates the use of data as a source of information to provide an overview of cattle breeders' knowledge and experience with medicinal plant treatments for treated animals.

#### *Data collection*

Gender, age, degree of education, job, number of cattle owned, and farming experience were among the demographic data collected from cattle breeder interviews. Local names of medicinal plants, parts of medicinal plants used, formulation, route of action, volume, duration of drug administration, disease treated, source, conservation status, and economic analysis are some of the ethnoveterinary medicinal plant data collected from the informants. There was also a search for further information in specific names of herbal medicine on theplantlist.org assigned to these plants. Data processing was carried out by recording and analyzing the information collected from the cattle breeders. Data from the interviews was gathered and organized in a table (Aziz et al. 2018; Raza et al. 2014; Tariq et al. 2014).



**Figure 1.** Maps of Bojonegoro District, East Java Province, Indonesia

### Statistical analysis

In this study, to evaluate inter-informant consensus (Fic) we used the method used by Tariq et al (2014), namely:

$$Fic = \frac{nur - nt}{nur - 1}$$

Where:

nur : number of used citations in every category

nt : number of the medicinal plants used

Fidelity Level (FL) analysis was calculated following the study procedures by Jadid et al. (2020) to discover information consistency between informants about the use of particular medicinal plants to treat certain disorders/diseases in cattle. The formula used to measure the percentage of FL is:

$$FL (\%) = \frac{NP}{N} \times 100\%$$

Where:

NP : informants who revealed a medicinal plant to treat a specific disease/disorder

N : Total number of informants who mentioned the same medicinal plant for the treatment of the same disease/disorder

Plant Part Frequency (PPF) was calculated to determine the relative frequency of use of a medicinal plant's particular part for the treatment of disease/disorders, following Jadid et al. (2020):

$$PPF (\%) = \frac{\sum RU (\text{plant part})}{\sum RU} \times 100$$

Where:

$\sum RU$  (plant part): sum of the cited medicinal plant parts

$\sum RU$ : total number of cited uses for a given medicinal plant

## RESULTS AND DISCUSSION

### Demographic data of informants

Bojonegoro District is one of the largest cattle-producing areas in Indonesia's East Java province. The majority of people living in rural areas prefer to work as cattle breeders. Although the breeding process is carried out by organized groups centralized in each area, their breeding management is still highly traditional. The barn is a semi-permanent structure made from scrap wood, demonstrates this, as does the poor handling of animal feed and trash. Cattle breeders still believe that medicinal plants help to cure many diseases in their cattle, in addition to more established animal health management practices. If one's livestock is seriously ill or dying, they will call a veterinarian. Cattle breeders always have a heifer nurtured until they give birth to a calf using artificial insemination.

The calf is raised for 3 to 12 months before being sold. If a breeder's productivity decreases, they will replace the heifer with new ones. The majority of respondents declare that raising cattle is not for profit but instead is a method of saving wealth for future needs. This concept is known as *rojokoyo*. A number of cattle breeders may sell their cattle to pay for school registration fees, weddings or circumcisions, and Eid al-Adha celebrations.

Even though they have other animals such as chickens, ducks, geese, and pigeons, most cattle breeders in Bojonegoro District have devoted their lives to cattle breeding. These animals are used as a source of protein for daily needs or as pets. The degree of wealth is determined by cattle ownership. Cattle raising can also be seen as an ancestral cultural mandate that must be preserved. A thanksgiving ceremony known as *brokohan* is held when a cow is born. This small celebration is held to thank God for their good fortune and pray for the newborn calf's wellness. There are no records of when ethnoveterinary therapy of cattle began. However, cattle breeders have noticed it since they were children from their grandparents. Because of the hot weather in the Bojonegoro District all year, they prefer to keep tropical cattle such as *peranakan ongole* (PO). Although they are gradually accepting other breed cattle, such as limousine, simmental, brahman, brahman cross, and mix breed, their numbers are still low.

All the respondents were males, with the primary occupation being farmer and cattle breeders. On average, each respondent has five cattle. Seventy-eight percent of the participants aged 30 to 50 years old, while 12.00% are older than 50 years old and 4.00% are younger than 30 years old. A senior high school diploma is held by 36.59% of cattle breeders, followed by the highest level of education obtained being a junior high school diploma (24.39%) or an elementary school education (19.51%). Meanwhile, only 17.07% of students were able to continue their education to the undergraduate level and 2.44% to the master's level. Around 59.00% of the respondents have worked as cattle breeders for less than ten years, 24.00% have worked as cattle breeders for more than 20 years. Only 17.00% have worked as cattle breeders for 10 to 20 years. About 59.00% of cattle in the Bojonegoro District are *Peranakan ongole*, while 41.00% are mixed breeds (PO, limousine, simmental, brahman). Adults of all breeds have a bodyweight of between 400 and 600 kilograms. The main source of food is the grass that grows wild near the barn, field, and along riverbanks. Some concentrates such as high protein feed (amino acid, ureum) and minerals such as calcium, magnesium, and phosphor are sometimes added sufficiently to the feed.

### Ethnoveterinary medicinal plant data

Table 1 presents the 41 ethnoveterinary medicinal plants mentioned by the 41 respondents to treat cattle diseases in the study area. Cultivation (65.80%), wild (31.70%), and traditional market purchases (4.80%) were the main sources of medicinal plants in the Bojonegoro District.

**Table 1.** Ethnoveterinary medicinal plants used for the treatment of cattle ailments in Bojonegoro District

Family	Scientific name	Local name	Using part	Treated disease	Source
Zingiberaceae	<i>Alpinia galanga</i> (L.) Wild	<i>Laos</i>	Rhizome	Digestion (stimulate appetite)	Cultivate
	<i>Curcuma aeruginosa</i> Roxb.	<i>Temuireng</i>	Rhizome	Digestion (stimulate appetite, bloating)	Cultivate
	<i>Curcuma longa</i> L.	<i>Kunyit, kunir</i>	Rhizome	Digestion (bloating, stimulate appetite)	Cultivate
	<i>Curcuma xanthorrhiza</i> Roxb.	<i>Temulawak</i>	Rhizome	Digestion (bloating, stimulate appetite)	Cultivate
	<i>Curcuma zedoaria</i> (Christm.) Roscoe	<i>Kunyit putih</i>	Rhizome	Digestion ((bloating, stimulate appetite), body warmers)	Cultivate
	<i>Kaempferia galanga</i> L.	<i>Kencur</i>	Rhizome	Digestion (stimulate appetite)	Cultivate
	<i>Zingiber montanum</i> (J. Koenig) Link ex A.Dietr.	<i>Bangle</i>	All	Digestion (stimulate appetite, bloating)	Wild
	<i>Zingiber officinale</i> Roscoe	<i>Jahe</i>	Rhizome	Digestion (stimulate appetite, bloating), body warmers	Cultivate
Fabaceae	<i>Leucaena leucocephala</i> (Lam.) de Wit	<i>Mlanding/ mlandingan/ lamtoro</i>	Leaf	Digestion (diarrhea), Integument (wound healing)	Cultivate
	<i>Pachyrhizus erosus</i> (L.) Urb.	<i>Bengkoang</i>	Root Tubers	Digestion (stimulate appetite)	Cultivate
	<i>Sesbania grandiflora</i> (L.) Pers.	<i>Turi</i>	Leaf	Lactation	Cultivate, wild
	<i>Tamarindus indica</i> L.	<i>Asam Jawa</i>	Leaf, fruit	Digestion (diarrhea), Respiratory	Cultivate
Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	<i>Serai</i>	Leaf	Digestion (stimulate appetite)	Cultivate
	<i>Gigantochloa verticillata</i> (Willd.) Munro	<i>Bambu</i>	Leaf	Digestion (diarrhea, detoxification)	Cultivate
	<i>Imperata cylindrica</i> (L.) Raeusch	<i>Ilalang</i>	Leaf	Digestion (diarrhea)	Wild
	<i>Saccharum officinarum</i> L.	<i>Tebu</i>	Stem	Digestion (detoxification)	Buy
Euphorbiaceae	<i>Euphorbia hirta</i> L.	<i>Patikan kebo</i>	Leaf	Integument (wound healing)	Wild
	<i>Jatropha multifida</i> L.	<i>Yodium</i>	Sap	Integument (wound healing)	Wild
Lamiaceae	<i>Ocimum sanctum</i> L.	<i>Kemangi</i>	Leaf	Digestion (stimulate appetite)	Cultivate
	<i>Tectona grandis</i> L.f.	<i>Jati</i>	Young leaves	Integument (wound healing)	Cultivate
Piperaceae	<i>Piper betle</i> L.	<i>Sirih/Suruh</i>	Leaf	Digestion (diarrhea, detoxification), Integument (wound healing)	Cultivate
	<i>Piper nigrum</i> L.	<i>Merica, lada</i>	Seed	Body warmers	Cultivate
Pandanaeae	<i>Pandanus tectorius</i> Parkinson ex Du Roi	<i>Pandan</i>	Leaf	Lactation	Cultivate
	<i>Pandanus amaryllifolius</i> Roxb.	<i>Empol pandan</i>	Rhizome	Lactation	Cultivate
Acanthaceae	<i>Andrographis paniculata</i> Ness	<i>Sambilot</i>	Leaf	Digestion (stimulate appetite)	Wild
Amaryllidaceae	<i>Allium cepa</i> L.	<i>Bawang merah</i>	Root-tubers	Digestion (stimulate appetite), Integument (wound healing)	Cultivate
Annonaceae	<i>Annona squamosa</i> L.	<i>Srikaya</i>	Leaf	Digestion (anthelmintic)	Cultivate
Apocynaceae	<i>Rauwolfia serpentina</i> (L.) Benth. ex Kurz	<i>Tule pandak</i>	Root	Integument (smooths fur)	Wild
Araceae	<i>Amorphophallus muelleri</i> Blume	<i>Porang hutan</i>	Leaf	Digestion (stimulate appetite)	Wild
Arecaceae	<i>Cocos nucifera</i> L.	<i>Kelapa hijau</i>	Coconut water	Digestion (detoxification)	Buy
Asteraceae	<i>Elephantopus scaber</i> L.	<i>Tapak liman</i>	Leaf	Digestion (stimulate appetite)	Wild
Convolvulaceae	<i>Ipomoea batatas</i> (L.) Lam.	<i>Ketela rambat</i>	Leaf	Lactation	Cultivate
Costaceae	<i>Costus speciosus</i> (J. Koenig) Sm.	<i>Dangkel pacing</i>	Stem, leaf	Digestion (anthelmintic), Lactation	Wild
Musaceae	<i>Musa sapientum</i> L.	<i>Pisang raja</i>	Young fruit	Integument (wound healing, snake bite)	Cultivate
Myrtaceae	<i>Psidium guajava</i> L.	<i>Jambu biji</i>	Leaf	Digestion (diarrhea)	Cultivate
Oxalidaceae	<i>Averrhoa bilimbi</i> L.	<i>Belimbing wuluh</i>	Fruit	Digestion (stimulate appetite)	Cultivate
Phyllanthaceae	<i>Sauropus androgynus</i> (L.) Merr.	<i>Babing/ katuk</i>	Leaf	Lactation	Cultivate
Portulacaceae	<i>Portulaca oleraceae</i> L.	<i>Krokot</i>	Leaf	Lactation	Wild
Rubiaceae	<i>Paederia foetida</i> L.	<i>Simbukan/Sembukan</i>	Leaf	Digestion (stimulate appetite, bloating)	Wild
Sapotaceae	<i>Manilkara zapota</i> (L.) P.Royen	<i>Sawo</i>	Leaf	Digestion (diarrhea)	Cultivate
Simaroubaceae	<i>Brucea javanica</i> (L.) Merr.	<i>Kwalot</i>	Leaf	Digestion (stimulate appetite, diarrhea; anthelmintic)	Wild

According to the International Union for Conservation of Nature (IUCN), all of the medicinal plants mentioned by the informant are not endangered, indicating that their populations in nature are still vast. Furthermore, these herbal plants have the potential to be used in large quantities. The majority of respondents stated that medicinal plants are administered by oral solution formulation, with an average administration duration of 2-3 days and an average volume of 0.5-1.5 liters per dose. According to the results of the economic analysis, giving medicinal plants to cattle is significantly cheaper, safer, and effective for treating disorders/diseases with mild to moderate symptoms.

According to Table 2, gastrointestinal disorders are the most common condition that medicinal plants treat. The major concerns in the gastrointestinal tract are stimulating appetite (0.78), bloating (0.75), and detoxification (0.70). Apart from non-digestive disorders, lactation and wound healing are the most severe problems, with 0.71 and 0.68, respectively. These diseases have a significant economic impact on cattle breeders because the appearance of the disease has a significant impact on the selling price of the cattle. Cattle breeders will be more aware of the major disease symptoms and will provide treatment derived from medicinal herbs when the symptoms first appear.

*Curcuma longa* L. was the most commonly mentioned medicinal plant species (88.00%) for treating bloating, followed by *Curcuma aeruginosa* Roxb. (86.00%) and *Zingiber officinale* Roscoe (82.00%) for stimulating appetite (Table 3). Cattle breeders commonly use rhizome medicinal plants since they are easy to cultivate and found in the traditional market. Furthermore, it is affordable and well-known in the Javanese community as traditional medicine, also known as *jamu empon-empon*. Cattle breeders also believe that plants belonging to the Zingiberaceae family can cure a variety of diseases in both humans and animals based on empirical data. *Cocos nucifera* L. infused in water is the most commonly used medicinal plant to treat various forms of poisoning in cattle. For a long time, this herb has been applied to protect

humans from toxins. Cattle breeders most frequently mention the leaf of the *Piper betle* L. as a natural ingredient for integumentum problem treatment. Meanwhile, *Pandanus amaryllifolius* Roxb. and *Pandanus tectorius* Parkinson ex Du Roi leaves are commonly used to strengthen lactation.

Table 4 presents which medicinal plant parts are usually used in Bojonegoro District: leaves (58.90%), rhizome (20.50%), root (10.20%), fruit (7.70%), stem (5.10%), seed (2.50%), and sap (2.50%). Leaves were used most frequently because the majority of medicinal plants used by cattle breeders in Bojonegoro are trees. Although treatment derived from medicinal plant species using their rhizomes are the most commonly used. The use of the leaves, which are more abundant, is more sustainable, as it does not cause harm to the plants.

**Table 2.** Informant Consensus Factor (Fic) treatment categories

Treatment categories	Citations	Number of species	FIC
Digestion (stimulate appetite)	32	17	0.78
Digestion (bloating)	21	6	0.75
Lactation	22	7	0.71
Digestion (detoxification)	11	4	0.70
Integumentum (wound healing)	20	7	0.68

**Table 4.** Plant Part Frequency (PPF) of medicinal plants used based ethnoveterinary medicinal study in Bojonegoro District, East Java, Indonesia

Parts	Frequency of parts (%)
Leaves	58.90
Rhizome	20.50
Root	10.20
Fruit	7.70
Stem	5.10
Seed	2.50
Sap	2.50

**Table 3.** Fidelity Level (FL) of medicinal plants in Bojonegoro District, East Java, Indonesia

Plant species	Diseases/disorder categories	Fidelity level (%)
<i>Curcuma longa</i> L.	Digestion (bloating)	88.00
<i>Curcuma aeruginosa</i> Roxb.	Digestion (stimulate appetite)	86.00
<i>Zingiber officinale</i> Roscoe	Digestion (stimulate appetite)	82.00
<i>Cocos nucifera</i> L.	Digestion (detoxification)	80.00
<i>Piper betle</i> L.	Integumentum (wound healing)	70.00
<i>Kaempferia galanga</i> L.	Digestion (stimulate appetite)	66.00
<i>Pandanus amaryllifolius</i> Roxb.	Lactation	66.00
<i>Pandanus tectorius</i> Parkinson ex Du Roi	Lactation	66.00
<i>Alpinia galanga</i> (L) Wild	Digestion (stimulate appetite)	60.00
<i>Curcuma xanthorrhiza</i> Roxb.	Digestion (stimulate appetite)	55.00

## Discussion

According to the data in Table 1, each medicinal plant species has a different function for the treatment of cattle disease. Medicinal plants mentioned by the respondents are all locally available Indonesian local plants. These plants are also easy to find and cultivate, particularly on the island of Java. They are cultivated by cattle breeders and used directly to treat cattle for many decades; however, some medicinal plants are still obtained from the forest or bought in traditional markets. This result of this study is consistent with those of Sargin and Büyükcengiz (2019) regarding the source of herbal medicine, mostly wild or cultivated. The use of medicinal plants for natural therapy is a part of their ancestral heritage. Plants familiar to the community and cultivated can also be found in the surrounding environment (Raza et al. 2014; Xiong and Long 2020; Yigezu et al. 2014). In this study, medicinal plants used for cattle therapy have been used very often by the Javanese community to overcome various human health problems. Later, when their cattle had problems, their ancestors tried to prescribe medicine by themselves. Their experimentation successfully cured the disease in cattle also. This knowledge was then passed on to their children and grandchildren, and thus it continues to be practiced today.

Under similar circumstances as in Indonesia, traditional medicines have been used for nearly 90.00% of livestock populations in Ethiopia, where complementary remedies are required in their modern health care system. All plants with pharmacological activity are complementarily prescribed as a good treatment for livestock diseases (Yigezu et al. 2014). Indeed, all across Africa also use medicinal plants are an important resource, if not the primary source of treatment: Benin, Rwanda, Tanzania, South Africa, and Uganda, for primary health care (Bakare et al. 2019; Dassou et al. 2020; McGaw et al. 2020; Yigezu et al. 2014; Sargin and Buyukcengiz 2019). Farmers who live in other regions also use medicinal plants for livestock, such as in the South Pacific Islands (Bakare et al. 2019), China (Xiong and Long 2020), Pakistan (Abbasi et al. 2013; Aziz et al. 2018; Khan et al. 2019; Raza et al. 2014), Turkey (Sargin and Buyukcengiz 2019), Europe (Schnyder et al. 2019), and Mesoamerica (Geck et al. 2020) and so forth. Among the most important medicinal plants used for treating animal diseases. *Aloe* sp., *Cassia fistula*, *Podophyllum hexandrum*, and *Pogostemon benghalensis* were the most important medicinal plants used for treating animal diseases as per use value in the study area of the North-Western Himalaya, India (Thakur et al. 2016). The alternative medicines from medicinal plants grown in the environment around a certain region or ethnicity are unique, having their characteristics. Those trusted for their efficacy are faithfully passed down and used by the descendants of that community.

Treatment for digestive disorders such as stimulating appetite, bloating and detoxification, the biggest problems in cattle, that are treated with medicinal plants by FIC value 0.74 respectively. These findings are consistent with the results of various other ethnoveterinary medicine studies showing that digestion-related disease is a major

focus of treatment with medicinal herbs in the Province of Giresun Turkey and with the same FIC value, 0.74 (Guler et al. 2021). Moreover, digestive problem in livestock in Buyi China, Jammu and Kashmir India, and Kohat Pakistan, the FIC value is above 0.80 (Sharma et al. 2012; Tariq et al. 2014). A number of domestic animals species in Buyi, China, are often treated by medicinal plants if clinical symptoms of the disorder appear, such as ruminal impaction, diarrhea, and abdominal pain. Massive disease attacks on the gastrointestinal system are caused by poor sanitation practices in closed environments (Sharma et al. 2012; Xiong and Long 2020). This problem can reduce the economic value of cattle. If not handled immediately, such ailments can cause death. Therefore, the medicinal plants that cattle breeders have long practiced have been essential to overcome various acute symptoms. However, if the disease is chronic, they will immediately call the veterinarian. Usually, the lack of appetite in cattle occurs due to changes in the type of feed, mainly at the change of seasons or when a calf begins to mature and become more independent. Bloating occurs when cattle eat leaves that are too young. This problem often occurs, especially in the rainy season. Some cattle breeders outsmart others by drying the grass before giving it to cattle, but this practice can not guarantee one hundred percent that cattle will be free from bloating problems. Concentrated diets that are too high compared to grass are also one of the problems causing bloating in cattle. Providing high concentrate feed is mostly undertaken by cattle breeders hoping that the Average Daily Growth (ADG) is high and cattle can develop quickly. Meanwhile, the main problem of poisoning in cattle is caused by accidentally eating poisonous plants, which are mixed in the vegetation when cattle breeders graze them in the fields, riverbanks, and forest. Cattle breeders mentioned accidentally mixing poisonous plants into animal feed also. On the other hand, there is still a lot of ignorance among young cattle breeders about plants that generally cause poisoning in cattle (Tariq et al. 2014; Schnyder et al. 2019; Xiong and Long 2020).

The medicinal plants most often used to treat digestive problems are species in the family Zingiberaceae (ginger). The most commonly used part for treating bloating is the rhizome of *Curcuma longa* L. (88.00%). Numerous other species can be used to stimulate appetite, including the rhizome of *Curcuma aeruginosa* Roxb (86.00%). This is similar to the results of Fidelity Level studies in which Zingiberaceae rhizomes were effectively used as a remedy for various digestive problems occurring in livestock, such as diarrhea, bloating, warming of the body, and anorexia more than 56% (Asmara et al. 2018; Jayakumar et al. 2018; Palanichamy et al. 2018; Xiong and Long 2020). Observations of various livestock in India showed that the rhizome of *Curcuma longa* L. is also used to treat reproductive disorders, heal cracks in teats, abrasions, horn avulsion, hematomas, and blisters on the udder (Jayakumar et al. 2018). Another study indicated that 96,50% of respondents used *Curcuma longa* L. as an antiseptic to treat their livestock (Kirmani et al. 2020).

The *Curcuma longa* L. species is well-known in rural areas, particularly in Java. The plant's rhizome is frequently

used in herbal mixtures and cooking spices (Elfahmi et al. 2014). Plants in the Zingiberaceae family are easy to grow in a variety of soil conditions, and they reproduce quickly. *Curcuma longa* L. is used to treat digestive disorders in cattle, such as boosting appetite and reducing bloating. Because of its nutritional, pharmacological, and medicinal qualities, curcumin, a natural polyphenolic bioactive substance produced from *Curcuma longa* L., has been employed as an additive (Wang et al. 2017). Anti-inflammatory, antioxidant, antibacterial, antiparasitic, and coccidiostat activities are all demonstrated in curcumin (Jaguezeski et al. 2018). A previous report from India showed that fresh *Curcuma longa* L. rhizomes and fresh *Tamarindus Indica* L. leaves are used to cure muscle tension in livestock (Jayakumar et al. 2018). Another study in human healthcare documented that *Curcuma longa* L. was also the most frequently used medicinal plant species by people in rural villages of West Java, Indonesia (Rahayu et al. 2020). Curcumin inhibits and minimizes pathogenic events by interacting with a wide range of molecules implicated in the inflammatory cascade (Tizabi et al. 2014). An increase in antioxidant enzyme activity usually results in a reduction in oxidative reactions, as well as oxidative stress and cellular damage reduction (Al-Rubaei et al. 2014). Research shows that curcumin added to dairy products provides increased antioxidant potential with a consequent improvement in storage stability. The anti-inflammatory and antioxidant actions of curcumin already benefit the health of the sheep in this initial period of lactation and reduce somatic cell count (SCC) in the milk when the lactating sheep may experience metabolic disturbances and oxidative stress (Salinas-Rios et al. 2017; Jaguezeski et al. 2018).

*Curcuma aeruginosa* Roxb. is reputable in the Javanese community as a herbal medicine for rheumatism and hemorrhoid problems, while *Zingiber officinale* Roscoe is usually used as a body warmer, a relaxant of muscles, and anti-cough treatment. The rhizome of *Curcuma aeruginosa* Roxb. contains germacrone, furanodiene, curcumenol, zedoarol, zedoarondiol, zedoalactone A, zedoalactone B, isocurcumenol, and isofuranodiene. These are non-volatile compounds that are important as antioxidants, antibacterial, and anti-inflammatory agents. They can improve various problems in the digestive tract, such as colic, diarrhea, and gastritis (Hossain et al. 2015; Theanphong et al. 2015). The essential oil in the rhizome of *Curcuma aeruginosa* Roxb. is suspected to be the key factor causing appetite increase cattle. It causes the essential oil to emit a distinctive aroma specifically found in all rhizomes of the Zingiberaceae family of plants. Recently, a study by Nurcholis et al. (2021), indicated that aussurea lactone, eucalyptol, camphor, epicurzerenone, and -elemene metabolites of *Curcuma aeruginosa* Roxb. are new sources of anticancer agents also. Phytochemicals in the rhizomes of *Zingiber officinale* Roscoe such as gingerol, shogaol, zingiberol, and zingiberene have been shown to have antimicrobial, antiviral, anti-inflammatory, anti-hyperglycemia, and anti-tumor properties which are crucial for digestive disorder treatments (Ali et al. 2008). The Buyi community in China frequently uses *Zingiber officinale* Roscoe as an herbal

medicine for the treatment of gastrointestinal diseases in livestock. If the temperature is cold or in the rainy season, giving a decoction of the *Zingiber officinale* Roscoe rhizome is very important to prevent animals from getting the flu (Xiong and Long 2020). As well as in Bojonegoro, if the environment is cold, cattle breeders will make a concoction of burnt *Zingiber officinale* Roscoe rhizomes for cattle to warm their bodies. The hyperthermic effect of *Zingiber officinale* Roscoe rhizomes is derived from polyphenols such as gingerol, 6-shogaol, 6-gingerol, and zingeron (Semwal et al. 2015; Sugimoto et al. 2018).

*Cocos nucifera* L. (coconut) water is most trusted by cattle breeders as a natural medicine for detoxification. Not only for cattle but also, the Javanese community generally believes that coconut water is a medicine with a myriad of benefits for neutralizing toxins in humans. Lima et al. (2015) explained that it has phytochemical activity includes anti-oxidant, anti-inflammatory, anti-microbial, anti-viral, anti-tumor, antifungal, and antihelmintic. Bhagya et al. (2012) show that tender coconut water (TCW) is rich in ascorbate acid, L-arginine, calcium, magnesium, and potassium, which can accelerate the sensitivity of insulin, regulate antioxidants, and lipid peroxidation inhibition. It is important to decrease oxidative stress, the source of inflammation. The high antioxidant agent is believed to be the main factor for detoxification. Minerals contained in coconut water can be a chelating agent that is able to bind toxic compounds to get out of the body immediately. In Fiji and India, water from *Cocos nucifera* L. has been proven to treat disorders of the kidneys and menstrual cycle. Other research results reveal that the water can be a renal and liver protective agent. The rats treated with coconut water presented decreased activities of the enzymes serum glutamate oxaloacetate transaminase and glutamate pyruvate transaminase. While rats treated with coconut water exhibit significant declines in calcium oxalate crystals, creatinine, blood urea nitrogen, lipid peroxidation, the enzyme activity of superoxide dismutase, and catalase (Sandhya et al. 2008; Gandhi et al. 2013).

*Piper betle* L. is a trusted medicinal plant that is trusted by cattle breeders as a natural medicine for the treatment of integumental disorders, especially for wound healing. This leaf is widely used to treat various types of wounds, such as those caused by insect bites, myiasis, and surgical wounds. Indeed, it has the potential as a source of healing skin and anti-aging agent. Many people have used it as a natural antiseptic to treat various disorders of the integument organs (Mgbeahuruike et al. 2017). According to Thi et al. (2021), *Piper betle* leaves have been shown to possess a phenolic component that has the capacity to heal cutaneous tissue wounds. A similar study found ethanolic extract of *Piper betle* L. was effective for healing acute wounds in rats (Rahayu et al. 2019). Several cattle breeders also mentioned that the leaves of this plant are crucially effective for treating diarrhea and detoxification. This is similar to research by Lutviandhitarani et al. (2015), which states that *Piper betle* L. leaves have good anti-oxidant and anti-bacterial activity because they contain phytochemicals such as eugenols, tannins, alkaloids, and terpenoids. The Javanese community believes that plants



have good potential to heal wounds. Their use is also practical, namely by affixing the leaves to the wound or washing the wound with boiled water from leaves. This plant is easy to cultivate, usually spreads on the fence, and is also widely sold in traditional markets.

Both of *Pandanus amaryllifolius* Robx. and *Pandanus tectorius* Parkinson ex Du Roi has long been used as a natural pant remedy for lactation. When heifers give birth, the two plants are always given for the first time. Those leaves are crushed then brewed in warm water. The Javanese community usually uses *Pandanus* sp. to make food tasty and give a nice fragrant smell. *Pandanus amaryllifolius* Robx extract contains gallic acid, catechin, caffeic acid, myricetin, luteolin, and quercetin (Ghasemzadeh and Jaafar 2014). Reshidan et al. (2019) attested that their research shows that leaf water extract of *Pandanus amaryllifolius* Robx can improve metabolic syndrome. This is very closely related to preventing the emergence of metabolic syndrome that often occurs in heifers that have just given birth. Sometimes this syndrome causes the cattle to collapse, which greatly affects the decrease in lactation productivity, but this syndrome is rarely found in heifers in Bojonegoro, suspected of being given the medicinal concoction. Meanwhile, based on previous research, *Pandanus tectorius* Parkinson ex Du Roi contains phytochemical compounds in the form of flavonoids and triterpenoids, especially in the leaves (Omodamiro and Ikekemma 2016). These compounds contain a lot of potential as an anti-oxidant, hepatoprotective, anti-inflammatory, and antimicrobial agents. These potentials are believed to be able to facilitate the lactation of heifers in Bojonegoro. Antioxidant, anti-inflammatory, and anti-microbial activity are mentioned as the main factors that play a role by inhibiting the occurrence of mastitis (Awad et al. 2019).

Plant Part Frequency of Leaves was a common component of herbal medicine in the Bojonegoro District by more than 58.00%, while seed and sap were the least common (2.50%). Similar to the other studies, leaves were an important component in traditional medicine in three districts of Pakistan's Lesser Himalayas (26.00%), in Giresun Turkey (30.00%), in Kohan Pakistan (47.00%), in Jimma zone Ethiopia (68.12%). It causes the leaves to be relatively easy to find and harvest, more convenient to formulate, and more renewable sources. Therefore making leaves perhaps more popular as herbal medicine (Abbasi et al. 2013; Guler et al. 2021; Tariq et al. 2014; Yigezu et al. 2014).

In contrast, a study conducted by Xiong and Long (2020) in Southwest Guizhou China discovered that the leaf is a less commonly used part of the medicinal plant (11.00%) since roots are more well-known in that tribal community. Furthermore, studies in South Omo, Southern Ethiopia demonstrated that roots (42.00%) are more edible as herbal medicine for their population because plant parts are available throughout the year, and it is the local beliefs that have a great therapeutic effect (Tolossa et al. 2013). Although the rhizome of Zingiberaceae species is the most commonly used medicinal plant in this study, the majority of medicinal plants mentioned by respondents are tree

species with a lot of their leaves taken. Leaves are commonly used as medicinal plants because they are easier to apply, particularly in the form of solutions such as decoction, infusion, and tinctures made from boiled or brewed leaves in water.

The use of medicinal plants and other natural multicomponent medicines could be one strategy for reducing antibiotic use in cattle and decreasing antibiotic resistance (Bischoff et al. 2016). The use of antibiotics for the treatment of various diseases has been shown to be harmful, resulting in the establishment of antibiotic resistance in bacteria and a lot of residue on meat, which can undoubtedly threaten the health of humans who consume it in the long run. The emergence of multidrug-resistant bacterial species required may need a highly restricted use of antibiotics in veterinary health practices (Mertenat et al. 2020). The substantial unfavorable effects of antibiotic use in cattle will almost certainly have an impact on the future use of therapeutic plants. During the pre-antibiotic era, a wide range of medicinal plants was utilized to treat animals. As a result, there is a need for the conservation of medicinal plants, which have a high potential for treating a variety of animal ailments. If there is a high demand for herbal medicine manufacture, a large-scale investigation will not result in the extinction of a species of herbal plant species (El Sooud 2018).

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