



# Ethnopharmacological Study of Medicinal Plants in the Rawamerta Region Karawang, West Java, Indonesia

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## Abstract

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**BACKGROUND:** Traditional medicinal plants' application has significant advantages for cultural development, acceptability, and economic affordability. Furthermore, they are claimed to cure several types of diseases compared to modern medicines.

**AIM:** This study aims to document and preserve the use of ethnomedicinal plants to treat various diseases by the community in the Rawamerta Region, Karawang, West Java, Indonesia.

**METHODS:** Fieldwork was carried out from January to August 2022 through face-to-face interviews, questionnaires, and discussions. Plant species were identified based on standard taxonomic methods, floral morphological characteristics, and possibly, by using samples for comparison, as well as expert consultation and literature. They were then grouped into families according to the Cronquist classification system. Furthermore, their names were checked on the Plant List ([www.plantlist.org](http://www.plantlist.org)) and the International Plant Name Index ([www.ipni.org](http://www.ipni.org)).

**RESULTS:** It was discovered that 50 plant species belonging to 31 families spread across 46 genera are employed for the treatment of various diseases in Rawamerta, such as diabetes, inflammation, hypertension, fever, dyslipidemia, antiseptic, gastric disorders, anticancer, cough, gout, etc. Based on the results, *Acanthaceae*, *Fabaceae*, *Zingiberaceae*, and *Myrtaceae* are the most dominant families applied for the treatment purpose. Meanwhile, the most frequently used genera are *Syzygium*, *Piper*, *Curcuma*, and *Annona*. The plant part majorly used in medicine preparation is the leaf (64%), followed by fruit (14%), rhizome (10%), and stem (6%), as well as flower, peel, and stem and leaf (2%, respectively). The most commonly applied preparation method is an infusion (48%), followed by decoction (44%), juice (4%), as well as paste and drops (2%, respectively). This study also showed more than one plant species is used for treating the same disease.

**CONCLUSION:** The results confirm that the Sundanese people in Rawamerta still rely heavily on medicinal plants for their health-care system. However, efforts to preserve medicinal plants and local wisdom in the region have not been significant. Therefore, the indigenes and the government are advised to carry out *in situ* and *ex situ* conservation strategies to maintain the availability of medicinal plants in the region.

## Introduction

Knowledge about the diversity of plant and animal species as well as the efficacy of their medicinal application is usually obtained empirically as part of local wisdom. Furthermore, local wisdom is formed evolutionarily, initiated by a certain group of people, and through trial and error gradually and continuously; hence, it becomes a traditional knowledge for the community [1]. Local people's knowledge of plant and animal species used for medicine is studied specifically in the field of ethnopharmacology. Ethnomedicine is concerned with the study of the relationship between humans and plants [2]. Plants are an important resource in herbal medicine preparation and they play an important role in the survival of tribes and indigenous peoples around the world. According to the World Health Organization (WHO), 80% of the global population is estimated to depend on traditional medicine for their

health needs [3]. In developing countries, 25% of herbal medicines are employed in treating chronic diseases and infections. Indigenous people in rural areas have extensive knowledge about how to use plants for the treatment of various diseases. Tribes and indigenous peoples have a strong belief in herbal medicine to cure diseases. In general, each tribe possesses extensive ethnomedicine knowledge to identify medicinal plants as well as unique and different techniques to apply them for treatment purposes [2]. Ethnomedicine has contributed tangibly to the health-care system since ancient times. There are two broad categories for medicinal plant uses. First, the traditional application by local doctors to cure diseases, and second, for the discovery and development of drugs [4].

In Indonesia, several ethnic groups have started using allopathic medicines together with ethnomedicine [5]. There is still a lack of documentation on herbal medicinal plants, making it necessary

to search for information on their ethnomedicine knowledge for the treatment of diseases. Therefore, this study aims to document indigenous knowledge of medicinal plant species used by the Sundanese in the Rawamerta Region.

## Materials and Methods

### Study area

Rawamerta is situated in Karawang Regency, West Java, Indonesia, with an area of 49,113 km<sup>2</sup>. This region has an altitude of 12 m above sea level with a maximum average air temperature of 30°C and a minimum of 27°C. Moreover, the location is between 06° 14' 283" South Latitude and 107° 19' 599" East Longitude. The region is a humid tropical climate area that is mostly inhabited by the Sundanese (98%) and other tribes (2%). The vegetation in the study area is under moist and dry deciduous forest type as presented in Figure 1.

### Data collection

A study in the context of interviewing was performed to investigate the traditional application of plants and to identify the parts of plants used by local people. To document the available information about medicinal plants from tribal practitioners, several field visits were carried out from January to August 2022 in the Rawamerta Region, Karawang, West Java, Indonesia. Participants of the study composed of 65 locals well-known people of both genders with an average age of 50 years from the study area. Local people were asked to collect the name of the plants, to indicate against which illnesses the plants were used

and to determine the methods of plant applications. Furthermore, only those species that could be directly indicated and collected by the local persons were studied. The vernacular names were collected with the cooperation of local people. For each species, the following information was collected: botanical taxon, family name, part used, and administration methods (such as paste, powder, juice, and decoction).

### Botanical identification

Plant species were identified based on standard taxonomic methods, floral morphological characteristics, and possibly, using samples for comparison, as well as expert consultation and literature [6]. They were then grouped into families according to the Cronquist classification system [7], except for Pteridophyta and Gymnosperms. Furthermore, their names were checked on the Plant List ([www.plantlist.org](http://www.plantlist.org)) and the International Plant Name Index ([www.ipni.org](http://www.ipni.org)).

### Ethics statement

All participants provided oral prior informed consent before the interviews, and the participants shown in figures in the paper gave consent to have their images published.

## Results and Discussion

A total of 50 plant species belonging to 31 families spread across 46 genera were discovered to be commonly employed by the local Sundanese for the treatment of various diseases, indicating that



Figure 1: Location of the study area. Rawamerta Region, Karawang, West Java, Indonesia

the study site is affordable in biodiversity. The results also showed that the most widely used plant family is *Acanthaceae* (five species), followed by *Fabaceae* and *Zingiberaceae* (four species, respectively), and *Myrtaceae* (three species), while the remaining 31 families are represented by <3 species. Based on Table 1, the most frequently used genera are *Syzygium*, *Piper*, *Curcuma*, and *Annona* (two genera, respectively).

Among various parts of the plant, the leaf (64%) is majorly used in medicine, followed by fruit (14%), rhizome (10%), and stem (6%), as well as flower and peel (2%, respectively) as demonstrated in Figure 2. It is easier to prepare and extract the leaf's active substance for treatment. At the same time, leaves create less effect on the mother plant [8].

According to Figure 3, the most commonly applied preparation method is an infusion (48%), followed by decoction (44%) and juice (4%), as well as paste and drops (2%, respectively). These results are in line with a previous study that the most widely used forms of traditional medicine by the community are infusion and decoction [6]. This present study also showed more than one plant species is employed for

treating the same disease. For example, *Allium sativum*, *Andrographis paniculata*, *Anredera cordifolia*, *Carica papaya*, *Clinacanthus nutans*, *Clitoria ternatea*, *Curcuma zanthorrhiza*, *Garcinia mangostana*, *Mesona palustris*, *Mimosa pudica*, *Momordica charantia*, *Morinda citrifolia*, *Pandanus amaryllifolius*, *Persea americana*, *Phaleria macrocarpa*, *Phyllanthus niruri*, *Piper betle*, *Pluchea*

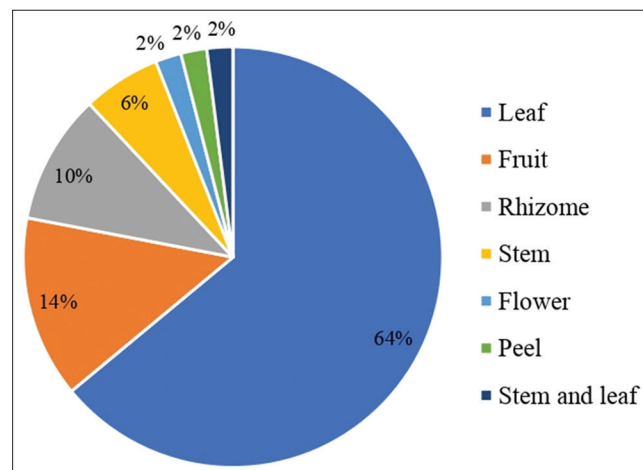


Figure 2: Percentage of plant parts used for the preparation of medicine

Table 1: Ethnomedicinal plants, local name, mode of administration and uses in Rawamerta, Karawang, Indonesia

| No | Species   | Family           | Local name    | Parts used | Medicinal uses   | Mode of administration |
|----|---|------------------|---------------|------------|--|------------------------|
| 1  | <i>Abrus precatorius</i> L.                         | Fabaceae         | Saga          | Leaf       | Cough, strep throat, anticancer, antiseptic                            | Infusion               |
| 2  | <i>Allium sativum</i> L.                            | Alliaceae        | Bawang putih  | Rhizome    | Diabetes, pain, inflammation, dyslipidemia, hypertension               | Juice                  |
| 3  | <i>Aloe vera</i> L.                                 | Xanthorrhoeaceae | Lidah buaya   | Stem       | Loss of hair   | Paste                  |
| 4  | <i>Alpinia galanga</i> (L.) Willd.                  | Zingiberaceae    | Lengkuas      | Rhizome    | Diarrhea   | Infusion               |
| 5  | <i>Andrographis paniculata</i> Nees.                | Acanthaceae      | Sambilot      | Leaf       | Fever, malaria, diabetes, hypertension, inflammation                   | Infusion               |
| 6  | <i>Annona muricata</i> L.                           | Annonaceae       | Sirsak        | Leaf       | Dyslipidemia, anticancer, hemorrhoids                                  | Infusion               |
| 7  | <i>Annona squamosa</i> L.                           | Annonaceae       | Srikaya       | Leaf       | Fever, pain  | Infusion               |
| 8  | <i>Anredera cordifolia</i>                          | Basellaceae      | Binahong      | Leaf       | Diabetes, hypertension, dyslipidemia                                   | Decoction              |
| 9  | <i>Apium graveolens</i> L.                          | Apiaceae         | Seledri       | Stem, leaf | Rheumatism, pain, anticalculi  | Infusion               |
| 10 | <i>Artocarpus altilis</i> J.R.Forster and G.Forster | Moraceae         | Sukun         | Leaf       | Stroke, dyslipidemia, hypertension, pain                               | Decoction              |
| 11 | <i>Averrhoa carambola</i> L.                        | Oxalidaceae      | Belimbing     | Fruit      | Hypertension, anemia   | Infusion               |
| 12 | <i>Carica papaya</i> L.                             | Caricaceae       | Pepaya        | Leaf       | Diabetes, hypertension, inflammation, fever                            | Decoction              |
| 13 | <i>Cassia siamea</i> Lamk.                          | Fabaceae         | Johar         | Leaf       | Stroke, dyslipidemia, hypertension, pain                               | Infusion               |
| 14 | <i>Centella asiatica</i> (L.) Urban                 | Mackinlayaceae   | Pegagan       | Leaf       | Hypertension, pain, inflammation                                       | Decoction              |
| 15 | <i>Citrus aurantiifolia</i> (Cristm.) Swingle       | Rutaceae         | Jeruk nipis   | Fruit      | Cough  | Decoction              |
| 16 | <i>Clinacanthus nutans</i> (Burm.f.) Lindau         | Acanthaceae      | Belalai gajah | Leaf       | Diabetes, fever, pain, inflammation                                    | Infusion               |
| 17 | <i>Clitoria ternatea</i> L.                         | Fabaceae         | Telang        | Flower     | Diabetes   | Infusion               |
| 18 | <i>Costus speciosus</i> (J.Konig) Sm.               | Costaceae        | Pacing tawar  | Stem       | Eye inflammation   | Drops                  |
| 19 | <i>Curcuma longa</i> L.                             | Zingiberaceae    | Kunyit        | Rhizome    | Antiseptic, inflammation, pain, jaundice, stomach disorders            | Infusion               |
| 20 | <i>Curcuma zanthorrhiza</i> Roxb.                   | Zingiberaceae    | Temulawak     | Rhizome    | Diabetes, pain, inflammation, anticancer                               | Infusion               |
| 21 | <i>Cymbopogon citratus</i> (DC.) Stapf              | Poaceae          | Serai         | Stem       | Antiseptic, pain, inflammation   | Infusion               |
| 22 | <i>Garcinia mangostana</i> L.                       | Clusiaceae       | Manggis       | Peel       | Diabetes, hypertension, inflammation, anticancer                       | Juice                  |
| 23 | <i>Graptophyllum pictum</i> L. Griff                | Acanthaceae      | Handeuleum    | Leaf       | Hemorrhoids  | Infusion               |
| 24 | <i>Ipomoea staphylina</i> Roem. & Schult.           | Convolvulaceae   | Tapak kuda    | Leaf       | Stomach disorders, pain, inflammation                                  | Infusion               |
| 25 | <i>Mangifera foetida</i> Lour.                      | Anacardiaceae    | Mangga        | Leaf       | Gout, pain, inflammation   | Infusion               |
| 26 | <i>Manihot utilisima</i> L.                         | Euphorbiaceae    | Singkong      | Leaf       | Hypertension, anemia   | Decoction              |
| 27 | <i>Mesona palustris</i> Bl.                         | Lamiaceae        | Cincau hitam  | Leaf       | Diabetes   | Decoction              |
| 28 | <i>Mimosa pudica</i> L.                             | Fabaceae         | Putri malu    | Leaf       | Diabetes, pain, inflammation   | Decoction              |
| 29 | <i>Momordica charantia</i> L.                       | Cucurbitaceae    | Pare          | Leaf       | Diabetes, hypertension, fever  | Decoction              |
| 30 | <i>Morinda citrifolia</i> L.                        | Rubiaceae        | Mengkudu      | Fruit      | Diabetes, hypertension   | Infusion               |
| 31 | <i>Moringa oleifera</i> Lamk.                       | Moringaceae      | Kelor         | Leaf       | Fever, pain, inflammation  | Decoction              |
| 32 | <i>Ocimum sanctum</i> L.                            | Lamiaceae        | Kemangi       | Leaf       | Pain, fever, stomach disorders   | Infusion               |
| 33 | <i>Orthosiphon aristatus</i> (Blume) Miq.           | Lamiaceae        | Kumis kucing  | Leaf       | Diuretic, pain, rheumatism   | Decoction              |
| 34 | <i>Pandanus amaryllifolius</i> Roxb.                | Pandanaceae      | Pandan        | Leaf       | Diabetes, hypertension   | Infusion               |
| 35 | <i>Persea americana</i> Mill.                       | Lauraceae        | Alpukat       | Leaf       | Diabetes, hypertension   | Decoction              |
| 36 | <i>Phaleria macrocarpa</i> (Scheff.) Boerl          | Thymelaeaceae    | Mahkota dewa  | Fruit      | Diabetes, pain, inflammation, dyslipidemia                             | Infusion               |
| 37 | <i>Phyllanthus niruri</i> L.                        | Phyllanthaceae   | Meniran       | Leaf       | Diabetes   | Infusion               |
| 38 | <i>Physalis angulata</i> L.                         | Solanaceae       | Ciplukan      | Fruit      | Pain, inflammation, rheumatism   | Infusion               |
| 39 | <i>Piper betle</i> L.                               | Piperaceae       | Sirih hijau   | Leaf       | Diabetes, inflammation, pain, fever, antiseptic                        | Decoction              |
| 40 | <i>Piper sarmentosum</i> Roxb.                      | Piperaceae       | Karok         | Leaf       | Cough, strep throat, flu, antiseptic, inflammation, fever              | Decoction              |
| 41 | <i>Pluchea indica</i> L.                            | Asteraceae       | Beluntas      | Leaf       | Diabetes   | Decoction              |
| 42 | <i>Psidium guajava</i> L.                           | Myrtaceae        | Jambu biji    | Leaf       | Diarrhea   | Decoction              |
| 43 | <i>Ruellia tuberosa</i> L.                          | Acanthaceae      | Kencana ungu  | Leaf       | Diabetes, hypertension, pain, inflammation                             | Decoction              |
| 44 | <i>Sauropus androgynus</i> (L.) Meer                | Phyllanthaceae   | Katuk         | Leaf       | Increase breast milk production  | Infusion               |
| 45 | <i>Smallanthus sonchifolius</i>                     | Asteraceae       | Daun Insulin  | Leaf       | Diabetes   | Infusion               |
| 46 | <i>Solanum torquatum</i> Swartz.                    | Solanaceae       | Tokakak       | Fruit      | Diabetes, rheumatism, pain, inflammation                               | Decoction              |
| 47 | <i>Strobilanthes crispus</i> Blume                  | Acanthaceae      | Kecibeling    | Leaf       | Diabetes   | Decoction              |
| 48 | <i>Syzygium aromaticum</i> L.                       | Myrtaceae        | Cengkeh       | Fruit      | Gout, pain, inflammation   | Decoction              |
| 49 | <i>Syzygium polyanthum</i> (Wight) Walpers          | Myrtaceae        | Salam         | Leaf       | Hypertension, gout, pain, inflammation                                 | Decoction              |
| 50 | <i>Zingiber officinale</i> Roscoe                   | Zingiberaceae    | Jahe          | Rhizome    | Antiseptic, cough, dyslipidemia, inflammation, pain, stomach disorders | Decoction              |



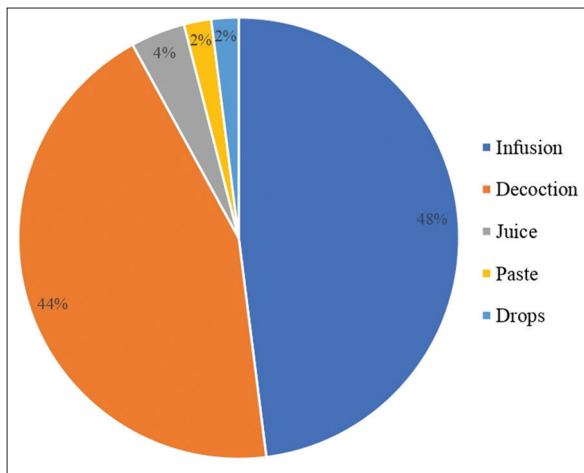


Figure 3: Percentage of mode of preparation

*indica*, *Ruellia tuberosa*, *Smallanthus sonchifolius*, *Solanum torvum*, *Strobilanthes crispata* (Diabetes), *A. sativum*, *A. paniculata*, *A. cordifolia*, *Artocarpus altilis*, *Averrhoa carambola*, *C. papaya*, *Cassia siamea*, *Centella asiatica*, *G. mangostana*, *Manihot utilissima*, *M. charantia*, *M. citrifolia*, *P. amaryllifolius*, *P. americana*, *Ruellia tuberosa*, *Syzygium polyanthum* (Hypertension), *A. sativum*, *A. cordifolia*, *Artocarpus altilis*, *Cassia siamea*, *P. macrocarpa*, *Zingiber officinale* (Dyslipidemia), *A. sativum*, *A. paniculata*, *C. papaya*, *Centella asiatica*, *C. nutans*, *Curcuma longa*, *C. zanthorrhiza*, *Cymbopogon citratus*, *G. mangostana*, *Ipomoea staphylyna*, *Mangifera foetida*, *M. pudica*, *Moringa oleifera*, *P. macrocarpa*, *Physalis angulata*, *P. betle*, *Piper sarmentosum*, *Ruellia tuberosa*, *Solanum torvum*, *Syzygium aromaticum*, *Syzygium polyanthum*, *Zingiber officinale* (Inflammation), *A. paniculata*, *Annona squamosa*, *C. papaya*, *C. nutans*, *Moringa oleifera*, *Ocimum sanctum*, *Piper betle*, *Piper sarmentosum* (Fever), *A. sativum*, *Annona squamosa*, *Apium graveolens*, *Artocarpus altilis*, *Cassia siamea*, *Centella asiatica*, *C. nutans*, *Curcuma longa*, *C. zanthorrhiza*, *Cymbopogon citratus*, *Ipomoea staphylyna*, *Mangifera foetida*, *M. pudica*, *Moringa oleifera*, *Orthosiphon aristatus*, *P. macrocarpa*, *Physalis angulata*, *Piper betle*, *Ruellia tuberosa*, *Solanum torvum*, *Syzygium aromaticum*, *Syzygium polyanthum*, *Zingiber officinale* (Pain), *Curcuma longa*, *Ipomoea staphylyna*, *Ocimum sanctum*, *Zingiber officinale* (Stomach disorders), *Abrus precatorius*, *Annona muricata*, *C. zanthorrhiza*, *G. mangostana* (Anticancer), *Mangifera foetida*, *Syzygium aromaticum*, *Syzygium polyanthum* (Gout), *Abrus precatorius*, *Citrus aurantiifolia*, *Piper sarmentosum*, *Zingiber officinale* (Cough), *Abrus precatorius*, *Curcuma longa*, *Cymbopogon citratus*, *Piper betle*, *Piper sarmentosum* (Antiseptic). In Indonesia, rural communities have developed knowledge about the medicinal and therapeutic properties of natural resources, as well as contributed to the maintenance and transmission of ethnomedicinal knowledge in society [9], [10]. In this study, almost all respondents (99%) claimed to know and use medicinal plants. The high percentage

of community knowledge about medicinal plants identified in Rawamerta may be due to some factors, such as the lower influence of contemporary urban lifestyles and the strength of cultural traditions in rural communities [11], [12]. This shows that medicinal plants still play an important role in primary health services in the region (Figure 4).



Figure 4: Field survey and interviews with the people of the Rawamerta Region (Photo by Eni Nuraeni in July 2022)

One of the most important aspects of this study is the documentation of a high number of taxa (46 genera and 31 families) and 50 species stated by the informants as medicine. This result confirms the great diversity of plants employed for therapeutic purposes and preserving traditional cultures. Figure 5 shows that 23 plant species are used for treating pain, followed by diabetes and inflammation (22 species, respectively), hypertension (16 species), fever (eight species), dyslipidemia (six species), antiseptic (five species), as well as gastric disorders, anticancer, cough, and gout (five species, respectively).

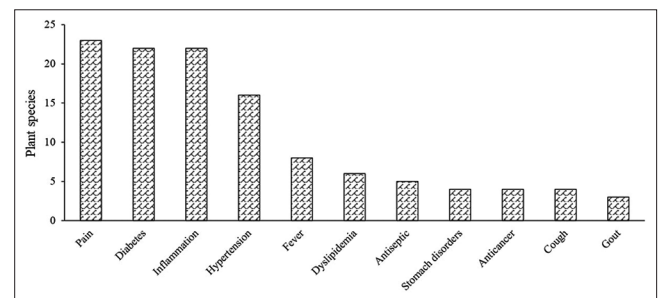


Figure 5: Number of plant species used in each treatment

In Rawamerta, harvested medicinal plants are strongly influenced by factors, such as agricultural expansion, urbanization, and natural elements. The results showed that 95% of these plants are endemic and native to Indonesia, meaning people are more familiar with the plants available in their area than exotic species. This indicates that knowledge about medicinal plants in Rawamerta is passed down from one generation to another [13]. Furthermore, the region is reported to have a diversity of medicinal plant species but efforts to preserve its local wisdom and the plants are not yet significant. These plants tend to be affected during agricultural expansion and urbanization [14]. Several countries, such as Iran, Brazil, and South Cotabato, have implemented *in situ* and *ex situ* conservation strategies for medicinal plants in their countries. This is done to maintain the availability of medicinal plants in their country [15], [16], [17]. Therefore, the Rawamerta

region requires special attention from the government, stakeholders, and the community. This study also suggests the indigenes and the government should carry out *in situ* and *ex situ* conservation strategies to maintain the availability of medicinal plants.

## Conclusion

The use of traditional medicinal plants for treatment purposes is an important strategy to maintain knowledge about complementary and alternative medicine in the health-care system. Furthermore, ethnopharmacological studies provide important information for guidance in the bioprospecting of new drugs derived from plants. The present study conducted in the Rawamerta region recorded 50 plant species belonging to 46 genera distributed across 31 families that have been indicated by the interviewed healers to be able to treat various human ailments. Efforts to preserve these plants and local wisdom in the region have not been significant. Therefore, the indigenes and the government are advised to carry out *in situ* and *ex situ* conservation strategies to maintain the medicinal plants' availability.

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