Ethnobotany of medicinal plant used by Sundanese Ethnic at Nyangkewok Hamlet, Kalaparea Village, Sukabumi District

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Abstract. Nyangkewok Hamlet community used medicinal plants and practices based on their local knowledge to treat and prevent various diseases. This study aimed to identify medicinal plants used by the Nyangkewok hamlet community who lives in Kalaparea Village. The research was conducted in February-May 2020. The field study was conducted from February-May 2020 in Kalaparea Village, Sukabumi District through in-depth interview and questionnaire then all information were written and documented. The result showed that 103 species of medicinal plants from 42 families. The highest frequency of plant parts used was leaf 52.02%. Based on ICS analysis the plant’s was categorized into high significance (16 species), moderate significance (25 species), low significance (33 species), and very low significance (29 species). The highest value of ICS was \textit{Zingiber officinale} and the lowest value was \textit{Spilanthes acmella}.

1. Introduction
Nyangkewok hamlet is one of the communities in Sundanese ethnic which possesses cultures, traditions, and biodiversity richness. There was a local traditional knowledge that offers unique opportunities for ethnobotany researchers to conserve. Nyangkewok Hamlet community used medicinal plants and practices based on their local knowledge to treat and prevent various diseases [1], [2]. Local traditional knowledge provides information about how to utilize medicinal plants to cure disease. According to Decree of Minister of Health RI No. 381/Menkes/SK/III/2007, it is recorded approximately 9,600 species of medicinal plants, of which about 940 plant species have been utilized by local people for traditional herbal medicine and 300 species utilized by drug industries [3].

Currently, in recent years, herbal medicine is popular in Indonesia, it increases public awareness of health enhancement with herbal medicine. A previous study found that the most used plant parts for the cure and treatment are leaves, stem, fruit, bark, and root or tubers [4]. Indonesia has many various tribes with their local knowledge [5], ethnobotany is the main aspect to analyze the interaction between people and plants. Ethnobotany is the study of how local people use local traditional
knowledge to utilize many parts of a plant. It observes the meaning of the ecological and biological
traits of medicinal plants based on the cultural and religious context of plant use [6].

Various studies state that ethnobotany is an essential aspect to evolve plant utilization models that
can help policy management, conserve the biodiversity of local food crops, and improve the food
welfare of local communities. Ethnobotany can function as a platform to study the special relationship
between community culture in utilizing local food plants based on local knowledge [7]. Nowadays,
ethnobotany has become a popular topic to increase the quality of health and conservation species,
especially medicinal plant. Ethnobotany is important to conserve biodiversity [8]. Ethnobotany can
analyze how local people use certain plants as medicinal plants, what diseases can be treated and how
it can be done and it found the differences between how communities traditionally utilize plants and
preserve nature by local knowledge [9]. Nyangkewok Hamlet which is located in Sukabumi located
relatively closed to Gunung Gede Pangrango National Park. Nyangkewok Hamlet has a high potential
for food plants [1], but that is a lack of knowledge and information about the medicinal plant. Local
knowledge is important to be documented so that the medicinal plant can be preserved [10]. This study
aims to identify potential medicinal plants used by the Nyangkewok Hamlet community.

2. Materials and Methods

This research was carried out in Nyangkewok Hamlet, Kalaparea Village, Sukabumi, West Java,
Indonesia in February-May 2020 (Figure 1). The methods were field observations, discussions, and
deeply personal interviews with the local community in Nyangkewok Hamlet. The number of
informants was 40 respondents which are selected with a snowball and purposive sampling method
between the ages of 17-75 years old. The Snowball sampling method is used to obtain the data from
the key respondent that can be divided into multiple sources of information [11]. Respondents were
categorized into tribal leaders, village heads, heads of hamlet, and other respondents who know the
utilization of medicinal plant. The age of respondents is an important indicator to analyze the level of
knowledge about medicinal plants [12].

![Figure 1](image1.png)

**Figure 1.** Map of Nyangkewok Hamlet, Kalaparea Village, Sukabumi, West Java, Indonesia.

Data and information collected from the informants were regarded to the use of plants for herbal
medicine were local names, type of plants, parts of plants, the preparation and application of plants.
Data analysis followed four concurrent activities: data collection, data reduction, data presentation,
and conclusion drawing. The data were analyzed descriptively and presented in the form of graphs and
tables. Index of Cultural Significance (ICS) uses to analyze the quantitative data analysis suggested by
Turner that aimed to identify the most important plant species in the community's lives [13]. The
 calculations employed the following formula:
ICS \sum_{i=1}^{n}(q \times i \times e)

where ICS: Index of Cultural Significance
Q: Quality value I: Intensity value
E: Exclusivity value

Table 1. Number of species (ICS values).

| ICS Values     | Category                     |
|---------------|------------------------------|
| ICS 100 and over | Very high significance       |
| ICS 50-99      | High significance            |
| ICS 20-49      | Moderate significance        |
| ICS 5-19       | Low significance             |
| ICS 1-4        | Very low significance        |
| ICS 0          | Negligible significance      |

All plant species were identified and analyzed directly in the field and laboratory in Universitas Nusa Bangsa. The name of plant species that could not be known was documented and identified by identification books and the identified scientific name of the plant was verified using online sources (www.theplantlist.org).

3. Results and Discussion

3.1. General description of the study site
In general, the topography of this area is surging with steep slopes of approximately 25°. The altitude of the study area is 550 meters above sea level (masl). The climate in this region has a category of climate B with an average rainfall of 2,000-3,000 mm/year, with temperatures at 20-45°C. The western, eastern, southern, and northern regions of the village are bordered by Balekambang Village, Darmareja Village, Babakan Panjang village, and closely related to Gunung Gede Pangrango National Park which is a buffer zone of Gede Mountain. Nyangkewok hamlet community is around 8,747 people and 2,616 households. The majority of people living in this hamlet are Sundanese Ethnic, and there are some Javanese Ethnic as immigrants. The highest number of education of people in Kalaparea Village was recorded in primary school. The main livelihoods are farmers [1]. The other main source of income is looking for beans, cacao, coconut, and palm sugar.

3.2. Age and local knowledge

Figure 2. Correlation between respondents of local knowledge and age.
Based on interviews, the local knowledge lacked in the young generation. The study recorded local knowledge about the medicinal plant is higher in Elder KU IV and decreasing in the young generation (Figure 2). Local knowledge based on practices and oral transmission may be vulnerable to lose and transformation through the modern era. The loss of traditional ecological knowledge is not new and has been widely documented. The loss of traditional knowledge is now regarded as one of the threats to the conservation of indigenous plant species [14][15].

Local knowledge is currently under threat of modernization. It is caused by the older generation's fails to pass the knowledge to the younger generation [16]. Globalization and modernization lifestyle caused young people alienated from their environment and consequently lose their knowledge of nature. Many factors influenced the decrease of local knowledge such as video games, the internet. In Bengkulu district found that the time spent on electronic and internet entertainment was not positively correlated with knowledge of plant names and uses. The frequency of time in the garden was significantly correlated with the knowledge of plants, older people visited the garden more often than the younger generation. This study stated that local knowledge was positively correlated with age and time spent in the garden. The decrease of local knowledge among the youth was presumably due to the less time they interacted with plants [7].

3.3. Diversity of medicinal plant

The result recorded 103 species of medicinal plant in 42 families (Figure 3) utilized by Nyangkewok Community. Nyangkewok hamlet has a higher amount of diversity of medicinal plant than in Cintakarya Village, in Pangandaran, West Java. A previous study in Pangandaran is found 35 species of the medicinal plant [17] Based on ICS analysis (Table 2) Ginger (Zingiber officinale) is the highest number in ICS analysis.

Zingiberaceae has been widely used in many locations in Indonesia as a medicinal plant and it has been an essential crop in India [18] preserved as sugar syrup or as sugar candy [19]. Zingiberaceae is a medicinal plant that has been widely used in almost all countries in the world. It has been used since ancient times as a spice and remains an important cooking spice around the world. Zingiberaceae has grown well at an altitude of 1500 meters above sea level. It grows well in a climate with moderate rainfall with well-drained soil like sandy loam rich in humus.

![Figure 3. Families of medicinal plant.](image-url)
Table 2. Diversity of medicinal plant with ICS analysis.

| No | Medicinal plant                        | ICS | Category              |
|----|----------------------------------------|-----|-----------------------|
| 1  | Persea americana Mill                  | 24  | Moderate significance |
| 2  | Centella asiatica                      | 28  | Moderate significance |
| 3  | Imperata cylindrica                    | 21  | Moderate significance |
| 4  | Polygala paniculata                    | 18  | Low significance       |
| 5  | Agreatum conyzoides                    | 20  | Moderate significance |
| 6  | Bambusa vulgaris                       | 9   | Low significance       |
| 7  | Tinospora crispa                       | 14  | Low significance       |
| 8  | Allium sativum L.                      | 32  | Moderate significance  |
| 9  | Amaranthus tricolor L.                 | 28  | Moderate significance |
| 10 | Averrhoa bilimbi                       | 9   | Low significance       |
| 11 | Begonia cucullata                      | 4   | Very low significance  |
| 12 | Erechtites hieracifolia L.             | 16  | Low significance       |
| 13 | Helianthus annuus                      | 6   | Low significance       |
| 14 | Basella rubra                          | 11  | Low significance       |
| 15 | Capsium frutescens L.                  | 38  | Moderate significance  |
| 16 | Oxalis barrelieri L.                   | 17  | Low significance       |
| 17 | Morinda citrifolia                     | 42  | Moderate significance  |
| 18 | Phyllanthus acidus                     | 7   | Low significance       |
| 19 | Physalis peruviana                     | 15  | Low significance       |
| 20 | Durio zibethinus Murr                  | 24  | Moderate significance  |
| 21 | Abelmoschus manihot                    | 6   | Low significance       |
| 22 | Imperata cylindrica                    | 14  | Low significance       |
| 23 | Melastoma malabathricum                | 22  | Moderate significance  |
| 24 | Antidesma bunius                       | 6   | Low significance       |
| 25 | Etlingera elatior (Jack.) R.M. Sm.     | 28  | Moderate significance  |
| 26 | Psidium guajava                        | 56  | High significance      |
| 27 | Zingiber officinale Rosc.             | 72  | High significance      |
| 28 | Jatropha curcas L.                     | 26  | Moderate significance  |
| 29 | Coleus scutellariorides                | 38  | Moderate significance  |
| 30 | Pithecolobium lobatum Benth.           | 6   | Low significance       |
| 31 | Citrus amblycarpa                      | 5   | Low significance       |
| 32 | Citrus grandis                         | 3   | Very low significance  |
| 33 | Citrus aurantifolia (Christm.) Swing   | 48  | Moderate significance  |
| 34 | Acmella paniculata                    | 5   | Low significance       |
| 35 | Phaseolus aureus                       | 30  | Moderate significance  |
| 36 | Ipomoea aquatic                        | 32  | Moderate significance  |
| 37 | Arenga pinnata                         | 19  | Moderate significance  |
| No | Medicinal plant                  | ICS | Category           |
|----|---------------------------------|-----|--------------------|
| 38 | Caladium bicolor                | 6   | Low significance   |
| 39 | Gardenia jasminoides            | 9   | Low significance   |
| 40 | Bougainvillea spectabilis       | 4   | Very low significance |
| 41 | Orthosiphon grandiflorus        | 22  | Moderate significance |
| 42 | Gynura sarmentosa DC.           | 18  | Low significance   |
| 43 | Amomum compactum                | 9   | Low significance   |
| 44 | Chromolaena odorata             | 9   | Low significance   |
| 45 | Neottoperis nidus               | 7   | Low significance   |
| 46 | Sauropus androgynus (L.) Merr.  | 58  | High significance  |
| 47 | Cocos nucifera                  | 62  | High significance  |
| 48 | Datura metel                    | 6   | Low significance   |
| 49 | Curcuma domestica Val.          | 56  | High significance  |
| 50 | Alpinia galanga (L.) Wild.      | 32  | Moderate significance |
| 51 | Gnetum gnemon L.                | 30  | Moderate significance |
| 52 | Garcinia mangostana L.          | 26  | Moderate significance |
| 53 | Cucumis sativus                 | 50  | High significance  |
| 54 | Morus alba                      | 34  | Moderate significance |
| 55 | Artocarpus heterophyllus Lamk.  | 32  | Moderate significance |
| 56 | Selaginella plana               | 18  | Low significance   |
| 57 | Myristica fragrans Houtt.       | 30  | Moderate significance |
| 58 | Carica papaya L.                | 34  | Moderate significance |
| 59 | Zingiber cassuminar             | 8   | Low significance   |
| 60 | Musa paradisiaca L.             | 46  | Moderate significance |
| 61 | Mimosa pudica                   | 22  | Moderate significance |
| 62 | Nephelium lappaceum L.          | 20  | Moderate significance |
| 63 | Ceiba pentandra                 | 7   | Low significance   |
| 64 | Staurogyne elongata (Bl.) O. Kuntze| 13 | Low significance |
| 65 | Abrus precatorius               | 8   | Low significance   |
| 66 | Zalacca edulis Reinw.           | 56  | High significance  |
| 67 | Syzygium polyanthum Wight.      | 51  | High significance  |
| 68 | Manilkara zapota L.             | 38  | Moderate significance |
| 69 | Brassica campestris             | 7   | Low significance   |
| 70 | Blumea balsamifera              | 6   | Low significance   |
| 71 | Andropogon nardus L.            | 68  | High significance  |
| 72 | Apium graveolens                | 12  | Low significance   |
| 73 | Piper betle                     | 62  | High significance  |
| 74 | Manihot utulisma                | 48  | Moderate significance |
| 75 | Annona muricata L.              | 52  | High significance  |
| 76 | Barringtonia asiatica           | 42  | Moderate significance |
| No | Medicinal plant                  | ICS | Category            |
|----|---------------------------------|-----|---------------------|
| 77 | *Artocarpus communis* Forst.     | 40  | Moderate significance |
| 78 | *Solanum torvum* Swartz.        | 46  | Moderate significance |
| 79 | *Curcuma zanthorrhiza*          | 38  | Moderate significance |
| 80 | *Colocasia esculenta* Schott.   | 28  | Moderate significance |
| 81 | *Artocarpus elasticus*          | 11  | Low significance     |
| 82 | *Boesenbergia rotunda*          | 13  | Low significance     |
| 83 | *Achasma megalolepis*           | 11  | Low significance     |
| 84 | *Sechium edule*                 | 16  | Low significance     |
| 85 | *Jatropha acerifolia*           | 8   | Low significance     |
| 86 | *Kaempferia galanga*            | 38  | Moderate significance |
| 87 | *Kalanchoe pinnata*             | 24  | Moderate significance |
| 88 | *Limnocharis flava*             | 22  | Moderate significance |
| 89 | *Momordica charantia*           | 9   | Low significance     |
| 90 | *Moringa oleifera*              | 9   | Low significance     |
| 91 | *Muntingia calabura*            | 9   | Low significance     |
| 92 | *Pleomele angustifolia*         | 16  | Low significance     |
| 93 | *Premna oblongifolia*           | 14  | Low significance     |
| 94 | *Rosa sp.*                      | 6   | Low significance     |
| 95 | *Saccharum officinarum*         | 24  | Moderate significance |
| 96 | *Solanum lycopersicum*          | 34  | Moderate significance |
| 97 | *Solanum melongena*             | 34  | Moderate significance |
| 98 | *Solanum nigrum*                | 36  | Moderate significance |
| 99 | *Sonchus arvensis*              | 6   | Low significance     |
| 100| *Syzygium aqueum*               | 60  | High significance    |
| 101| *Syzygium aromaticum*           | 30  | Moderate significance |
| 102| *Theobroma cacao*               | 20  | Moderate significance |
| 103| *Vigna cylindrica*              | 18  | Low significance     |

In general, the Zingiberaceae is easy to cultivate in Nyangkewok Community. Besides, it has been used as a medicinal plant to prevent and cure various diseases, gastrointestinal disorders, such as constipation, diarrhea, anorexia, colic, dyspepsia, nausea, vomiting, and motion sickness. The main essential pharmacological of zingiber compound a high anti-oxidant include immuno-modulatory, anti-tumorigenic, anti-inflammatory, anti-apoptotic, anti-hyperglycemic, anti-lipidemic, and anti-emetic [20]. Jeruk Bali (*Citrus grandis*) is the lowest number in ICS analysis. This species has been the lowest utilization as a medicinal plant in this location because it has been utilized only for food as a fruit. The local people did not know how to utilize it as a medicine. This species is the source of vitamin C and antioxidants [21], but in Nyangkewok community there was limited utilization of Jeruk Bali as a medicinal plant. It was utilized only as a food plant by elders. The utilization of medicinal plants by the Nyangkewok Community has been transferring orally from generation to generation. Nyangkewok community utilize all parts and some parts of plants such as leaves, root, tuber, rhizome, stem, bark, flowers, fruit as a medicine. Leaves (52.02 %) are the most used to cure diseases. The percentage analysis of plant parts used as traditional medicine by Nyangkewok community is shown in Figure 4.
Highly frequency of the utilization of leaves as a medicinal treatment appears to be connected with several advantages such as greater number or productivity of leaves, easier to obtain than other parts because they can be used directly [22]. Leaves are an essential part of plants that take the main role in the process of photosynthesis that produces secondary metabolites as an active component that have is an antitoxic system so widely used in the field of medicine [23].

![Plant parts](image)

**Figure 4.** Plant parts.

3.4. Medicinal plant processing

Nyangkewok community has various types to process medicinal plant as a traditional medicine which is presented in Figure 5. The highest popular frequency to use is boiling and drink the medicinal plant (41%) because it is easy to process such as *Zingiber officinale*, *Curcuma domestica*, *Imperata cylindrica*. Similar to Turgo hamlet people have used various types to process the medicinal plant materials [24].

![Medicinal plant processing](image)

**Figure 5.** Medicinal plant processing.
4. Conclusions
The results identified 103 species, 42 families of a medicinal plant that were utilized by Nyangkewok Hamlet Community. Leaves were mostly used in plant parts used (52.02%). The study observed four categories of ICS analysis; 16 species high significance, 25 species moderate significance, 33 low significance, and 29 species very low significance. *Zingiber officinale* is the highest number in ICS analysis.

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