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Traditional Medicine Uses of Madurese Ethnic, Indonesia: Indigenous Knowledge “Jamu” in Relation with Medicinal Plants

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Abstract: Among the indigenous knowledge possessed by Indonesians is their proficiency in utilizing medicinal plants. Madura Island, a constituent of East Java Province in Indonesia, stands out for its local wisdom associated with herbal ingredients. This indigenous knowledge pertaining to various medicinal substances can be explored through an ethnobotanical investigation of medicinal plants. This study delves into the findings of studies on ethnobotany, shedding light on the potential of medicinal plants employed as herbal remedies by the Madurese people. This study aimed to document the types of medicinal plants, parts, and types of Madurese Jamu. Field data were collected by direct observation and semi-structured interviews with both herbalists and vendors specializing in Madura herbal medicine ingredients. Subsequently, the obtained results underwent analysis utilizing descriptive statistical methods, including UV (Use Value), FUV (Frequency of Use Value), and the Informant Consensus Factor



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(ICF). The findings revealed the utilization of 27 distinct formulations as traditional herbal remedies (jamu), incorporating 74 species of medicinal plants sourced from 40 different families. Among the residents, 28% preferred to use plant leaves. Predominantly, species from the Zingiberaceae family were widely used ($FUV = 0.43$), with *Curcuma longa* being consistently reported by all informants, boasting a UV of 1.06. Notably, herbs specific to women exhibited the highest Informant Consensus Factor (ICF) values, reaching 0.75. The incorporation of scientific knowledge regarding the types and applications of medicinal plants may be pivotal for advancing treatment development and enhancing public health in the future.

Keywords: ethnobotany, Jamu, Madura, medicinal plants, traditional medicine

印度尼西亚马都拉族的传统医药用途：土著知识“贾穆”与药用植物的关系

摘要：印尼人拥有的本土知识之一是他们善于利用药用植物。马都拉岛是印尼东爪哇省的组成部分，因其与草药成分相关的本土智慧而闻名。通过对药用植物进行民族植物学研究，可以对与各种药用物质有关的本土知识进行科学探索。本研究深入探讨了民族植物学研究的结果，揭示了马都拉人将药用植物用作草药的潜力。本研究旨在记录药用植物的种类、部位和马都拉Jamu的类型。实地数据是通过直接观察和对专门从事马都拉草药成分的草药师和供应商进行半结构化访谈收集的。随后，利用描述性统计方法对获得的结果进行分析，包括UV（使用价值）、FUV（使用价值频率）和知情人共识因子(ICF)。研究结果显示,27种不同的配方被用作传统草药(jamu)，包含来自40个不同科的74种药用植物。在居民中,28%的人更喜欢使用植物叶子。主要使用姜科植物(FUV = 0.43)，所有受访者一致报告使用姜黄，UV为1.06。值得注意的是，女性专用草药的受访者共识因子(ICF)值最高，达到0.75。结合有关药用植物类型和应用的科学知识可能对促进治疗发展和增强未来公共卫生至关重要。

关键词：民族植物学, 贾穆, 马都拉语, 药用植物, 传统医学

1. Introduction

The use of medicinal plants dates back to ancient times, and their relevance persists, positioning them as a form of modern medicine [1]. According to the World Health Organization (WHO), countries in Africa, Asia, and Latin America use medicinal herbs to complement primary medicine [2]. It is frequently stated in scientific literature [3, 4] that people in some countries use traditional, complementary, and herbal medicines. In recent years, more people have been using herbal medicines to maintain their health. Herbal staging comebacks occur worldwide [5]. Some consumers have argued that herbal products are generally safe when used correctly at therapeutic doses [6]. Furthermore, herbal medicines are used to study the medicinal properties of plants [7]. Traditional knowledge of medicinal plants is important for understanding the use, ecology, diversity, and traditional knowledge related to phytomedicine [8, 9].

Madura Island, situated in the East Java Province, is

home to the Madurese Ethnic group, known for its cultural products, including a distinctive processed herbal medicine called Madurese Jamu. The Madurese Ethnic community possesses a wealth of traditional medical knowledge, and Jamu is a notable example that continues to be embraced by Indonesians. The consumption of herbal medicine represents local wisdom cherished by Madurese, reflecting their commitment to preserving traditional practices. Every community has knowledge to deal with local occurrences [10]. Local wisdom and traditional knowledge have continuously faded; hence, they must be preserved [11].

There are two kinds of Jamu in Madura, namely non-commercialized, processed, and produced based on prescription, and commercialized, which are manufactured by home industries [12]. Most commercialized Jamu made by Madurese Ethnic is famous for its strong medication, such as men’s potent herbs, Sari rapet, and empot-empot. Jamu has a

complex composition, which is limited to medicinal plants and other components. In addition to the varied composition and methods of herbal medicine, the Madura herbal concoction between sellers or families also varies. Based on this information, it is necessary to conduct a study on diversity, including utilization, species, plant parts, and diseases treated using plants by the Madurese Ethnic. This study aimed to identify and analyze plant species that are efficacious in medicine by Madurese Ethnic.

2. Materials and Methods

2.1. Study Area

This study was conducted in four districts situated on Madura Island, an island in the East Java Province of Indonesia. Madura Island is geographically positioned between 112° 40' 32" E and 114° 37' 17" E, and 6° 52' 42" S. According to data from Badan Meteorology Climatology and Geophysics (BMKG), Madura Island experiences a dry climate. The Java Sea borders the northern part of Madura Island, whereas the eastern boundary is formed by the Flores and Java seas. To the south lies the Madura Strait and the western border is adjacent to Surabaya (Figure 1).

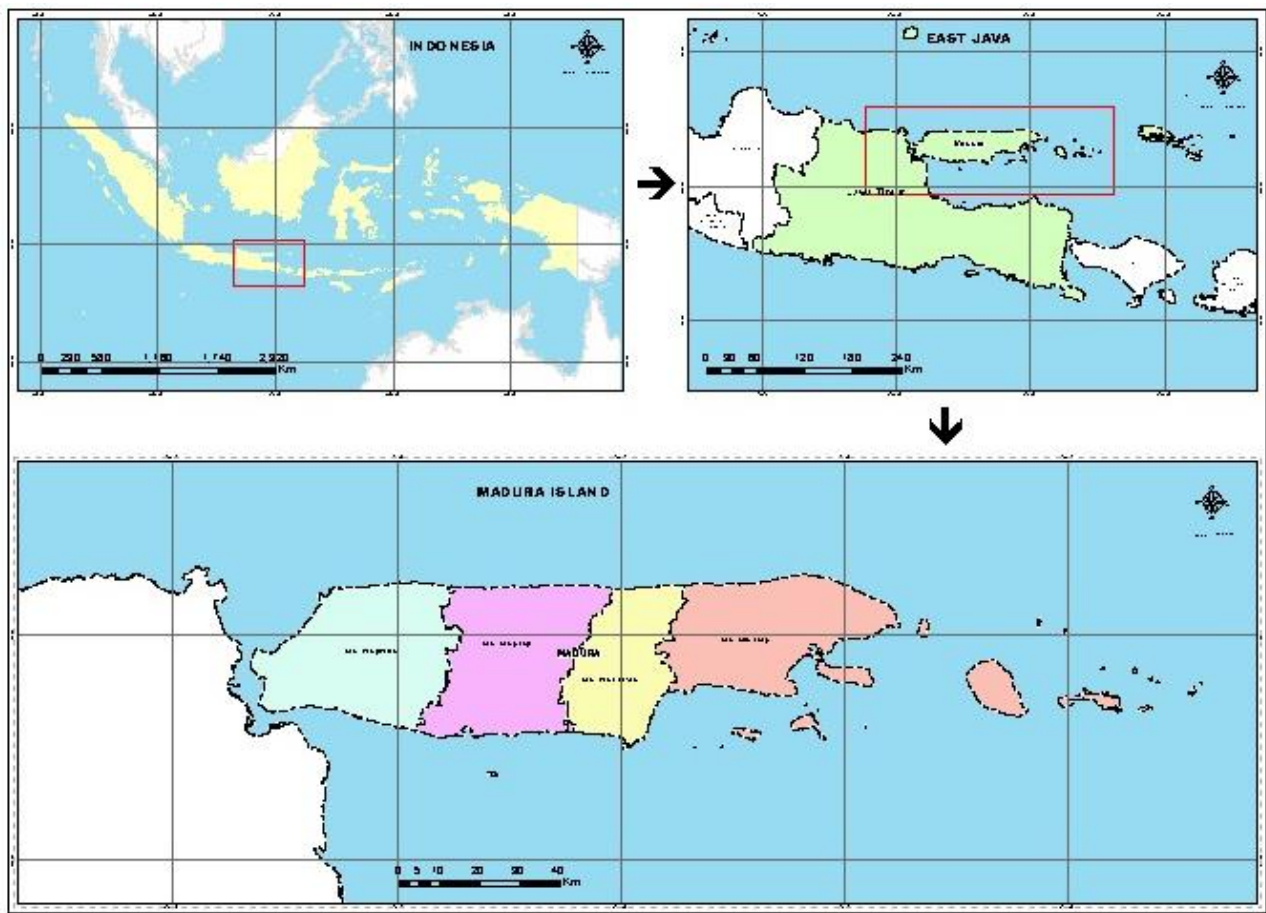


Figure 1. Madura Island (Source: Indonesia Geospatial Portal, scale 1: 25.000 [13])

2.2. Data Collection

Ethnobotanical data were collected between Maret 2022 and February 2023. This study used a qualitative approach, and the subjects were herbalists and sellers of Jamu in Madura. The Purposive Sampling technique was used for data collection through active participation observation, in-depth interviews, field observations, and literature studies on traditional medicinal materials. Informed consent was obtained from each participant before conducting the interview. Furthermore, around 36 selected informants (herbalist/“dukun” were interviewed to determine and explore traditional Knowledge regarding the use of

medicinal plant species, parts used, and herbal ingredients

2.3. Data Analysis

Plant species and types of treatments can be analyzed using the *Use Value* (UV), *Family Use Value* (FUV), and *Informant Consensus Factor* (ICF) values.

2.3.1 Use Value (UV)

Use value represents the relative importance of the informant’s objective to the individual species of medicinal plants. Use value was calculated by the following formula (Eq. 1),

$$UV = \sum \frac{U_i}{N}$$

(1)

where *UV* is the use value of species; *U_i* - the number of the use stated by informants for the plant species and *N* - the number of informants interviewed.

2.3.2 Family Use Value (*FUV*)

Family Use Value is the average use for plant species in the family. Family Use Value was calculated by the following equation (Eq. 2)

$$FUV = \sum \frac{UV_s}{ns}$$

(2)

where *FUV* is the family use value; *UV_s* - the use value of species in the family and *ns* - the total number of species in a particular family.

2.3.3 Informant Consensus Factor (*ICF*)

The informant concentration factor was calculated to determine the homogeneity of the information for a certain plant as herbal medicine (*jamu*) ingredients. *ICF* was calculated using the following equation (Eq. 3),

$$ICF = \frac{(N_{ur} - N_t)}{(N_{ur} - 1)}$$

(3)

where *N_{ur}* is the total number of use reports for a particular *jamu* category and *N_t* - the total number of species used for this *jamu* category.

3. Results

3.1. Demographic Profile

All informants for documentation were native Madurese with indigenous knowledge of herbal medicine (*jamu*) and medicinal plants (Table 1). The informants included 36 practitioner informants, mostly women (75%).

Table 1. Demographical profile (developed by the authors)

Demographical Profile		%
Gender	Male	25
	Female	75
Educational Background	Primary School	58
	Junior High School	31
	Senior High School	11
	University	0
Ages	41-50	42
	>50	58

3.2. Medicinal Plants

Based on the interview, the Family Use Value (*FUV*) of the most widely used herbal plant species comes from the *Zingiberaceae* family, as much as 0.43 (Figure 2) and 74 plants from 40 families were obtained and used to prepare *Jamu* potions by Madurese (Table 2).

3.3. Plant Parts Used as Madurese Jamu

The plant parts used in Madurese *Jamu* include the roots, rhizomes, bark, leaves, fruits, flowers, seeds, and bulbs. Figure 3 shows that 28% of the respondents mostly utilized leaves. This is because they are easy to find, and there are many of them. The community also uses mixtures of different plant parts to treat other diseases.

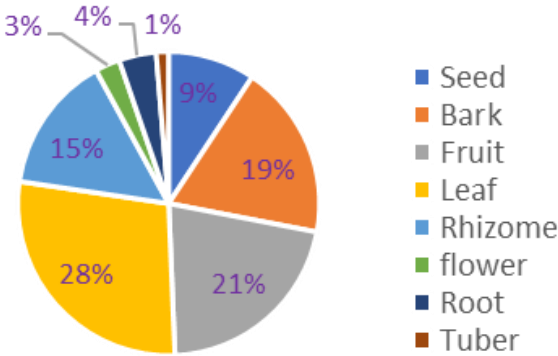


Figure 3. Plant Parts Used in Madura Herbal Medicine

Table 2. Medicinal plants used by Madurese ethnic (developed by the authors)

No.	Plant families and species	Local name	Part Used	Medicinal Uses	UV	FUV
<i>Fabaceae</i>						0.07
1	<i>Parkia timoriana</i>	Kedawung	Seed	galian putri, panas dalam, bangkes,	0.14	
2	<i>Trigonella foenum-graecum</i>	Fenugreek	Bark	galian putri, empot-empot	0.06	
3	<i>Tamarindus indica L.</i>	Accem	Fruit	jamu beras	0.03	
<i>Lauraceae</i>						0.13
4	<i>Cinnamomum verum</i>	Kajuh Manes	Bark	galian putri, sehat bugar, sehat laki-laki, rapet wangi, majun,	0.22	

				pegel linu	
5	<i>Cinnamomum sintok</i>	Jerk	Bark	sehat laki-laki, bangkes, susut perut	0.08
6	<i>Cryptocarya massoia</i> (Oken) Kosterm.	Mesojih	Bark	ramuan sehat, sehat laki-laki, kesehatan rahim, empot-empot, jamu beras, pegel linu	0.17
7	<i>Cassytha filiformis</i> L.	Mas Semasan	Seed	empot-empot, majun	0.06
Piperaceae					0.29
8	<i>Piper retrofractum</i> Vahl.	Cabbhi Jhamo	Fruit	galian putri, sehat laki-laki, galian rapet, haid, empot-empot, majun, selokarang, pegel linu, pelangsing,	0.33
9	<i>Piper cubeba</i>	Kamokos	Fruit	sehat laki-laki, haid, empot-empot, majun, bangkes	0.14
10	<i>Piper betle</i> L.	Sere	Leaf	galian putri, galian rapet, rapet wangi, empot-empot, godokan galian	0.47
11	<i>Piper nigrum</i>	Sa'ang Celleng	Seed	galian putri, galian rapet, haid, majun, selokarang, pegel linu	0.22
Zingiberaceae					0.43
12	<i>Curcuma zanthoriza</i>	Temo Labak	Rhizome	ramuan sehat, galian rapet, majun, maag, selokarang, pegel linu, godokan galian, sehat wanita, susut perut, wasir, keputihan	0.42
13	<i>Curcuma longa</i>	Konye'	Rhizome	kesehatan anak, galian putri, sehat bugar, ramuan sehat, sehat laki-laki, galian rapet, kesehatan rahim, sehat pria wanita, rapet wangi, empot-empot, majun, bangkes, maag, pegel linu, susut perut, pelangsing, kemantin	1.06
14	<i>Curcuma zedoaria</i>	Konye' Pote	Rhizome	galian putri, ramuan sehat, kesehatan rahim, selokarang, keputihan	0.14
15	<i>Curcuma aeruginosa</i>	Temo Ereng	Rhizome	ramuan sehat, sehat laki-laki, kesehatan rahim, empot-empot, majun, selokarang, pelangsing	0.31
16	<i>Elettaria cardamomum</i>	Chief of Police	Fruit	Sehat laki-laki, kesehatan rahim, haid, rapet wangi, empot-empot, jamu beras, sehat wanita	0.28
17	<i>Zingiber officinale</i>	Jhaih	Rhizome	sehat bugar, ramuan sehat, sehat laki-laki, galian rapet, haid, sehat pria wanita, empot-empot, majun, bangkes, jamu beras, pegal linu, susut perut, asam urat kolesterol	0.78
18	<i>Zingiber zerumbet</i>	Lampojang	Rhizome	sehat laki-laki, maag, wasir, asam urat kolesterol	0.11
19	<i>Zingiber montanum</i>	Pandhiyang	Rhizome	galian putri, galian rapet, rapet wangi, empot-empot, majun, pegel linu, susut perut, pelangsing	0.28
20	<i>Kaempferia galanga</i>	Kencor	Rhizome	galian putri, sehat bugar, sehat laki-laki, galian rapet, sehat pria wanita, empot-empot, majun, maag, selokarang, jamu beras, pegel linu, sehat wanita, pelangsing, asam urat kolesterol	0.67

21	<i>Alpinia galanga</i>	Laos	Rhizome	sehat bugar, ramuan sehat, sehat laki-laki, galian rapet, empot-empot, majun, bangkes, pegel linu,	0.22
22	<i>Boesenbergia rotunda</i>	Konce	Rhizome	galian putri, galian rapet, rapet wangi, empot-empot, pegel linu, godokan galian, sehat wanita, susut perut	0.44
Lamiaceae					0.04
23	<i>Ocimum basilicum</i>	Selase	Seed	ramuan cantik	0.03
24	<i>Orthosiphon aristatus</i>	Songot Koceng	Leaf	ramuan sehat	0.06
25	<i>Coleus scutellarioides</i>	Majana	Leaf	galian putri, wasir	0.03
Fagaceae					0.39
26	<i>Quercus infectoria</i>	Maja'an	Fruit	galian putri, ramuan cantik, galian rapet, kesehatan rahim, empot-empot, bangkes, godokan galian, kemantin	0.39
Caricaceae					0.03
27	<i>Carica papaya</i>	Kates	Leaf	ramuan sehat	0.03
Rhamnaceae					0.03
28	<i>Ziziphus mauritiana</i>	Bukkol	Leaf	asam urat dan kolesterol	0.03
Punicaceae					0.36
29	<i>Punica granatum</i>	Dhelimah	Fruit	galian putri, ramuan sehat, galian rapet, empot-empot, pegel linu, godokan galian, keputihan	0.36
Bark					
Apiaceae					0.20
30	<i>Erygium foetidum L.</i>	Mose	Fruit	ramuan sehat, bangkes, susut perut	0.08
31	<i>Foeniculum vulgare</i>	Adhas	Fruit	galian putri, ramuan sehat, galian rapet, panas dalam, empot-empot, majun, maag, selokarang, jamu beras, godokan galian	0.47
32	<i>Coriandrum sativum</i>	Ketombhar	Seed	majun, godokan galian	0.06
Alliaceae					0.17
33	<i>Allium sativum</i>	Bhabang Pote	root	ramuan sehat, haid, majun, pegel linu, keputihan	0.17
Arecaceae					0.19
34	<i>Areca catechu</i>	Penang	Fruit	ramuan sehat, galian rapet, majun,	0.19
Myrtaceae					0.10
35	<i>Psidium guajava</i>	Jhambu	Leaf	galian putri, ramuan sehat	0.06
36	<i>Syzigium aromaticum</i>	Cengke	Fruit	ramuan sehat, galian rapet, majun, keputihan	0.17
37	<i>Melaleuca leucadendra</i>	Kajhu Pote	Bark	ramuan cantik, majun, bangkes, maag, pegel linu, keputihan	0.14
38	<i>Syzygium polyanthum</i>	Greeting	Leaf	asam urat kolesterol	0.03
Menispermaceae					0.06
39	<i>Tinospora cordifolia</i>	Lalang	Leaf	galian putri, ramuan sehat	0.06
Acanthaceae					0.08
40	<i>Andrographis paniculata</i>	Pepaitan	Leaf	ramuan sehat, haid, empot-empot, selokarang	0.17
41	<i>Graptophyllum pictum</i>	Karotong	Leaf	wasir	0.03

Continuation of Table 2					
Solieriaceae					0.03
42	<i>Euchema spinosum</i>	Rebbha Tase'	Leaf	ramuan sehat,	0.03
Cucurbitaceae					0.03
43	<i>Benincasa hispida</i>	Kondur	Fruit	ramuan sehat	0.03
44	<i>Momordica charantia</i>	Pepareh	Fruit	galian putri	0.03
Caesalpiniaceae					0.14
45	<i>Caesalpinia sappan</i>	Kajuh secang	Bark	galian putri, galian rapet, susut perut	0.14
Ranunculaceae					0.17
46	<i>Nigella sativa</i>	Jhinteng Celleng	Seed	galian putri, ramuan sehat, empot-empot, majun, susut perut	0.17
Phyllanthaceae					0.06
47	<i>Phyllanthus urinaria</i>	Meniran	Leaf	panas dalam, selokarang	0.06
Apocynaceae					0.32
48	<i>Parameria laevigata</i>	Medaksi	Bark	galian putri, ramuan sehat, galian rapet, empot-empot, susut perut, keputihan	0.50
49	<i>Alyxia reinwardtii</i> Bl.	Plasare Watershed	Bark	galian putri, galian rapet, panas dalam, empot-empot, bangkes,	0.14
Sterculiaceae					0.14
50	<i>Guazuma ulmifolia</i>	Jhateh Madhura	Bark	galian putri, ramuan sehat, susut perut	0.14
Schisandraceae					0.03
51	<i>Illicium verum</i>	Pokak	Flower	empot-empot	0.03
Nymphaeaceae					0.03
52	<i>Nyctanthes arbor-tristis</i>	Sere Gaddhing	Flower	galian putri	0.03
Nyctaginaceae					0.03
53	<i>Mirabilis jalapa</i> L.	Ramo' Kembang Kol Empa'	Leaf	galian putri	0.03
Anacardiaceae					0.03
54	<i>Mangifera Casturi Delmiana</i>	Kastore	Bark	galian putri	0.03
Rutaceae					0.07
55	<i>Murraya paniculata</i>	Kemoneng	Leaf	empot-empot	0.03
56	<i>Aegle marmelos</i>	Maos	Seed	galian rapet, majun, bangkes	0.14
57	<i>Citrus hystrix</i>	Orange Porot	Fruit	galian putri, majun	0.06
Thymelaeaceae					0.03
58	<i>Phaleria macrocarpa</i>	Obhat Dewa	Fruit	kesehatan rahim	0.03
Mackinlayaceae					0.06
59	<i>Centella asiatica</i>	Boarding house-teapot	Leaf	ramuan sehat, kesehatan rahim	0.06
Asteraceae					0.03
60	<i>Tithonia diversifolia</i>	Pamaitan	Leaf	majun	0.03
61	<i>Pluchea indica</i>	Baluntas	Leaf	galian putri, galian rapet	0.06
62	<i>Elephantopus scaber</i>	Talpak Tana	Leaf	asam urat dan kolesterol	0.03
63	<i>Blumea</i>	Kamandhin	Leaf	maag	0.03

	<i>balsamifera</i>				
	Dioscoreaceae				0.06
64	<i>Dioscorea hispida</i>	Gaddhung	Rhizome	ramuan sehat, haid	0.06
	Melastomataceae				0.06
65	<i>Melastoma candidum</i>	Kamanden	Leaf	ramuan sehat, haid	0.06
	Simaroubaceae				0.06
66	<i>Pausinystalia johimbe</i>	Yohimbe	Bark	majun	0.03
67	<i>Eurycoma longifolia</i> Jack.	Bedara Pote	Bark	majun	0.06
	Araliaceae				0.03
68	<i>Panax quinquefolius</i>	Pok-pokan	Root	majun,	0.03
	Poaceae				0.03
69	<i>Cymbopogon citratus</i>	Sare	Bark	majun	0.03
	Polygonaceae				0.03
70	<i>Rheum officinale</i>	Rhubarb	Root	galian putri	0.03
	Lythraceae				0.03
71	<i>Woodfordia floribunda</i> Salisb	Dhubaya	Leaf	galian putri	0.03
	Combretaceae				0.06
72	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Jaha	Fruit	galian rapet	0.06
	Acoraceae				0.03
73	<i>Acorus calamus</i>	Jhrongo	Tuber	pegel linu	0.03
	Myristicaceae				0.17
74	<i>Myristica fragrans</i>	Palah	Fruit	galian rapet, majun, bangkes, pegel linu	0.17

3.4. Traditional Medicine in Madura

Countries in Asia, particularly in Indonesia, specifically in Java and Madura Islands, have distinctive traditional herbal remedies known as Jamu. These herbal concoctions are formulated using natural ingredients derived from various plant parts and animal bodies [14]. Among Indonesia’s renowned traditional medicines, Madurese Jamu (locally referred to as Jamu Madura) stands out. Madura Island comprises four districts: Bangkalan, Sampang, Pamekasan, and Sumenep. In Madura, 27 types of herbal remedies are crafted using medicinal plants, reflecting the rich tradition of herbal medicine in the region (Figure 4).

Table 3. Jamu Categories and ICF Values of Ethnomedicinal Uses

Concoction “Jamu” categories	Diseases reported in the present study	Number of Use reports (Nur)	Number of taxa (Nt)	ICF
Child health	Kesehatan anak (5)	5	3	0.50
General health	ramuan sehat (22), sehat bugar (5), jamu super sehat pria wanita (4), jamu beras kencur (6), Sehat Wanita (7), Sehat laki-laki (23)	67	36	0.47
Female herbs	Galian rapet (48), Rapet wangi (27), Empot-empot (35), Galian wanita (28), penyehat Rahim (8), lancar haid (10)	156	40	0.75
Male herbs	Majun (46)	46	27	0.42
Gastrointestinal herbs	Maag (8)	8	7	0.14
Postpartum herbs	Jamu bangkes (15), godokan galian (9)	24	18	0.26
Respiratory herbs	Selokarang (10), panas dalam (4)	14	11	0.23
Musculoskeletal herbs	pegel linu (19), uric acid (4)	23	14	0.41
Blood and Cardio Vascular herbs	Kolesterol (8)	8	5	0.43

Continuation of Table 3				
Hemorrhoids herbs	Wasir (8)	8	5	0.43
Dermatological infection and disorder herbs	Keputihan (10)	10	7	0.33
Weight Loss herbs	Ramuan Cantik (10), Susut perut (16), pelangsing (20)	46	30	0.36

To define the informant consensus factor values (ICF), all 27 jamu categories were documented according to the efficacy of these herbs (Table 3). The ICF values were calculated for the recorded plants and range from 0.23-0.75.

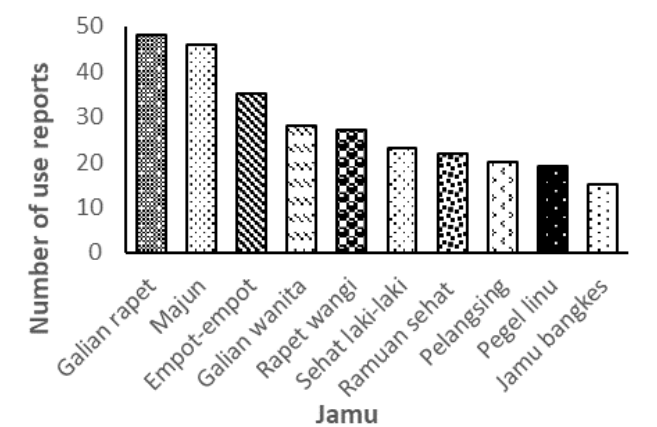


Figure 4. Primary Jamu administered by the Madurese community (developed by the authors)

4. Discussion

4.1. Demographic Profile

The demographic data indicate a predominant presence of female informants, possibly due to the cultural expectation that women in Madura bear responsibility for family health [15-16]. As shown in table 2, among the 36 informants, 15 individuals fell within the 41-50 age group (42%), while 21 were aged over 50 years (58%). In terms of educational background, the majority had completed elementary school (58%), followed by middle school (31%) and high school (11%). The primary occupations included traditional herbalists (19%) and sellers of traditional herbal medicines (81%). Traditional herbalists typically engage in door-to-door production, known as “jamu gendong,” while sellers operate home-based businesses (home industry) that offer packaged traditional herbal medicine. Most traditional herbalists and sellers prefer to convey their indigenous knowledge about medicinal plants orally to family members or trusted associates, aligning with common practices observed in various communities [17].

4.2. Medicinal Plants

The Zingiberaceae family plays a pivotal role in the formulation of Madura herbal medicine ingredients because of its widespread usage, and is characterized by a highly complex array of secondary metabolite

compounds [18]. Through interviews, data on 74 plants from 40 families were gathered, revealing their application in the preparation of Jamu potions by Madurese (Table 1). Notably, the Zingiberaceae family is the most extensively utilized family, consistent with previous research emphasizing its significant role in ethnomedicine [19, 20]. Despite the morphological similarities among its members, the Zingiberaceae family exhibits wide variations in therapeutic and pharmacological properties [21]. Several species from the Zingiberaceae family find application in Madura herbal medicine, including *Curcuma zanthorhiza*, *Curcuma longa*, *Curcuma zedoria*, *Curcuma aeruginosa*, *Elettaria cardamomum*, *Zingiber officinale*, *Zingiber zerumbet*, *Zingiber montanum*, *Kaempferia galanga*, *Alpinia galanga*, and *Boesenbergia rotunda*. The community employs herbal medicine both preventively and curatively as part of its health maintenance efforts. The raw materials for herbal medicine are primarily derived from medicinal plants. Jamu Madura is commonly used for various health purposes, including maintaining overall health, child health, female organ health, uterine health, addressing vaginal discharge, male health, maternity herbal medicine, and ulcer health. These data not only reveal the high demand for specific herbal remedies within the local community but also attest to the perceived efficacy of these herbs, as reported by those who consume them.

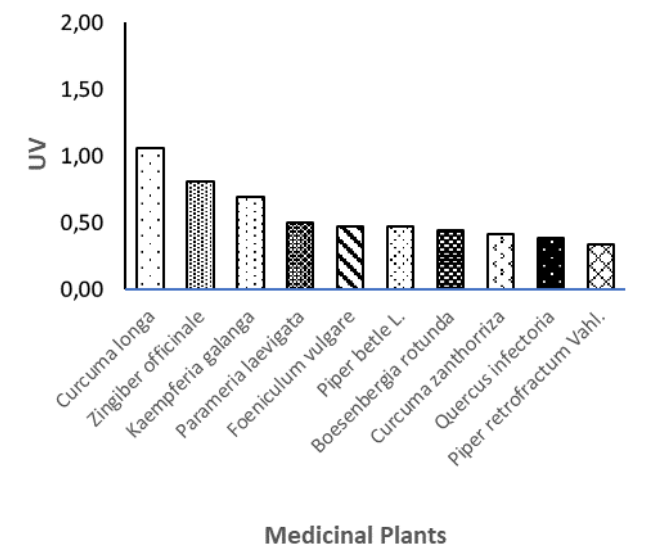


Figure 5. The ten herbal plants most extensively utilized in Madura (developed by the authors)

As shown in Table 2, 74 species were obtained, and 10 types of medicinal plants were widely used as herbs

in Madura herbal medicine (Figure 5). Of the 10 types, five belonged to the *Zingiberaceae* family, including *Curcuma longa*, *Kaempferia galanga*, *Curcuma zanthorriza*, *Zingiber officinale*, and *Boesenbergia rotunda*. Other families were also derived from *Apiaceae* (*Foeniculum vulgare*), *Fagaceae* (*Quercus infectoria*), *Piperaceae* (*Piper retrofractum* Vahl and *Piper betle* L.), and *Apocynaceae* (*Parameria laevigata*).

4.3. Plant Parts Used as Madurese Jamu

As shown in Figure 3, the plant parts used for Madurese Jamu include roots, bark, leaves, fruits, seeds, flowers, bulbs, and rhizomes, where the leaves are the most widely used parts. The tradition of leaf utilization is information known to the public for generations based on evidence of its efficacy, and this is related to the content of chemical compounds [22]. Leaves also contain more efficacious chemical compounds, such as flavonoids, tannins, saponins, phenols, and alkaloids. This is consistent with a previous study [23-26]. Leaves are used as restorative materials because they are more easily obtained than other plant parts, such as stems, rhizomes, flowers, and fruits. From the perspective of conservationists, harvesting leaves for use as medicinal herbs up to a certain point is not detrimental to the continued existence of a single plant. This is because other plant parts can sustain plant survival. It is different when the organ used is the root or stem, where harvesting can injure and harm individual plants.

4.4. Traditional Medicine in Madura

Countries in Asia have special traditional herbs known as Jamu, which are widely used in Indonesia, specifically in Java and the Madura Islands. Herbs are based on natural ingredients from plants and animals [14]. Madurese Jamu, locally known as Jamu Madura, is one of Indonesia's most famous types of traditional medicine. Madura Island has four districts: Bangkalan, Sampang, Pamekasan, and Sumenep.

These findings indicate that Madurese people continue to use numerous medicinal plants for the treatment of various diseases. The expertise in formulating these remedies is derived from the ancestral knowledge transmitted across generations. Scientific validation through laboratory experiments has substantiated some of these traditional concepts, as evidenced in previous studies [27-30].

There are 24 types of herbs made using medicinal plants in Madura (Table 3). People use plants as herbs for Madura herbal medicine to make galian rapet, ramuan sehat, majun, bangkes, empot-empot, etc. Various types of herbal medicine potions, it turns out that what has received special attention or is quite large in Madura people is the health of women and men both

teenagers and adults, including Galian Rapet, Majun, Empot-empot, Galian wanita, Rapet wangi, Sehat laki-laki, ramuan Sehat, Pelangsing, Pegel linu and Jamu bangkes (Figure 4).

The ICF values were calculated for the recorded plants and range from 0.23-0.75. A higher suggests that the informants strongly agree with the use of a certain species in making traditional herbal medicine (Jamu). Women's herbs are recorded with the highest ICF score of 0.75, and Galian rapet is the most consumed by Madurese people. This shows that the majority of herbal medicine consumers are women [12] with the aim of maintaining health and increasing fertility, care, and beauty of the body [12, 31-33].

5. Conclusion

The study of medicinal plants utilized by Madurese Ethnic has contributed to the limited documentation of traditional and complementary alternative medicines in Madura. Medicinal plants are used to process a wide range of Madurese Jamu. A total of 74 plant species were recorded in this study. They belong to 40 different families, with *Zingiberaceae* being the most represented family. Many medicinal plants have been used for Galian Rapet, Majun, and Ramuan Sehat, with the leaves being the most prominent part utilized.

Declarations

Author Contributions

Conceptualization, L.K.M. and S.F.; methodology, S.F.; software, S.F. and M.S.; validation, L.K.M., S.F. and M.S.; formal analysis, L.K.M.; investigation, L.K.M.; resources, S.F.; data curation, S.F.; writing—original draft preparation, all authors contributed equally; writing—review and editing, S.F.; visualization, M.S.; supervision, S.F.; project administration, S.F.; funding acquisition, L.K.M. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

The data presented in this study are available in this article.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of the Universitas Trunojoyo Madura and Ethics Committee of the Institut Teknologi Sepuluh Nopember.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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