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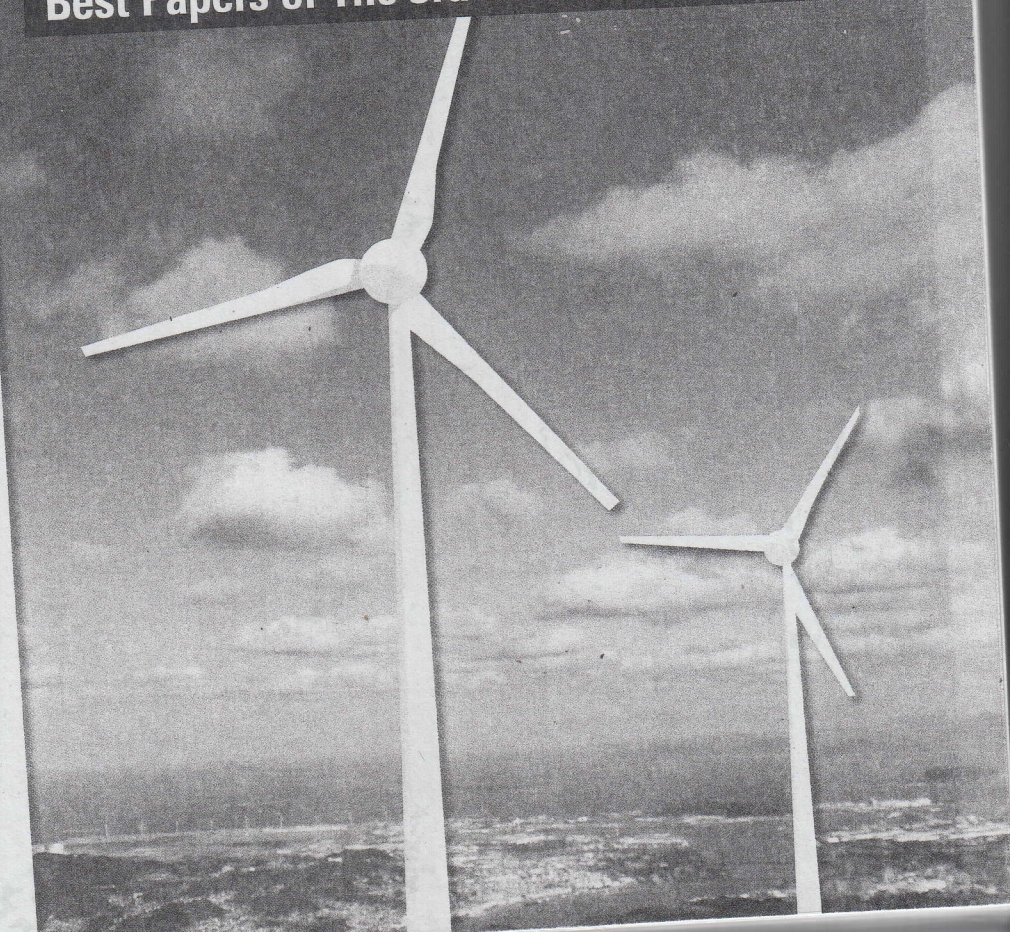

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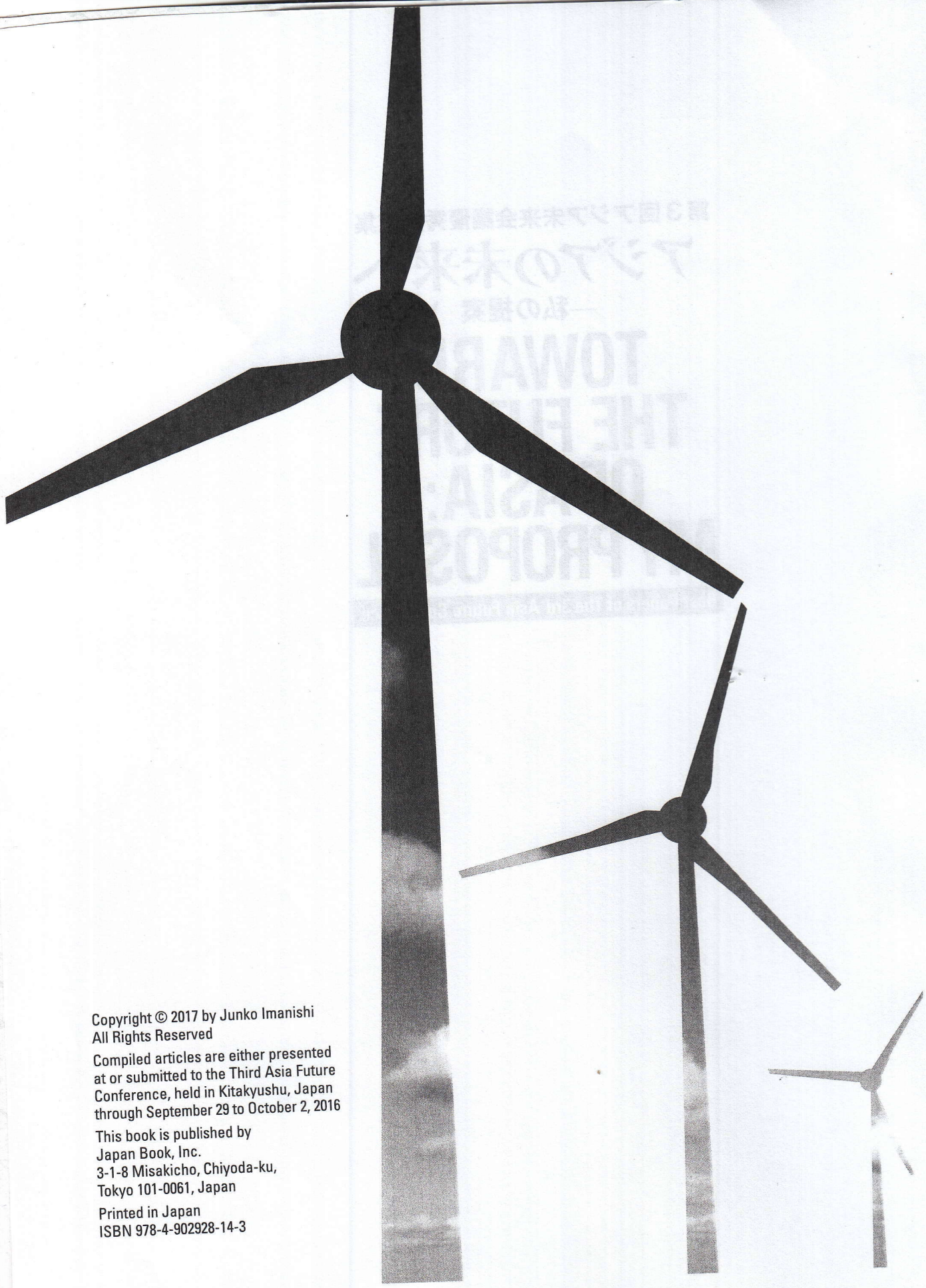

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Theme of The 3rd Asia Future Conference:
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「環境と共生」

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Ethnobotanical Study of *Oke Sou*: Traditional Herbal Drink from Lako Akediri Village in West Halmahera, Indonesia

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Abstract

Oke sou is a herbal drink from Lako Akediri village West Halmahera, to maintain health of women reproductive function. This drink is consumed when women get their first menstruation. This is the first study of *Oke sou* to document all plant species used in preparing of the herbal drink. It describes phytochemical content of the most cited plant based on the study of literature. Ethnobotanical data were collected using semi-structured interviews individually on indigenous medical practitioner and a local woman (30 respondents). Plant specimens were collected from the habitat, made into herbarium voucher, and then identified. Recorded as many as 66 plant species from 59 genera belonging to 37 families are used in making the *oke sou*. The most frequently mentioned plants (>5 respondents) are (number of respondents; part used), *Cananga odorata* (Lam.) Hook.f. & Thomson (10; bark), *Curcuma longa* L. (8; rhizome), *Cymbopogon citratus* (DC.) Stapf. (7; stem), *Kaempferia galanga* L. (7; rhizome), *Myristica fragrans* Houtt. (7; fruit and seeds), *Syzygium aromaticum* (L.) Merr. & L.M. Perry (7; leaf & flower), *Cynometra cauliflora* L. (6; bark), and *Tamarindus indica* L. (6; bark). These plants are already well studied regarding phytochemical content in maintaining women's reproductive health. Therefore, the results of this study can be used as a reference for the development of medical products based on local knowledge.

Keywords: ethnobotany, oke sou, herbal drink, women, west halmahera

Introduction

Traditional herbal drinks in Indonesia is still used till today. These drinks have become a part of living culture to maintaining body health or beauty care, such as *jamu*. *Jamu* is traditional herbal drink from Java that have been used for a long time. This herbal drink can consist of a single or mixture some medical plants [(17)]. It is used to treat some diseases and to maintain good health.

Beside in Java, traditional herbal drink also found in another region, for example Bali. Based on Sujarwo dkk. (2015), the Bali community, especially in ancient villages, still produce and consume *loloh* to prevent and treat different ailments. *Loloh* are the most common herbal drinks in Bali which generally prepared as decoctions of some medical plants.

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Traditional herbal drinks are also found in the eastern region of Indonesia, precisely at Lako Akediri village, District West Halmahera, North Moluccas. This herbal drink is made from various kind of plants at Lako Akediri village. It is believed efficacious to maintain health of girl reproductive function and to eliminate body odor of girl. The community at Lako Akediri call that herbal drink by the name *oke sou*.

In Indonesia, traditional medicine knowledge passed down orally[(4)]. This is also occurred on inheritance of knowledge composition plants used in *oke sou* herbal drink. Inheritance knowledge by oral is highly vulnerable to losing traditional medicine knowledge because of no one documentation can be inherited[(22)]. Moreover, research on *oke sou* herbal drink has not ever been implemented. Therefore, an inventory about its diversity plant species is quite important to be conducted.

There are two objectives of this research. First, to inventory all plant species used in preparing *oke sou* herbal drink. Second, to describe and to explain phytochemical content of the most frequently mentioned plants used in *oke sou* herbal drink at Lako Akediri village, West Halmahera, North Moluccas - Indonesia.

Material and Methods

Study Area

The study was conducted at Lako Akediri Village (Fig. 1), on May - June 2014 and October 2014. Lako Akediri Village (Fig. 2) is geographically lied on coastal area E 27º22'17.323" – E 127º37'5.214" and N 0º58'13.505" – N 1º 8'5.332". Total area of Lako Akediri Village is 10 hectares, which located at an altitude 31 meters above sea level with average rainfall 15 mm/month[16]. The population in 2014 was 344 people; 175 males and 169 females, with number of households were 85. As many as 98% community at Lako Akediri Village come from Sahu tribe, while the rest are ethnic immigrants, such as Buton, Bugis, and Sasak. The agricultural plants at Lako Akediri Village are tubers, corn, coconuts, clove, and nutmeg [16].

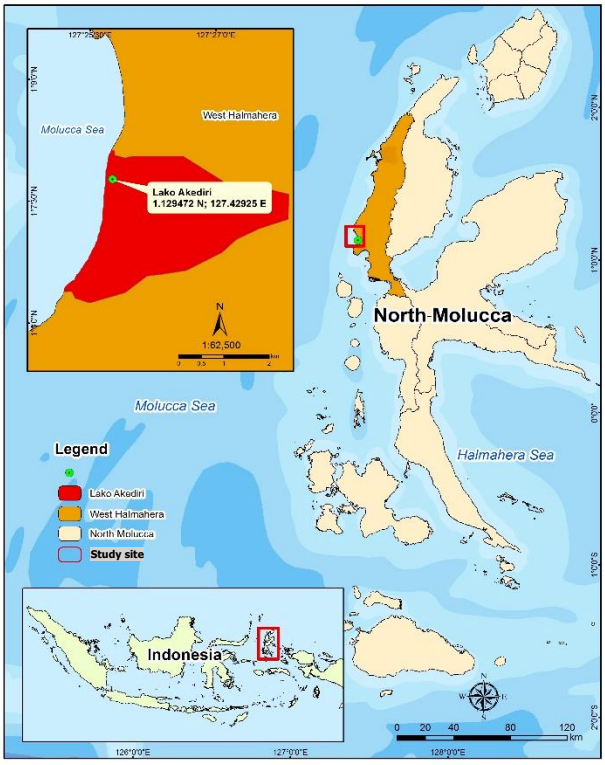

Fig 1. Study site at Lako Akediri Village Sub District Sahu, District West Halmahera, North Moluccas - Indonesia

Fig 2. The Lako Akediri Village on Sub District Sahu

Ethnobotanical Data Collection

The ethnobotanical data in this research consists of interview result and list of used plant species. Interview data were collected using semi-structured interviews method that conducted individually on key respondent and general respondent. Key respondent is person who considered having more knowledge about *oke sou* herbal drink, such as indigenous medical practitioner. General respondent is local woman who ever participated in producing *oke sou* herbal drink with age range of 12 - 60 years old (30 respondents).

Plant specimens were collected from the habitat together with key respondent. Then plant specimens were made into herbarium voucher. After that specimens were identified at Laboratory of Plant Taxonomy in Department Biology Universitas Indonesia.

Data Analysis

Data were analyzed using quantitative and qualitative approaches. Quantitative analysis was conducted to obtain total plants species and families, also to know the most frequently mentioned plant and part used in *oke sou* herbal drink. Qualitative analysis aimed to determine phytochemical content in most frequently mentioned plants used in *oke sou* herbal drink at Lako Akediri village.

Result

Plant species used in "oke sou" herbal drink

The investigation recorded as many as 66 plant species from 59 genera used for preparation *oke sou* herbal drink (Table 1). These plants belong to 37 families which are Acanthaceae, Fabaceae, and Lamiaceae being the most represented family (6 plant species each family). There are eight plant species that most frequently mentioned by respondents (plant species; part used), *Cananga odorata* (Lam.) Hook.f. & Thomson (bark), *Curcuma longa* L. (rhizome), *Cymbopogon citratus* (DC.) Stapf. (stem), *Kaempferia galanga* L. (rhizome), *Myristica fragrans* Houtt. (fruit and seeds), *Syzygium aromaticum* (L.) Merr. & L.M. Perry (leaf & flower), *Cynometra cauliflora* L. (bark), and *Tamarindus indica* L. (bark).

The plant parts, which are harvested to prepare *oke sou* herbal drink, are bark, leaves, stems, rhizomes, flowers, fruits, seeds (Fig. 3). Bark is being the most frequently used part in preparing *oke sou* herbal drink (31 species). Meanwhile, the least frequently used part is rhizomes. The data showed that aerial parts (79%) are preferred than underground parts (21%). This may be because of the easier accessibility in picking plant source and the greater quantity of aerial parts than underground parts [(1) (7)].

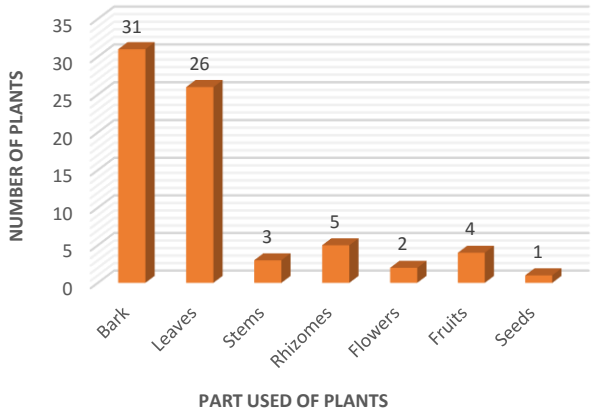

Fig 3. Number of species and plant part used in preparing *oke sou* herbal drink

Preparation of "oke sou" herbal drink

The preparation of *oke* sou herbal drink is started by classifying the same part of used plants, such as leaves with leaves, bark with bark, or root with root. Then, each group is crushed separately. The collisions were given water and then squeezed in a clean cloth - same as the technique in making juice-. After that, the juice of each part of used plants is all mixed, then boiled until boiling. When boiled, *oke sou* herbal drink is mixed with herb spices to improve the acceptability of this herbal drink. Usually the herb spices that used are *Coriandrum sativum* L., *Piper nigrum* L., *Curcuma longa* L., *Zingiber officinale* Roscoe., *Cymbopogon citratus* (DC.) Stapf., *Kaempferia galanga* L., *Myristica fragrans* Houtt., and *Syzygium aromaticum* (L.) Merr. & L.M.Perry. The *oke sou* herbal drink is ready to be consumed when its color becoming as brown as the color of strong tea.

Oke sou herbal drink is only taken by girl when getting her first menstruation in tradition ceremony of welcoming maturity girl. The tradition is held for 3, 7, or 9 days depending on length of menstruation period and decision of the girl's family. During that time, the girl takes *oke sou* herbal drink 3 times for a day. Usually the girl drinks as much as 8.1 liters of *oke sou* herbal drink as her lifetime.

Table 1. Plant used in preparing *oke sou* herbal drink at Lako Akediri Village Sub District Sahu, District West Halmahera, North Moluccas - Indonesia. The life form, vernacular name, part used, and number informant also provided.

Plant families and species	Life form	Vernacular Name	Part Used	Number Informant
Family: Acanthaceae				
Graptophyllum pictum (L.) Griff	clump	*kabi-kabi merah*	leaf	1
Graptophyllum pictum 'Roseum variegatum'	clump	*kabi-kabi putih*	leaf	1
Hemigraphis alternata (Burm. F) T. Anderson	herb	*lire buntal (♀)*	leaf	4
Hemigraphis rependa(L.) Hall. F	herb	*lire panjang (♂)*	leaf	1
Justicia gendarussa Burm. F.w	herb	*gandarusa*	leaf	3
Ruellia simplex C. Wright.	herb	*Puli*	leaf, stem	2
Family: Anacardiaceae				
Mangifera sp.	tree	*mangga dodol*	bark	5
Family: Annonaceae				
Annona muricata L.	tree	*nangka belanda*	bark	5
Cananga odorata (Lam.) Hook.f. & Thomson	tree	*kenanga*	bark	10
Family: Apiaceae				
Coriandrum sativum L.	herb	*surai*	leaf, seed	2
Family: Apocynaceae				
Alstonia scholaris R. Br.	tree	*hange*	bark	4
Family: Asteraceae				
Blumea balsamifera (L.) DC.	herb	*madikapu*	leaf	1
Wollastonia biflora (L.) DC.	herb	*cinga-cinga*	leaf	1

Table 1. (continued)

Plant families and species	Life form	Vernacular Name	Part Used	Number Informant
Family: Bombacaceae				
Durio zibethinus L.	tree	*durian*	bark	3
Family: Burseraceae				
Canarium amboinense Hoch.	tree	*kenari*	bark	1
Family: Clusiaceae				
Garcinia mangostana L.	tree	*manggis*	bark	5
Family: Combretaceae				
Terminalia catappa L.	tree	*ngusu*	bark	2
Family: Commelinaceae				
Tradescantia spathacea Sw.	herb	*bia-bia*	leaf, flower	3
Family: Convolvulaceae				
Merremia peltata (L.) Merr.	herb	*koge*	bark	1
Family: Cyperaceae				
Scleria sp.	shrub	*cakagole*	bark	1
Family: Euphorbiaceae				
Homalanthus novoguineensis (Warb.) K. Schum.	tree	*gidilule*	bark	1
Jatropha curcas L.	clump	*balacai putih*	leaf	5
Macaranga tanarius (L.) Müll.Arg.	tree	*same*	bark	1
Mallotus apelta (Lour.) Müll.Arg.	tree	*lufiti*	leaf	4
Family: Fabaceae				
Albizzia saponaria (Lour.) Miq	tree	*fau-fau*	bark	1
Cynometra cauliflora L.	tree	*mano mano*	bark	6
Pongamia pinnata (L.) Pierre	tree	*hatehira*	bark	4
Pterocarpus indicus Wild.	tree	*ligua*	bark	2
Sesbania grandiflora Pers.	tree	*Turi*	bark, leaf	2
Tamarindus indica L.	tree	*asam jawa*	bark, leaf	6
Family: Lamiaceae				
Callicarpa rubella Lindl.	herb	*ngaai madudera*	bark	4
Coleus scutellariodes Bth.	herb	*mayana*	leaf	5
Leucas zeylanica (L.) R.Br.	herb	*gofu hairani*	leaf	2
Orthosiphon grandiflorus Bold.	shrub	*kumis kucing*	leaf	4
Premna serratifolia (Blanco) Benth.	tree	*gumira*	bark	3
Vitex pinnata L.	tree	*gofasa*	bark	2
Family: Lauraceae				
Cassytha cf. *filiformis*	climber	*tali kuning*	stem	2
Family: Lygodiaceae				
Lygodium sp.	herb	*gumoho*	leaf	1
Family: Magnoliaceae				
Michelia champaca L.	tree	*cempaka*	bark	4
Family: Malvaceae				
Kleinhovia hospita L.	tree	*liwui*	bark	2
Family: Meliaceae				
Xylocarpus moluccensis (Lam.) M. Roem	tree	*lolesou*	bark	3
Family: Moraceae				
Ficus cf. r*ibes*	tree	*senang*	leaf	1
Ficus fistulosa Reinw. Ex Blume	tree	*Coro*	bark	4

Table 1. (continued)

Plant families and species	Life form	Vernacular Name	Part Used	Number Informant
Ficus hispida Linn.	tree	*tagalolo*	bark	3
Family: Myristicaceae				
Myristica fragrans Houtt.	tree	*Pala*	fruit, seed	7
Family: Myrtaceae				
Psidium guajava L.	tree	*giawas*	leaf	6
Syzygium aqueum (Burm.f.) Alston.	tree	*gora*	leaf	3
Syzygium aromaticum (L.) Merr. & L.M. Perry	tree	*cengkeh*	leaf, flower	7
Family: Oxalidaceae				
Averrhoa bilimbi L.	shrub	*belimbing wuluh*	bark, fruit	2
Family: Phyllanthaceae				
Breynia cernua (Poir.) Müll.Arg.	tree	*gagilamo*	bark	3
Phyllanthus sp.	herb	*balakama seed*	leaf	3
Family: Piperaceae				
Piper nigrum L.	climber	*rica jawa*	fruit	2
Piper sarmentosum Roxb.	herb	*tofure*	leaf	1
Family: Poaceae				
Cymbopogon citratus (DC.) Stapf.	herb	*gramakusu*	stem	7
Family: Ranunculaceae				
Nigella sativa Linn.	herb	*jinta hitam*	fruit	5
Family: Rhamnaceae				
Alphitonia moluccana Teijsm. & Binn. Ex Brais.	tree	*raurika*	bark	2
Family: Rubiaceae				
Morinda citrifolia L.	tree	*kome*	bark	1
Family: Rutaceae				
Melicope latifolia (DC.) T.G. Hartley	shrub	*sawuyo*	leaf	2
Family: Selaginellaceae				
Selaginella sp.	herb	*rutu-rutu*	leaf	4
Family: Solanaceae				
Physallis peruviana L.	herb	*dagameme*	leaf	4
Family: Sonneratiaceae				
Sonneratia alba Sm.	tree	*posi-posi / soki bulat*	bark	3
Family: Zingiberaceae				
Boesenbergia rotunda (L.) Mansf.	herb	*tumbukunci*	rhizome	1
Curcuma longa L.	herb	*kuning*	rhizome	8
Curcuma zanthorrhiza Roxb.	herb	*tumbulawak*	rhizome	1
Kaempferia galanga L.	herb	*bataka*	rhizome	7
Zingiber officinale Roscoe.	herb	*guraka*	rhizome	4

Phytochemical profile

All the most frequently mentioned plants are well studied and have documented phytochemical profile also pharmacological activities (Table 2.). The common pharmacological activities related to efficacy of *oke sou* herbal drink are antimicrobial, antifungal, aromatherapy, antioxidant, and anti-cancer. *Canangan odorata* (Lam.) Hook.f. & Thomson has 65 different chemical compound have been isolated with more than 13 pharmacological activities. This plant is effective to maintain cleanness vagina area due to its antimicrobial activity that contains essential oil, ethyl acetate ethanolic, methanolic, cyclohexane, and clorofrom [(25)]. The other plants that also contain antimicrobial activity are *Kaempferia galanga* L., *Syzygium*

aromaticum (L.) Merr. & L.M. Perry. and *Tamarindus indica* L. [2][6] [16] [27].

Some plants have essential oil which efficacious to reduce body odor, such as camphene (*Cananga odorata* (Lam.) Hook.f. & Thomson)[26], geraniol (*Cymbopogon citratus* (DC.) Stapf.)[28], myristicin (*Myristica fragrans* Houtt.)[10], and eugenol (*Syzygium aromaticum* (L.) Merr. & L.M. Perry.)[10]. These chemical compound have pharmacological activities as aromatherapy and become basic material in perfume producing. Based on the data (Table 2) there are antifungal activity in some plants used in *oke sou* herbal drink which effective against *Candida albicans* activity, vaginal discharge agent [26].

Table 2. The most frequently mentioned plant species (>5 respondents) to prepare *oke sou* herbal drink and their phytochemical profile and pharmacological activities at Lako Akediri Village Sub District Sahu, District West Halmahera, North Moluccas - Indonesia.

Plant Species	Phytochemical profile	Pharmacological activities
Cananga odorata (Lam.) Hook.f. & Thomson	bornyl acetate (leaves); camphene (leaves, flowers); geraniol (leaves, flowers); geranyl acetate (flowers); limonene (leaves, flowers, fruits); (E,Z)-farnesal (leaves) 1-epi-cubenol (flowers); caryophyllene epoxide (leaves); spathulenol (leaves); *t*-cadinol (leaves); α-amorphene (leaves, flowers); α-ylangene (leaves, flowers); methyl antharanilate (flowers)[26]; liriodenine, sampangine (bark)[19]; methylisoeugenol, benzyl benzoate (flower)[17]	aromatherapy, anti-microbial, anti-inflammatory, antivector[26] antifungal, anti-mycobacterial, antimalarial[28] [13]
Curcuma longa L.	curcumin; dimethoxy curcumin; bisdemethoxy curcumin; sodium curcuminate (rhizomes)[19] [9]	anti-carcinogenic[8] anti-bacteria, anti-HIV, antioxidant, anti-inflamatory, anti-tumor[9]
Cymbopogon citratus (DC.) Stapf.	d-Limonene, geraniol (leaves)[28] ; *α*-citral, *β*-neral, myrcene (leaves)[13]	aromatherapy[27]; antibacterial[12]
Kaempferia galanga L.	*α*-pinene, camphene, carvone, benzene, eucalypto;, borneol, methyl cinnamate, ethyl-*p*-methoxycinnate (rhizomes)[26]; *β*-phyllandrene, *α*-terpineol, ethylcinnate, dihydro *β*-sesquiphylandrene (rhizomes) [21]	anticancer, antimicrobial activity, antioxidant[27]
Myristica fragrans Houtt.	macelignan (fruits)[5]; ethanolic (seeds) [26]; myristicin(fruits)[10]; malabaricone B, malabaricone C(fruits)[14]	anti-bacterial[5]; aphrodisiac[25]; antifungal[14]; aromatherapy[10]
Syzygium aromaticum (L.) Merr. & L.M. Perry.	eugenol, eugenyl acetate, benzyl alcohol (leaves)[12] [15], ethanolic (seeds)[25]	antioxidant[12]; antimicrobial, antifungal[15]; aphrodisiac[24]
Cynometra cauliflora L.	methanolic (fruits)[26]; tannin, saponin, flavonoid (leaves, stems, barks); terpenoid (leaves, stems)[5]	anti-cancer[26]; antioxidant[4]
Tamarindus indica L.	acetone, methanol (seeds)[11]; alkaloids, flavonoids, saponins, tannins (fruits) [6]; glycosides, cardiac glycosides (seeds)[2]	antibacterial[11]; antimicrobial[6] [2]; antifungal hypoglycaemic, cytotoxic effects, cholesterolemic[2]

Discussion

The knowledge of diversity plants that used in preparing *oke sou* herbal drink is obtained by oral from older indigenous medical practitioner to younger, who is her daughter or her niece. Indigenous medical practitioners has dominant role in keeping the information about composition *oke sou* herbal drink. They have prohibition to bequeath that information to people except to her maternal ancestry. Therefore, not all community at Lako Akediri village know composition the herbal drink.

Oke sou herbal drink believed by community at Lako Akediri efficacious to maintain the health of women's reproductive function. Based on science investigation *oke sou* herbal drink maintains the reproductive health by keeping the cleanness of organ reproduction[2][6][16][27][26]; reducing bad odor on vagina area and girl's body[10][26][28]; protecting the organ reproduction from potency of cancer[8][29][26]; and free radicals[9][27][4]. Those efficacies are obtained from diversity of plants that used in preparing *oke sou* herbal drink. For example, plants that are useful to keep the cleanness of organ

reproduction (vagina), *Cananga odorata* (Lam.) Hook.f. & Thomson[26][28][13], *Curcuma longa* L.[9], *Cymbopogon citratus* (DC.) Stapf.[12], and *Kaempferia galanga* L[27]. Those plants have pharmacological activities such as, anti-microbial, anti-fungal, and antibacterial.

Futhermore, the preparation *oke sou* herbal drink has a boiling stage that aims to extract the phytochemical contenct in part of plant used[23]. The efficacy of *oke sou* herbal drink is better when phytochemicals content in plants used can be completely soluble in water. Meanwhile classification of plant part and crushing separately in order to facilitate the process of squeezing of the juice plant.

Conclusion

Recorded as many as 66 plant species from 59 genera used for preparation *oke sou* herbal drink with *Cananga odorata* (Lam.) Hook.f. & Thomson being the most frequently mentioned plant by community at Lako Akediri village. The phytochemical content in used plants have various compound, but the pharmacological activities can be summarized in common are antimicrobial, antifungal, aromatherapy, antioxidant, and anti-cancer. The results of this study can be used as new reference for the development medical herbal product based science, especially for maintaining the healthy women's reproduction.

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