Jurnal Biologi, Volume 5 No 2, April 2016
Hal. 49-58

ETHNOBOTANY OF MEDICINAL PLANTS IN VUNATUI CLAN OF THE TOLAI SOCIETY IN EAST NEW BRITAIN PROVINCE, PAPUA NEW GUINEA

Felicitas Bureng[1,2], Jumari[1] , Jafron Wasiq Hidayat[1]
[1]Biology Department, Faculty of Science & Mathematics, Diponegoro University
[2]Kokopo PO Box 140 Telephone (675) 9828346; East New Britain, Papua New Guinea
email : feybureng@gmail.com

ABSTRACT

Traditional knowledge of medicinal plant use in many regions of Papua New Guinea and the East New Britain Province is poorly described and rapidly disappearing due to some factors like religion and outside influence that may have contributed to the fading away of indigenous knowledge within each ethnic group. The main aim of this research was to identify some of the plants used as medicinal plants in the Vunatui clan of the Tolai society in East New Britain, PNG and determine the type of disease or conditions being treated by these plants and how the plants are being prepared. The main data of this researched was compiled through consultation and interview with three of the traditional doctors “tena dawai” within the clan who helped to provide the information on plants used as medicine. Although most of the traditional or indigenous knowledge in East New Britain are based on secrecy and must be paid for in some circumstances if one wants to learn or know about it, the medicinal doctors were willing to provide information after they were made aware of the purpose and benefit of this research. There were about 50 species of plants gathered in this research and there is variation shown among the plants. The plants range from herbaceous to vines, shrubs and trees and were found on the coastal areas to mid- mountains of the area of study. Different methods of preparartion were used but the most common method used was infusion. From the methods of applications that were used, oral administration was the most common.

Key words: Traditional medicinal plants, Vunatui Clan, tena dawai,

ABSTRAK

Pengetahuan traditional mengenai penggunaan tumbuhan obat di Papua Nugini Propinsi “East New Britain” belum banyak di informasikan dan mempunyai kecenderungan untuk cepat hilang. Banyak faktor luar yang berkontribusi terhadap menghilangnya pengetahuan lokal ini antara lain adalah faktor agama dan pendidikan. Tujuan penelitian ini adalah untuk mengidentifikasi berbagai jenis tumbuhan yang digunakan untuk pengobatan di suku Vunatui. Penelitian ini menggunakan metode survey dan wawancara dengan informan kunci pengobatan tradisional “tradisonal docter tena dawai”. Hasil penelitian menemukan ada 50 jenis tumbuhan yang digunakan untuk pengobatan tradisional pada masyarakat Tolai, suku Vunatui di Provinsi New Britain timur. Tumbuhan tersebut berhabitus herba, semak, tanaman merayap, dan pohon, ditemukan mulai dari daerah pesisir sampai dengan pegunungan. Cara penyiapan ramuan paling banyak dengan metode “infuse” sedangkan cara penggunaan paling banyak adalah secara oral.

Kata kunci: Tanaman obat tradisional, Vunatui Clan, tena dawai

1. INTRODUCTION

Rural communities in Papua New Guinea (PNG) depend very much on traditional plants for their health needs. PNG has at least 800 ethnic traditions characterized by distinct languages (Asher, 1994 and Grimes, 2000), scattered mostly in rural hamlets across the mountainous region to the coastal and islands region of the country. The geology of the country has also resulted in extraordinary biological diversity estimated to be greater than 5% of the global total including an estimated 15,000 to 20,000 vascular plants, approximately 60% of which are endemic (Beehler, 1993 and Mittermeier *et al*., 1997). The vast biodiversity of the country has led to a rich and varied practice of medicinal plant use in different areas and different cultural groups. Currently medicinal plant preparations are used to treat various ailments such as sexually transmitted diseases, asthma, diarrhea/ dysentery, body/abdominal pain, headaches, boils/sores, tuberculosis, cold/cough, fever/ malaria and insect bites.

According to a 1999 national report, 80% population in PNG has used herbal medicines and traditional medicine therapies (National Department of Health, 2007). However, most people use both traditional medicine and Western medicine. For people living in the most remote parts of PNG where they have limited excess to public health services often means that a traditional healer is their only option.

Despite the fact that there is a lot of evidence of the use of traditional medicine, there has been disparaged in some literature because often the curing properties of the plants are conceived by the users as magical. For the case of the Vunatui Clan of the Tolai society of East New Britain, which is the targeted group for this ethnobotanical survey, the indigenous knowledge of the use of traditional plants is based on secrecy or "*pidik"* as how it is stated in the indigenous Tolai language. A healer may know the different kinds of herbs and the rituals of a particular medicine but has to harness the powers of the spirits to successfully practice the knowledge.

The fact that a sizable majority of the PNG population relies on medicinal plants and traditional practitioners for health care has been formally recognized by the national government (National Department of Health, 2007). The PNG National Health Plan, 2001–2010, promoted collaboration between the World Health Organization (WHO) and UPNG to assist in the development of traditional medicines in the country. A traditional medicines survey questionnaire was developed using WHO guidelines. In 2001 the surveys initiated with approvals and endorsements from the UPNG School of Medicine and Health Sciences Research and Ethics Committee and the Medical Research and Advisory Committee of the PNG Department of Health. Also established at this time was a proprietary database for traditional medicines, maintained at UPNG (Rai, 2004), that now serves as a national resource as the government seeks to move validated and safe herbal remedies into the national health care formulary (National Department of Health, PNG, 2007).

It is widely recognized that the traditional use of medicinal plants constitutes an important information reservoir that is threatened by on-going development and Westernization. This cultural reservoir of knowledge has been empirically tested and adopted through millennia of trial and error. Prior to the

UPNG Traditional Medicines surveys, however there was no national effort to preserve such knowledge. The documentation of medicinal plants in PNG has been haphazard and the accrued knowledge has not been widely disseminated internationally. Furthermore, the corresponding pharmacological validation of PNG medicinal plant use has not been systematically studied. It has been estimated that historically some 800 PNG plants species have been described in the literature for treatment of various ailments, but this represents only a fraction of the total number of plants actually utilized.

Vunatui clan is one of the many ethnic groups in Papua New Guinea that is still using traditional medicinal plants as a means to heal different conditions and diseases. Because of this the traditional medicinal plants used by the Vunatui can be compared with other clans or ethnic group in and around Papua New Guinea as well as around the world.

2. RESEARCH METHODOLOGY

2.1. Time and Place of Research

This research was conducted in the Vunatui Clan of the the Tolai Society in East New Britain, Papua New Guinea in the month of February 2015.

2.2. Tools and Materials

The tools and materials used in this research were stationaries, label tags, scissors, newspapers, voice recorder, camera and herbarium

2.3. Procedure

During the research in the Vunatui Clan, photographs of the plants used medicinally by the traditional doctors "*tena dawai*" were taken at the time of interview based of questionaires and the descriptions of plant morphology, habitat, medicinal use, part of plant used, the methods of preparation and application even their local name in the *Kuanua* language were recorded. Samples of the plants useful for the identification (flowers, fruit, seed, leaves, twigs, root, stem) were harvested, dried and compressed into an herbarium.

A total of 50 medicinal plant species altogether were gathered from this research which were based on the information collected from the 3 main informants.

2.4. Data Analysis

The data collected from the Vunatui clan was identified and tabulated as seen in table 3.1 of the results. Of which it shows the local name of the plants in the Vunatui clan, the local name, scientific name,and family, part being used, how it is being prepared, applied, the plant type and the habitat.

3. RESULTS AND DISCUSSION

3.1. Diversity of Traditional Medicinal Plants in the Vunatui Clan.

One of the main objectives of this research was to find out about the diversity of the traditional medicinal plants that are used by the Vunatui clan. This objective was achieved and can be seen in Table 3.1. which shows the local names of the medicinal plants in the indigenous language "*Kuanua*", the scientific name, plant family, the condition or diseases being treated, the part that is used, the mode of preparation and application, the habitus and the habitat in which the plants were found in.

Some of the plants that are regularly used by the Vunatui Clan as traditional medicine are *Alstonia scholaris, Bischofia javanica, Abrus precatorius* and *Epipremnum pinnatum.* This plants are said to be the most popular because they are associated with treating some of the common diseases and conditions faced every now and then by the people within the clan like diarrhea, dysentery, headache, cough, stomachache and malaria.

Jurnal Biologi, Volume 5 No 2, April 2016
Hal. 49-58

Table 3.1. List of traditional medicinal plants used by the Vunatui Clan

No	Local Name	Scientific Name	Family	Condition/ Disease	Part	Preparation	Application	Habitus	Habitat
1	Aiting	*Alstonia scholaris*	Apocynaceae	Dislocation or broken bones, Diarrhea & Dysentery, Headache	Sap	Infusion	Oral	Tree	Primary & secondary forest
2	Aloe	*Aloe vera*	Xanthorrhoeaceae	Cuts, sores, wounds fungal & infections	Sap	Fresh	Topical	Herb	cultivated as a house plant
3	Alok	*Bischofia javanica*	Euphorbiaceae	Aching stomach & sore feet	Bark, Leaf & Sap	Fresh; crushed, bark sap mixed with lime	Massage, topical	Tree	Primary or secondary forest
4	Akikik-anabebe	*Ageratum conyzoides*	Asteraceae	Diarrhea & Dysentery, Headache, Sore, Cuts, Wounds, Vomiting, sore eye	Leaf	Infusion; crushed; succus	Oral, massage, topical	Herb	Roadsides, forest, grassland and cultivated areas
5	Avavai	*Ficus wassa*	Moraceae	Dysentery & Contraceptive	Bark & Root	Scraped	Oral	Tree	Lowland rainforest
6	Baibai	*Cycas circinalis*	Cycadaceae	Sores, cuts, wounds and ulcers; cough	Seed & leaf	Crushed; boiled	Topical; oral	Tree	Grassland areas
7	Balbal	*Erythrina variegata*	Fabaceae	Swelling; stomach ache; Fever; Cough& sore throat; Sores; toothache	Bark; Leaf	Scraped and mix with lime; crushed and mixed with sea water; heated; infusion; decoction	Massage; oral;	Tree	Gardens, roadsides, and house yards
8	Barabar atan	*Hedychium flavescens*	Zingiberaceae	Asthma, Cough	Leaf	Infusion	Oral	Shrub	Disturbed moist Forest
9	Burung-ai	*Dalbergia Sissoo*	Fabaceae	Pregnancy Problem	Leaf	Infusion	Oral	Tree	Moist areas
10	Dipule	*Abrus precatorius*	Fabaceae	Cough, Asthma	Leaf	Infusion	Oral	Vine	Dry regions at low elavations
11	Divai na kalagar	*Adenanthera pavonina*	Mimosaceaea	Gastric pains, diarrhoea and dysentery	Leaf	Decoction	Oral	Tree	Roadsides, sandy foreshores,open areas and forest
12	Ela	*Inocarpus fagifer*	Fabaceae	Fever	Leaf	Succus	Oral	Tree	Coastal areas
13	Frangi-pani	*Plumeria Acuminate*	Apocynaceae	Dislocation or broken bones	Sap	Infusion	Oral	Tree	Sub-tropical areas
14	Galgalut	*Epipremnum pinnatum*	Araceae	Cleansing of the womb after giving birth.joint problems, dislocation or broken bones, cuts and wounds.	Stem	Infusion; crushed	Oral; topical	Vine	Coconut plantation
15	Gorgor	*Alpinia oceanica*	Zingiberaceae	Sore tongue	Leaf	Chewed	Oral	Herb	Cultivated and wild in disturbed moist forests & gardens
16	Kaburn-arar	*Flemingia strobilifera*	Fabaceae	Contraceptive	Seed	Chewed	Oral	Shrub	Disturbed areas
17	Kagua	*Ficus copiosa*	Moraceae	Stomach ache & Boil	Fruit Leaf Root & sap	Chewed; Fresh	Oral; topical	Tree	Forest
18	Kanda-kandolo	*Ipomoea pes-caprae*	Convolvulaceae	Broken bones	Leaf	Infusion	Oral	Herb	Beach
19	Kapiak	*Artocarpus communis*	Moraceae	Sore, boils, swollen groins, abscesses, chest pain,	LeafSap, bark	Infusion; decoction	Topical, oral, inhale	Tree	Forest,bush land and also widely cultivated

Table 3.1 (Continued)

				pneumonia & asthma	& root				
20	Karong-on	*Euodia hortensis*	Rutaceae	Cold; malaria; pneumonia, pain and fever	Leaf& root	Infusion; chewed; concoction	Oral	Shrub	Around home, village and gardens
21	Kakaul	*Cymbopogon citratus*	Gramineae	Cold & cough, Sore throat and upper respiratory infections	Leafstem	Crushed and boiled; decoction	Inhale; oral; bath	Herb	Coastal areas
22	Kokoai	*Acalypha wilkesiana*	Euphorbiaceae	Diarrhea & dysentery; laryngitis; pneumonia, malaria, pain and fever; appendicitis	Leaf	Infusion; succus; concoction; chewed	Oral, Bath	Shrub,	House yard and gardens
23	Kroton	*Codiaeum variegatum*	Euphorbiaceae	Stomach ache, tooth ache, fever, fungal infection & cuts	Root, leaf, sap	Chewed with betelnut; boiled, sqeezed	Oral, bath, topical	Shrub	Cultivated areas
24	Kaukau	*Ipomoea batatas*	Convolvulaceae	Sore; stomach ache	Sap, leaf	Fresh; boiled	Topical; oral	Vine	Cultivated in gardens
25	Kunai	*Imperata cylindrica*	Poaceae	Cut or wounds	Leaf & stalk	Crushed	Topical	Herb	Anywhere in the tropics
26	Lama	*Cocos nucifera*	Arecaceae	Cut or wounds Kidney problem Diarrhea	Midrib Juice New shoot	Heated; crushed; fresh; chewed	Topical, oral	Tree	Coastal areas
27	Lavar	*Curcuma longa*	Zingiberaceae	Stomach ulcer	Rhiz’	Chewed	Oral	Herb	Cultivated areas
28	Lombo	*Capsicum frutescens*	Solanaceae	Body pain, ulcer, headache, pneumonia& asthma	Ripe fruit, leaf	Squeezed; heated; infusion	Topical, massage, oral	Herb	Gardens, ,house yards, often cultivated
29	Maig	*Euodia anisodora*	Rutaceae	Tuberculosis, Stomach ache, constipation& diarrhea	Sap & Leaf	Heated; concoction;	Oral	Tree	Primary & secondary forest, also cultivated around gardens
30	Malam-alai	*Costus speciosus*	Zingiberaceae	Constipation & Sore	Sap & Leaf	Infusion; heated; chewed fresh	Oral, topical	Herb	Moist forests & old gardens
31	Mamad	*Mallotus philippensis*	Euphorbiaceae	Diarrhea	Leaf	Boiled	Oral	Tree	Re-growth rainforest
32	Mamua	*Kleinhovia hospita*	Sterculiaceae	Cough &tuberculosis; Skin disease; headache	Bark & Leaf	Infusion; crushed	Oral; topical; massage	Tree	Secondary forest and in plantation
33	Mangas	*Desmodium umbellatum*	Papillionaceae	Constipation	Leaf	Infusion	Oral	Shrub	Foreshores and Grassland
34	Marinda	*Catharanthus roseus*	Apocynaceae	Cancer, stomach ache, scabies & swelling	whole plant, roots & Leaf,	Decoction, boiled; heated	Oral, bath, massage	Herb	Coastal areas; near houses and in coconut plantations.
35	Marmar	*Derris trifoliata*	Fabaceae	Malaria	Leaf	Decoction	Oral	Shrub	Foreshore and along creeks
36	Matmat	*Mimosa pudica*	Fabaceae	Skin disease	Whole plant	Boiled	Bath	Herb	Along road side, disturbed areas, gardens
37	Nalup	*Aristolochia Elegans*	Aristolochiaceae	Mouth Cancer	Leaf, shoot	Decoction; concoction	Oral	Vine	Coastal areas
38	Oroto	*Calophyllum inophyllum*	Clusiaceae	Irritant eyes, skin infections, cuts, sore, ulcer & boils	Sap, Leaf	Infusion, decoction, heated	Topical	Tree	Coastal areas
39	Pal-a-karkar	*Centella asiatica*	Umbelliferae	Skin infections (ringworm & white spot)	Leaf	Squeezed	Topical	Herb	open areas, shaded road side

Table 3.1 (Continued)

40	Parag-um	*Colocasiae sculenta*	Araceae	Boils, sores & burns	Leaf, tuber	Heated, squeezed	Topical	Herb	Coastal areas and along creeks
41	Pilpil	*Breynia cernua*	Euphorbiaceae	Cough, body pain, sore or ulcer & fever	Leaf	Infusion; fresh; heated and mixed with lime; decoction	Oral, massage, topical	Shrub	Primary and secondary forest and cultivated at home
42	Puka	*Dioscorea bulbifera*	Dioscoreaceae	Cough & Body aches	Leaf	Infusion	Oral	Herb	Plantations and secondary forest
43	Salat	*Laportea decumana*	Urticaceae	Relieve pain	Leaf	Tap on skin	Topical	Herb	Shady places and grows well in wet areas
44	Sawa sop	*Annona muricata*	Annonaceae	Upset stomach	Leaf	Heated	Inhale, massage	Tree	Lowland areas
45	Tagete	*Cordyline fruticosa*	Agavaceae	Diarrhea, dysentery, stomach ache, wounds	Leaf & stem	Infusion; heated	Oral; topical	Shrub	garden areas, house yards, ceremonial grounds
46	Talis	*Terminalia catappa*	Combretaceae	Sores, cuts; Cancer	Leaf	Heated; concoction	Topical; oral	Tree	Coastal areas
47	Tantad	*Euphorbia hirta*	Euphorbiaceae	Asthma and internal haemorrhaging, infertility	Leaf & flower	Infusion	Oral	Herb	Open grasslands, roadsides and pathways
48	Tilivur	*Cassia alata*	Fabaceae	Grille, parasitic skin diseases,ringworms, scabies, rashes & eczema	Leaf, bark & flower	Crushed; decoction	Topical	Shrub	Rainforest and wet habitats, road sides & cultivated in gardens
49	Valeara	*Merremia peltata*	Convolvulaceae	Sore, Cuts & Wounds, cough	Stem, Leaf	Crushed; infusion	Topical; oral	Vine	Grassland areas and reforested areas
50	Varvar	*Hibiscus tiliaceus*	Malvaceae	Facilitate child birth, Cough, Sore throat; tuberculosis; sores	Bark; Leaf	Infusion; heated	Oral; topical	Tree	Beaches, forest margins and around homes.

i. Family Diversity

Family diversity of the traditional medicinal plants in the Vunatui Clan is dominated by Fabaceae with a total of 8 species; *Abrus precatorius, Cassia alata, Dalbergia sisso, Derris trifoliata, Erythrina variegata, Flemingia strobilifera, Inocarpus fagifer, Mimosa pudica*. There are a total of 27 different families in which the 50 medicinal plants belong to respectively, including Fabaceae. This can be seen in Fig.3.2

Fabaceae, also called leguminosae, pea family of flowering plants. Fabaceae, which is the third largest family among the angiosperms after Orchidaceae and Asteraceae, consists of more than 700 genera and about 20,000 species of trees, shrubs, vines, and herbs and is worldwide in distribution. (Doyle *et al*. 2000).

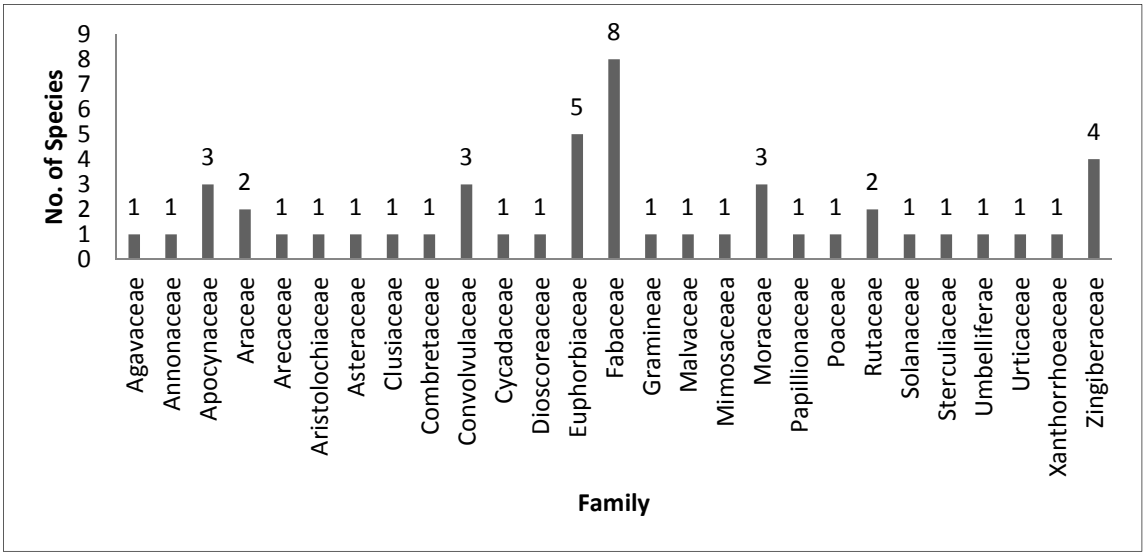


Fig.3.1 Family Diversity in the Vunatui Clan

ii. Habitat

The 50 plant species were found distributed all through out the area of survey. Some of the medicinal plants were found along the coastal areas such as the *Ipomoea pes-caprae* which is found along coastal beaches, forming large mats that assist in stabilizing sands and *Terminalia catappa.* Some were found along the roadsides or disturbed areas and gardens such as *Mimosa pudica*, *Ageratum conyzoides* and *Adenanthera pavonina*. Majority of the plants are found in the forest like; *Alstonia scholaris*, *Bischofia javanica*, *Ficus wassa*, *Euodia anisodora* and *Merremia peltata.* Others are widely cultivated or found around the houses like; *Aloe vera*, *Euodia hortensis*, *Acalypha wilkesiana*, *Ipomoea batatas* and *Capsicum frutescens.*

iii. **Part of Plant used**

The survey results, it revealed that the organ of plant most widely used in the Vunatui Clan is the leaf/leaves with a total of 38 plants. A leaf is an organ of a vascular plant and is the principal lateral appendage of the stem. It is the part of plant that accumulates for the process of photosynthesis, respiration and transpiration. It also contains a lot of organic and secondary metabolic compounds such as vitamin, minerals, dietary fibers, beta carotene, essential oil, phenol, alkaloids, potassium compound and chlorohyll (Mauseth, 2008).

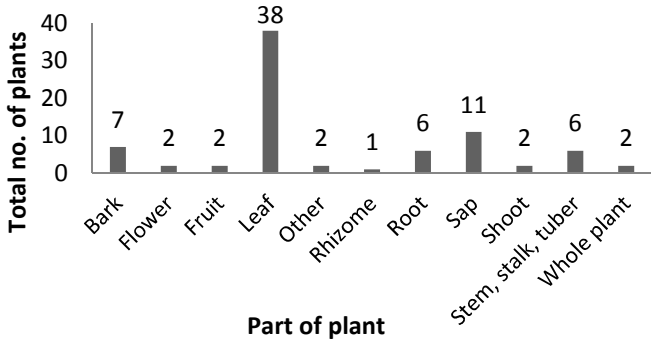
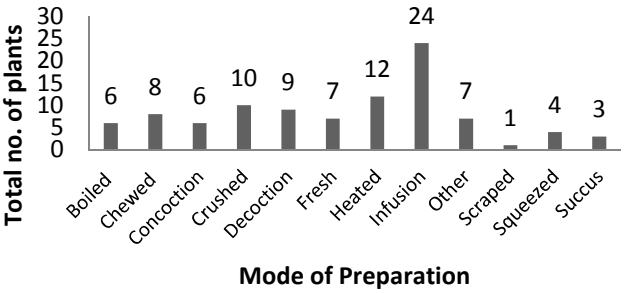


Fig.3.2 Plant part utilized by Vunatui clan

3.2. Mode of Preparation and Application

Different methods of preparation and application were used within the Vunatui Clan as what is shown in Fig. 3.3 (a) and (b). The most common methods used are infusion and oral respectively.

Infusion is a herbal preparation in which a ground herb or plant component (e.g., bark, root, nuts or seeds) is boiled in water to obtain an extract of interest (Leslie, 2004). Some of the species that are prepared using this method are; *Hedychium flavescens, Dalbergia sissoo, Abrus precatorius, Plumeria acuminate* and *Ipomoea pes-caprae.*



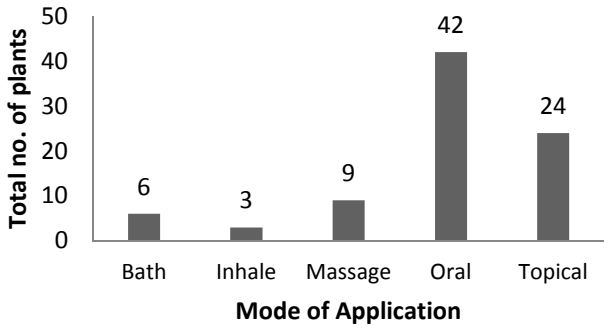


Fig. 3.3 (a) Mode of Preparation (b) Mode of Application

Oral administration is a route of administration where a substance is taken through the mouth. According to the Institute for Quality and Efficiency in Health Care (2013), many medications are taken orally because they are intended to have a systemic effect, reaching different parts of the body via the bloodstream. Some of the species that use oral administration are; *Erythrina variegata*, *Hedychium flavescens*, *Dalbergia sissoo*, *Abrus precatorius* and *Adenanthera pavonina.*

3.3. Diseases and Conditions in the Vunatui Clan

Papua New Guinea suffers from many different common health problems. Because of limited access to proper health care and unsanitary living conditions, certain diseases run rampant through all parts of Papua New Guinea (WHO, 2007). Vunatui Clan like every other ethnic group in PNG, suffers from some of the common diseases and condition like what is seen in Fig.3.4 where it shows the diseases and conditions, the plant species that are used for treating each ailments.

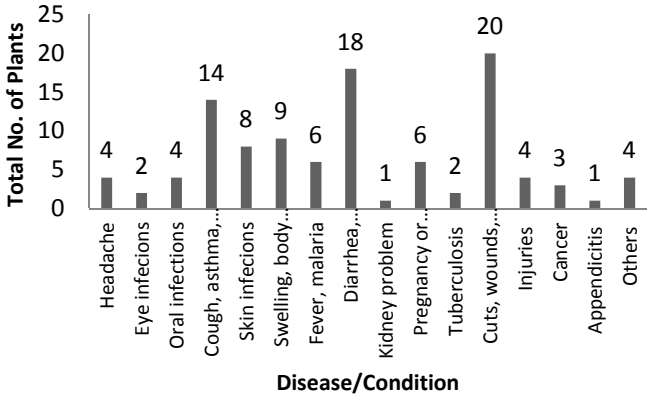


Fig.3.4 Number of plants used to treat diseases or conditions in Vunatui Clan

Many different conditions and diseases are found in the Vunatui Clan, most of which are common, such as headache, sores, cuts, wounds, cough, fever, diarrhea, stomachache, injuries, skin infections and many others. Of all these diseases and condition, two of which are said to be on the top 5 most common health issues in PNG according to the World Health Organization and are found to be treated using some of the 50 medicinal plants are; malaria and tuberculosis among HIV Aids, filariasis and leprosy.

Malaria is one of the most common diseases that plague Papua New Guinea. Malaria is spread by mosquito

bites so a person needs to take certain precautions against getting bit by these pesky bugs. Wearing bug repellant at all times is essential in Papua New Guinea if a person wants to avoid contracting Malaria (WHO, 2008). *Euodia hortensis* and *Acalypha wilkesiana* are two medicinal plants used by the Vunatui clan to treat malaria.

Euodia hortensis as a single plant, the shredded leaves are shaken in water and the filtrate drunk to relieve a cold. Leaves and roots are cleaned and chewed daily to combat malaria. In a concoction, young leaves of *E.hortensis* and *Acalypha wikesiana* are placed together in hot water and the patient exposed to hot vapour for treatment of pneumonia, malaria, pain and fever. *Acalypha wikesiana* as a single plant, leaves are squeezed into water and the resulting solution drunk to treat diarrhoea and dysentery, while the fresh leaf juice is drunk for laryngitis. Leaves are boiled in water and used to massage the body of a fever patient.

Tuberculosis is another disease that is causing problems in Papua New Guinea. Tuberculosis is transmitted through tainted food and water. It is a highly contagious disease that can be transmitted by coming into contact with an infected person. In order to decrease the risk of contracting Tuberculosis, a person must be careful about what he or she eats and drinks (WHO, 2008). Sadly during the research survey only two species are found to treat tuberculosis in the Vunatui Clan and they are; *Euodia anisodora* and *Kleinhovia hospita.*

4. CONCLUSION & RECOMEMENDATION

Vunatui clan like any other ethnic groups in Papua New Guinea has a wide range of biodiversity and the use of traditional medicinal plants is still a common despite the change in lifestyle and society. A total of 50 plant species gathered from this research are used as medicinal plants by the Vunatui clan. They belong to 28 different families and are found in a diverse environment from the coastal beaches to the homes and forest. Different parts of the plants are used but leaves are the most common part used.

There are 11 different methods of preparation and 5 different methods of application that are used by the Vunatui Clan. The most common methods are infusion and oral respectively.

Its is a requirement that medicinal plants should be protected and conserved for future generation by cultivating them because they play a vital role in the lively hood of many communities especially in places that have limited access to hospitals. It is better to create an some form of medicinal plant garden around houses within the village like what is done in Indonesia where the governement encourages families to make an "*Apotic Hidup*" which is a small herbal garden around their house. This is done to conserve the medicinal plants

ACKNOWLEDGMENT

I gratefully acknowledge the traditional medicinal doctors in the Vunatui Clan for providing information necessary to complete this research. I also acknowledge Diponegoro University especially the Facculty of Science and Mathematics for the study opportunity. Special thank you to Dr. Jumari, S.Si, M.Si and Dr. Jafron Wasiq Hidayat M.Sc in the Biology Department for their guidance and supervison in this research. This research was funded by the Ministry of Education and Culture of the Republic of Indonesia under the Scholarship (Beasiswa Unggulan) Program.

REFERENCE

Acharya, D. &Anshu, S. 2008, Indigenous herbal medicines: Tribal formulations and traditional herbal practices. Aavishkar Publishers Distributor, Jaipur, India.ISBN 978-81-7910-252-7. 440p.

Angiosperm Phylogeny Group, 2009. "An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III" (PDF). *Botanical Journal of the Linnean Society* 161 (2): 105–121

Beehler, 1993. B.M. Beehler (Ed.), Papua New Guinea Conservation Needs Assessment, vol. 2 Papua New Guinea Department of Environment and Conservation, Boroko, Papua New Guinea (1993)

Doyle, A. Chappill, C. D. Bailey, and T. Kajita. 2000. Towards a comprehensive phylogeny of legumes: evidence from rbcL sequences and non-molecular data. Pages 1 -20 in Advances in legume systematics, part 9, (P. S. Herendeen and A. Bruneau, eds.). Royal Botanic Gardens, Kew, UK.

Epstein, A. L. 1969. Matupit: Land Politics and Change among the Tolai of New Britain. Berkeley: University of California Press.

Epstein, A. L. 1979. "Tambu: The Shell-Money of the Tolai." In Fantasy and Symbol, edited by R. H. Hook. London: Academic Press.

Epstein, A. L. 1988. "Matupit Revisited: Social Change, Local Organization, and the Sense of Place." *Journal de la Société des Océanistes* 86: 21-40.

Epstein, T. S. 1968. Capitalism, Primitive and Modern: Some Aspects of Tolai Economic Growth. Canberra: Australian National University.

Gajalakshmi, S., Vijayalakshmi, S., & Rajeswari V. (2013). Pharmacological activities of Catharanthus roseus: A perspective review. *Intjpharma Bio*, 4 (2)

Gianoli, E. 2004. "Evolution of a climbing habit promotes diversification in flowering plants". Proceedings of the Royal Society B: Biological Sciences 271 (1552): 2011–2015.

Gong M, Wang F and Chen Y 2002. "[Study on application of arbuscular-mycorrhizas in growing seedings of Aloe vera]".*Zhong Yao Cai* (in Chinese) 25 (1): 1–3

Holdsworth.D., 1977. Medicinal Plants of Papua New Guinea, South Pacific Commission Technical Paper No. 175, Noumea, New Caledonia, 12.

Institute for Quality and Efficiency in Health Care. "Oral medications". *Informed Health Online*. Institute for Quality and Efficiency in Health Care. Retrieved 22 June 2013.

Mauseth B and James D. 2008 *Botany: An Introduction to Plant Biology*. Jones & Bartlett

National Department of Health: National Policy on Traditional Medicine. Waigani: PNG Govt. Press; 2007.

PROSEA 12 (1), 1999. Plant resources of South-East Asia. vol. 12 (1). *Medicinal and poisonous plants*. ed. by L.S. de Padua, N. Bunyapraphatsara & R.H.M.J. Lemmens. Leiden/Wageningen, Backhuys/PROSEA. (Bogor, PROSEA, 1999). 711 p

Rai, 2004. P.P. Rai (Ed.), Traditional Medicine in Papua New Guinea, University of Papua New Guinea Printery, National Capital District, PNG (2004).

Traditional Medicine Database, 2002, National Department of Health,Govt. of Papua New Guinea, Waigani, N.C.D., Papua New Guinea.

World Health Organization, 2008. World Health Organization. Traditional medicine. Fact sheet No.134.

Zaghi, D; Maibach 2007. "Survey of Safety and efficacy information in drug inserts for topical prescription medications". *American Journal of Clinical Dermatology* 8 (1): 43–44

Jurnal Biologi, Volume 5 No 2, April 2016
Hal. 49-58