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From: Ahmad Dwi Setyawan (unsjournals@gmail.com)

To: obedlense@yahoo.com

Date: Sunday, 12 December 2010 at 10:14 am GMT+9

Oke Pak, tampaknya naskahnya sudah cukup siap, tx atas partisipasinya, Ahmad

Pada 12 Desember 2010 06.04, Obed Lense <obedlense@yahoo.com> menulis:

Dear Pak Ahmad Dwi Setyawan,

Sesuai informasi yang kami terima dari Bapak Yos Rahawarin, berikut kami kirimkan naskah publikasi kami yg kedua untuk keperluan peer review dan publikasi di jurnal (Biodiversitas) yang Bapak pimpin.

Demikian penyampaian kami dan atas perhatian dan kerjasamanya kami sampaikan banyak terima kasih.

Salam hormat,
Obed

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Managing Editor,
Biodiversitas, Journal of Biological Diversity.
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Uncorrection proof

From: Ahmad Dwi Setyawan (unsjournals@gmail.com)

To: obedlense@yahoo.com

Date: Tuesday, 10 April 2012 at 10:51 pm GMT+9

P. Obed,

Berikut adalah uncorrection proof atas naskah anda. Perbaikan ditunggu dalam 1-2 minggu.

Btw, Saya sudah kirimkan naskah anda yang diterbitkan Nusantara Bioscience i.e. Biological screening.... Saya alamatkan ke P. Yos Rahawarin, karena kalau dikirimkan ke kantor saya khawatir tidak sampai ke anda.

Tx
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Ahmad



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Wild plants used as traditional medicines by indigenous people of Manokwari, West Papua

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ABSTRACT

Lense O. 2012. Wild plants used as traditional medicines by indigenous people of Manokwari, West Papua. Biodiversitas 13: 00-00. The aims of the research were to identify the main plant species which are used as traditional medicines by native people in Manokwari District, West Papua Province and also to describe the method of preparation and uses of some of the medicinal plants. This research was held in seven sub-regencies, ie. Manokwari, Ransiki, Kebar, Wasior, Mimyambouw, Merdey and Anggi-Sururey sub-District. Information recorded including methods of diagnosis and treatment of diseases, tribal name of a plant they used for treating disease (s), part of the plant used, preparation and mode of application, and whether the plant is used alone or in combination with other plants. Results indicate that the indigenous people in Manokwari District have been using at least 99 plant species (93 genera and 59 families) as sources of medicines. Most of these traditional medicinal plants are commonly gathered from the local tropical rainforest communities. At least 40 kind of sickness and injuries such as malaria, fever, and wounds can be treated by using traditional medicinal plants from Manokwari District. Reserach also found that all parts used, but leaf extracts are the most common part of the plant used for treating medical condition.

Key words: wild plants, traditional medicines, indengineous people, Manokwari.

INTRODUCTION

As modern worldviews and lifestyles reach rural indigenous communities through technology and personal contact, centuries-old traditional cultures are changing. Change takes place daily, nothing remains the same. Every day the world is becoming smaller due to the development of travel and communication technologies, and hardly a group of peoples on the planet remain untouched by forces of "progress." However, through this process a great store of knowledge held by native peoples is threatened with extinction. Historically, modern societies have regarded indigenous people and traditions as less progressive and, as a result, many groups of indigenous peoples, especially their younger generations, are encouraged to devalue their native culture and to adopt new lifestyles and technologies.

The knowledge of traditional medicinal plants, accumulated over centuries, may disappear in only a couple of generations if the current pace of cultural change continues to occur amongst the tribes in Manokwari District. Preliminary field visits (interviews) have indicated that transferring the traditional knowledge of the use of plant-based preparations in the primary health care of these people is under threat. There were a small number of young people (3 younger than 45) who have inherited a traditional knowledge of medicinal plants from their old generation in each village visited. The process of transferring traditional knowledge appears to be the main factor leading to the decline of knowledge of traditional medicine. There is no formal school or traditional institution involved in passing

on this knowledge. Transferring knowledge only happens amongst family groups when they are engaged in other activities. At that time, many young people are not interested in following their parents, and the number of people who have a good knowledge of traditional medicinal plants is declining. It is possible that in next couple of decades, the knowledge of medicinal plant within these ethnic groups may disappear completely.

The aims of this research were to identify the plant species that are used as traditional medicines by the native people of Manokwari District, West Papua, and to describe their methods of preparation and use of the medicinal plants. The study represents the first step to documenting significant aspects of the local medicinal plant knowledge before it disappears.

MATERIALS AND METHODS

The location of this project was in Manokwari District in the province of Papua, Indonesia. This research was held in seven sub-regencies, ie. Manokwari, Ransiki, Kebar, Wasior, Mimyambouw, Merdey and Anggi-Sururey sub-District.

The plants were collected for botanical identification from several location/villages (Mandopy, Merdey, Sururey, Jandurau, Dembek, Siwi, Wasior, Tandia, Minyambouw, Indabri, and Inambuari) and each plant allotted a TMHM (Traditional Medicine Herbarium Manokwariense). Plant specimens were labelled based on the date, locality, altitude,

latitude, tribal name, collector, and collection number. In addition, as plants are located and identified their use and method of preparation were documented and photographs were taken. The herbarium specimens were identified with the assistance of Marthen Jitmau and lodged in the Herbarium Manokwariense (MAN), Manokwari, West Papua, Indonesia, and were preserved for reference voucher at the Traditional Medicine Research Unit.

Several aspects of the medicinal plants were recorded including methods of diagnosis and treatment of medical conditions; tribal name of a plant used for treating the conditions; part of the plant used; preparation and mode of application; whether the plant is used alone or in combination with other plants.

Interviews were conducted in order to record relevant ethnobotanical data. These interviews were conducted, as recommended by Chhabra and Mahunnah (1994). In each village two older persons whose empirical knowledge was respected by everyone in the area, and two traditional healers who prescribed local herbs were interviewed. Interview data were recorded in an ethnobotanical notebook (Martin 1995).

RESULTS AND DISCUSSION

Plants used for traditional medicine

In the Manokwari District, 99 plant species were documented as traditional medicinal plants. They are widely distributed among 94 genera and 59 families, ten of which are members of the Araceae family, widespread in the rainforests of the District. This indicates the diversity of traditional medicinal plants in Manokwari District. Except for cultivated species such as *Cocos nucifera* L., *Carica papaya* L. and *Musa x paradisiaca* L., traditional medicinal plants were most commonly gathered from the local vegetation communities.

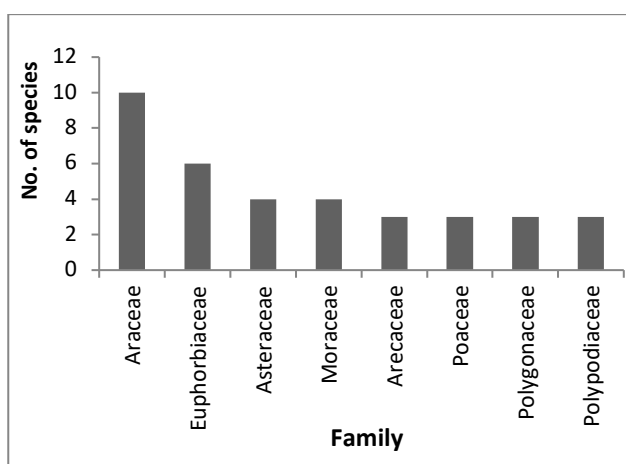


Fig. 1. Plant families most commonly used for traditional medicine by Indigenous people from Manokwari District.

Plants used to treat more than 40 different medical conditions were grouped into several categories according to use by indigenous people: gastrointestinal disorders, dermatological conditions, illnesses associated with pain

and/or fever, respiratory illnesses, women's medicines, plants used to counteract bites by venomous animals, eye remedies, wounds and burns, and other uses (Ankli et al. 1999).

The category with the largest number of species was that used to treat illnesses associated with pain and/or fever, and the next largest group consisted of plants used to treat gastrointestinal disorders, whereas only one species was documented as being used to counteract venomous animal bites. The cause of some of the sickness and injuries were attributed to 'supernatural powers'. Even minor accidents to such as cuts and body pains were sometimes attributed by tribal people such outside influences.

The number of medicinal plants found in the present study was higher than that found in previous studies in West Papua, and other regions of eastern Indonesia: the Dani people in the Baliem Valley in Jayawijaya District used 30 plant species to treat a number of local diseases (Purwanto and Waluyo 1992), and the Tangma people in Kurima Sub-District used 26 medicinal plants in their daily health care (Alhamid and Sumarliani 1996). Roemantyo and Wiriadinata (1991) reported that indigenous people in Kupang, West Timor, recognize and use 37 species as medicinal plants. However, the number of species found in the present study is less than the 164 traditional medicinal plants used by indigenous people in Tanimbar-Kai Island, south-east Maluku, Indonesia (Purwanto and Waluyo 1992).

Unpublished data from local health authorities suggest that illnesses associated with pain and/or fever (frequently malaria, ear pain, and headaches) and gastrointestinal disorders (diarrhoea, dysentery, and stomach-aches) are the major health problems in Manokwari District. Infected wounds, inflammatory skin diseases, and chronic and infectious eye diseases are also common. Although bites from poisonous snakes are feared, only a few cases have been recorded.

The numbers of traditional medicinal plant species, which are used simultaneously to treat a medical condition appears to depend on the nature of the condition. Tribal people will use several medicinal plant species to treat a particular illness if they consider the illness to be dangerous. The people of the present study used at least ten plant species to treat malaria, since malaria is one of the primary medical conditions that often result in death. However, to cure influenza the people often use one only medicinal plant species.

The people at all the study sites believed that there are several reasons why someone suffers from certain illnesses. These medical conditions include diarrhoea, dysentery, influenza, and malaria, all known to be caused by microorganisms. For these conditions, a combination of modern medicines and traditional medicinal plants are very popular choices. The local people also believe that certain ailments may be caused by a person or a group entering an area which does not belong to the group. The symptoms of this illness are stomach-pains, swollen navel, diarrhoea, pale appearance, and a feeling of general debility. They believe that these conditions are related to the "supernatural" and can be healed using traditional medicinal plants only. Native people in Manokwari District, especially people from the

Big Arfak tribe (Sough, Hatam, Meyah, and Moile sub-tribes), also believe that their members may suffer from certain medical conditions due to a curse from an ancestor. The main symptoms of this illness are swollen parts of the body such as the eyebrows, eyelids, and stomach, and they believe that both hands and legs shrink and may not be able to move easily. Medical conditions, caused by “suanggi” (a member of the group who is able to kill another member using magic; tribal communities consider this magical) are thought to be incapable being healed by either modern or traditional medicines. The major symptoms of this sickness are darkening of the entire body of the affected person and immobility of hands, legs, and fingers. Based on the field interviews, the only way to treat conditions caused by both an ancestor curse and “suanggi” is by applying traditional medicinal plants. However, this medicine cannot cure the illness completely, as the person who suffers from the illness will die at the later stage. During the present study, no information has been recorded regarding the species of medicinal plants which may be used to treat medical conditions caused by both curses from ancestors or “suanggi”.

The study also indicated that there were some similarities and differences amongst the tribes in using medicinal plants in their daily health care. Some species used as traditional medicines were used to treat similar medical conditions throughout the region. *Alstonia scholaris*, widely distributed throughout Manokwari District, has been used by the native people in Siwi and Dembek village (Ransiki), Jandurau village (Keban), Tandia village (Wasior), and Mandopi village in Manokwari sub-District to treat malaria and fever. Field observations indicated that *Laportea interrupta*, *Alstonia scholaris*, *Pipturus repandus*, *Costus speciosus*, and *Cordyline fruticosa* occurred at all of the study sites. Particular species of traditional medicinal plants were found in two or more study sites to treat different medical conditions. For example *Cordyline fruticosa* was used by the community in Ransiki sub-District to treat dysentery, whereas in Minyambouw sub-District the species was used to treat menstruation problems. There were also some similarities in medicine preparation and in the ways to apply the potions. It may be that frequent visits of the members of particular tribes, including the older person or traditional healers, to meet their extended families or to attend the traditional ceremonies may be one possible factor that produced these similarities.

Plants used for pain and/ or fever

Fourty species were documented for illnesses associated with pain and/or fever in which fever and malaria were the frequent conditions (Table 1). In general, traditional medicines were prepared as decoctions or infusions, or sometimes applied or rubbed on to the part of the body affected. For example, in treating fever, a potion may be prepared as an infusion to be drunk and the solid parts applied to the forehead.

Malaria and fever are the most frequently treated medical conditions. This group includes diseases associated with

chest pain, headaches, muscular pain, and influenza. Of the 40 species recorded to treat pain and/or fever, 21 species were used by the people in the District specifically to treat malaria (Table 1). *Alstonia scholaris* and *Pipturus repandus* were the most common plants used in four different sub-regencies to treat fever. *Cerbera manghas*, *Casuarina equisetifolia*, *Flagellaria indica*, *Freycinetia* sp., *Lansium domesticum*, *Loranthus* sp., *Senna alata*, and *Solanum* sp. were used in only one sub-District. However, these species are widely distributed and seen in all four areas. Nevertheless, each tribe in the region has their own traditional plants to treat local medical conditions. Nettles, *Laportea interrupta* (L.) Chew. are widely recognised by almost all communities in the region as a medicinal plant to combat muscular pains and fatigue. The method of use was to rub the fresh, hairy leaves on the skin to produce a very hot and itchy feeling.

Several species found in the present study to treat pain and fever are also used by traditional communities around the world to treat similar medical conditions. People in Aceh (Erdelen et al. 1999) and East Lombok, Indonesia (Hadi and Bremner 2001), Malaysia (Salleh 1997), and Karnataka Province, India (Shankar et al. 1999) use the species *Alstonia scholaris* to combat malaria and fever. *Carica papaya* L. (leaves, stem, roots, and flowers) is used to treat malaria in West Lombok, Indonesia (Hadi and Bremer 2001). The leaves of *Bidens pilosa* L. are made into a decoction and then used as a gargle in Dominican Republic and Papua New Guinea (Morobe Province) for treating toothaches (Taylor 1998; Woodley 1991). The Fijians use this plant as a traditional medicine but for different diseases: the young shoots are used as an internal remedy for influenza, and the leaves are used to treat infective hepatitis (Cambie and Ash 1994).

Some species recorded to treat pain and fever are also known to contain phytochemical compounds. Some of these compounds have been tested in order to establish their efficacy in treating particular medical conditions. *Bidens pilosa* has been the subject of recent clinical studies which have supported many of its uses in herbal medicine (Taylor 1998). As early as 1979, scientists demonstrated that specific chemicals found in this species were phototoxic to bacteria and fungi (Wat et al. 1979; Arnason et al. 1980). Subsequently, Swiss scientists isolated several known phytochemical compounds with anti-microbial and anti-inflammatory properties which led them to believe that the presence of these compounds "may rationalise the use of this plant in traditional medicine in the treatment of wounds, against inflammation and against bacterial infection of the gastrointestinal tracts (Geissberger and Sequin 1991). In the same year, scientists in Egypt documented the antimicrobial activity of *Bidens pilosa* L. (Sarg et al. 1991), and another research group reported that the species has anti-inflammatory properties (Chih et al. 1995). New bioactive phytochemicals were also discovered

Table 1. Manokwari traditional medicinal plants used for illnesses associated with pain and/or fever.

Plant name	Family	Medical conditions	Plant parts used
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<i>Alpinia purpurata</i> (Vieill.) K.Chum.	Zingiberaceae	Earaches	Stem
<i>Alstonia scholaris</i> R.Br.	Apocynaceae	Fever, malaria	Bark
<i>Bidens pilosa</i> L.	Asteraceae	Toothaches	Leaves
<i>Blumea saxatilis</i> Zoll. & Mor.	Asteraceae	Cold, influenza	Leaves
<i>Carica papaya</i> L.	Caricaceae	Malaria	Leaves
<i>Casuarina equisetifolia</i> L.	Casuarinaceae	Malaria	Bark
<i>Cerbera manghas</i> L.	Apocynaceae	Fever	Latex
<i>Cinnamomum culilawan</i> Blume	Lauraceae	Toothaches and muscular pains	Bark
<i>Coelogyne asperata</i> Lindl.	Orchidaceae	Chest pain	Bulbs
<i>Costus speciosus</i> Sm.	Zingiberaceae	Ear pain	Stem
<i>Cyathea contaminans</i> L.	Cyatheaceae	Fever	Stem
<i>Cyrtosperma</i> sp.	Araceae	Chest pain	Tubers
<i>Diplazium esculentum</i> (Retz.) Sw.	Athyriaceae	Headaches	Leaves
<i>Dysoxylum arborescens</i> Miq.	Meliaceae	Fever and Malaria	Bark
<i>Dryopteris filix-max</i> (L.) Scott.	Dryopteridaceae	Fever	Leaves
<i>Ficus</i> sp1.	Moraceae	Fever	Bark, shoot
<i>Ficus</i> sp2.	Moraceae	Toothaches	Leaves, roots
<i>Flagellaria indica</i> L.	Flagellariaceae	Fever	Stem juices
<i>Freycinetia</i> sp.	Pandanaceae	Fever	Stem juices
<i>Homalomena aromaticum</i> (Roxb.) Schott.	Araceae	Muscular pain	Bulbs
<i>Kalanchoe pinnata</i> Pers.	Crassulaceae	Fever	Leaves
<i>Lansium domesticum</i> Jack.	Meliaceae	Malaria	Bark
<i>Laportea interrupta</i> (L.) Chew.	Urticaceae	Muscular pain	Leaves
<i>Loranthus</i> sp.	Loranthaceae	Fever in babies	Leaves
<i>Macaranga mappa</i> Muell. Arg.	Euphorbiaceae	Chest pain	Leaves
<i>Macaranga tanarius</i> Muell. Arg.	Euphorbiaceae	Chest pain, malaria	Leaves
<i>Mucuna novo-guineensis</i> Scheff.	Fabaceae	Malaria, fever	Stem
<i>Octomeles sumatrana</i> Miq.	Dasticaceae	Fever	Bark
<i>Palmeria</i> sp.	Monimiaceae	Back pains	Stem
<i>Pentapalanqium pachycarpum</i> A.C. Smith	Clusiaceae	Joint pain	Bark
<i>Philodendron</i> sp.	Araceae	Rheumatic and joint pains	Stem
<i>Pimelodendron amboinicum</i> Hassk.	Euphorbiaceae	Headaches	Leaves, Latex
<i>Pipturus repandus</i> (Bl.) Wedd.	Urticaceae	Fever	Bark
<i>Pisonia</i> sp.	Nyctaginaceae	Headaches	Roots
<i>Platyterium</i> sp.	Polypodiaceae	Malaria, fever	Leaves
<i>Ricinus communis</i> L.	Euphorbiaceae	Malaria	Leaves
<i>Scindapsus hederaceus</i> Schott.	Araceae	Colds of babies	Leaves
<i>Senna alata</i> L.	Caesalpiniaceae	Fever	Leaves
<i>Smilax</i> sp.	Smilacaceae	Headaches	Stem
<i>Solanum</i> sp.	Solanaceae	Malaria	Leaves

Table 2. Manokwari traditional medicinal plants used for gastrointestinal disorders.

Plant name	Family	Medical conditions	Plant parts used
<i>Acorus calamus</i> L.	Araceae	Dysentery	Rhizomes
<i>Adenantha microsperma</i> Teijsm.&Binn.	Mimosaceae	Diarrhoea	Leaves
<i>Aquilaria malacensis</i> Lam.	Thymelaeaceae	Dysentery	Leaves
<i>Artocarpus altilis</i> (Park.) Fosb.	Moraceae	Diarrhoea/dysentery	Sap, bark
<i>Canarium</i> sp.	Burseraceae	Liver problems	Bark
<i>Canna indica</i> L.	Cannaceae	Dysentery	Stem
<i>Cinnamomum culilawan</i> Blume	Lauraceae	Stomach-aches	Bark
<i>Cocculus carolinus</i> (L.) DC.	Menispermaceae	Stomach-aches	Water from stem
<i>Commelina diffusa</i> Burm. F.	Commelinaceae	Dysentery	Leaves
<i>Cordyline fructicosa</i> A. Cheval.	Dracaenaceae	Dysentery	Leaves
<i>Costus speciosus</i> Sm.	Zingiberaceae	Stomach-aches, food poisoning	Stem
<i>Crinum asiaticum</i> L.	Amaryllidaceae	Stomach-aches	Tubers
<i>Homalanthus nutans</i> Guill.	Euphorbiaceae	Stomach-aches	Leaves
<i>Homalonema aromaticum</i> (Roxb.) Schott.	Araceae	Stomach-aches	Bulbs
<i>Horsfieldia</i> sp.	Myristicaceae	Stomach complaint	Bark
<i>Intsia palembanica</i> L.	Caesalpiniaceae	Dysentery	Bark
<i>Morinda citrifolia</i> L.	Rubiaceae	Stomach-aches	Leaves
<i>Mucuna nova-guineensis</i> Scheff.	Fabaceae	Diarrhoea	Stem
<i>Piper</i> sp.	Piperaceae	Stomach-aches	Leaves
<i>Pipturus repandus</i> (Bl.) Wedd.	Urticaceae	Diarrhoea	Leaves
<i>Planchonella</i> sp.	Sapotaceae	Dysentery	Bark
<i>Polygonum</i> sp3.	Polygonaceae	Dysentery	Leaves
<i>Pothos scandens</i> L.	Araceae	Diarrhoea	Leaves
<i>Pterocarpus indicus</i> Willd.	Fabaceae	Dysentery	Bark
<i>Senna alata</i> L.	Caesalpiniaceae	Stomach-aches	Leaves
<i>Wollastonia biflora</i> DC.	Asteraceae	Diarrhoea	Leaves and flowers

in 1996 which indicated that *B. pilosa* was effective against normal and transformed human cell lines (Alvarez et al.

1996). The plant extract was shown to possess prostaglandin-synthesis inhibitory activity, a process linked

to headaches and inflammatory diseases (Jager et al. 1996). Subsequently, a research group in Taiwan documented its hepatoprotective (liver protecting) activity, and showed that the species can protect liver injuries from various hepatotoxins, and suggested that it has the potential as a broad-spectrum anti-hepatic agent (Chin et al. 1996). In addition, Rabe and Staden (1997) reported that the species showed antibacterial activity against gram-positive bacteria.

Plants used for gastrointestinal disorders

Twenty-six species from the Manokwari District were documented for treating gastrointestinal disorders (Table 2). Majority of the species of traditional medicinal plants recorded in this group were used to treat stomach-aches and dysentery; other illnesses treated included diarrhoea, liver diseases and poisoning. Unpublished data from the Manokwari District community health centre show that stomach-aches and dysentery are important medical conditions throughout the region and they have caused many deaths amongst these communities. The “way of life”, the officer said, was the primary reason. Treatments consist mostly of circular massages of the medicinal plants around the navel as well as drinking a decoction or infusion made from various plant parts.

Some species used to cure these medical conditions were used by more than one tribe. *Homalanthus nutans* was widely used by the sub-tribes in four different sub-regencies (Ransiki, Anggi-Sururey, Wasior, and Kebar) to treat stomach-aches. The shrubs are easy to access, growing mostly in secondary forest and previously cultivated area surroundings the villages. The tribes also used similar methods of preparation as a decoction or cold infusion, followed by rubbing the prepared plants on the affected areas.

Some of the species found under this section have also been reported as treatments for similar medical conditions in different parts of the world. *Artocarpus altilis* is recognized in Java and other Indonesian areas, (root bark, sap, and sometimes stem-bark), Samoa and Tonga (roots), and in Papua New Guinea (latex) to treat diarrhoea and dysentery (Perry 1980; Dittmar 1998). Another study also reported that a decoction of leaves and rhizomes of *Cordyline fruticosa* is used to cure diarrhoea and dysentery in Central Lombok

(Puyung), Indonesia (Hadi and Bremner 2001), and Samoa (Dittmar 1998). In Malaysia, *Acorus calamus* (Jerangau) is used to cure fevers, dysentery, and to improve the appetite (Salleh 1997). A decoction of bark of *Artocarpus altilis* and the leaves and bark of *Morinda citrifolia* were also used in the Philippines and Tonga to treat stomach-aches (Perry 1980; Singh 1984). A phytochemical study of the latex of *Artocarpus altilis* has shown that it contains cardenolides (Qujano and Arango 1979; Wong 1976) and cerotic acid (Perry 1980), but no pharmacological information relating to indigenous uses is available.

Plants used for dermatological conditions

In this group, eight plant species from the Manokwari District have been reported to be used to treat a variety of dermatological conditions such as scabies and abscesses (Table 3). Treatments mostly consist of preparing a decoction or cold diffusion and applying it to the affected skin. Bark and roots were the most common parts of the plant used. To treat measles, the roots of *Imperata cylindrica* and *Metroxylon rumphii* were boiled, filtered, cooled, and the solution is swallowed twice per day until the patient is healed.

The native people in Wasior, Kebar, and Merdey have used the bark of the stem of *Ficus* sp. and *Leea aculeata* as well as the leaves of *Polygonum* sp. to treat abscesses. Treatment is mainly by drinking a decoction or cold infusion of the potion followed by application of prepared plants whereas to cure ringworm, these communities applied the crushed bark and leaves directly to affected skin.

Some of the species found under this category have been using as medicinal plants worldwide. In West Lombok, Indonesia, *Cocos nucifera* (leaves, stem, and roots) is used for fever and dysentery (Hadi and Bremner 2001). People in the Marshall Islands used the leaf sheath of this species to support broken limbs (Spennemann 2000). Elsewhere in Indonesia, the roots of *Imperata cylindrica* are used to treat blood pressure, fever, coughs, and hepatitis (Erdelen et al. 1999). In Sri Lanka, a decoction of rhizomes is used to relieve the retention of urine and passing of blood in the urine (Jayaweera 1999).

Table 3. Manokwari traditional medicinal plants used to treat dermatological conditions.

Plant name	Family	Medical conditions	Plant parts used
<i>Cocos nucifera</i> L.	Arecaceae	Measles	Milk from young coconut
<i>Ficus</i> sp1.	Moraceae	Abscesses	Bark, shoot
<i>Imperata cylindrica</i> L.	Poaceae	Measles	Roots
<i>Leea aculeata</i> Blume	Leeaceae	Abscess	Bark
<i>Lithocarpus brassii</i> Soepadmo	Fagaceae	Ringworm	Bark
<i>Metroxylon rumphii</i> Mart.	Arecaceae	Measles	Roots
<i>Polygonum</i> sp1.	Polygonaceae	Scabies	Roots
<i>Polygonum</i> sp2.	Polygonaceae	Abscesses	Leaves

Table 4. Manokwari traditional medicinal plants used for respiratory illnesses.

Plant name	Family	Medical conditions	Plant parts used
<i>Alstonia scholaris</i> R.Br.	Apocynaceae	Coughs, asthma	Bark, roots

<i>Endospermum mollucanum</i> Becc.	Euphorbiaceae	Bronchitis	Bark
<i>Euodia</i> sp.	Rutaceae	Asthma	Bark
<i>Horsfieldia</i> sp.	Myristicaceae	Asthma	Bark

Table 5. Manokwari traditional medicinal plants used as women's medicines.

Plant name	Family	Medical conditions	Plant parts used
<i>Ageratum conyzoides</i> L.	Asteraceae	Eases birth, decoction after delivering a baby	Leaves
<i>Biophytum petersianum</i> Klotzsch	Oxalidaceae	Fertility	Whole plant
<i>Centella asiatica</i> L.	Umbelliferae	Problems of menstruation	Leaves
<i>Colocasia</i> sp.	Araceae	Childbirth	Bulbs
<i>Cordyline fructicosa</i> A. Cheval.	Dracaenaceae	Problems of menstruation	Leaves
<i>Cyathea contaminans</i> L.	Cyatheaceae	Problems of menstruation	Stem
<i>Musa x paradisiaca</i> L.	Musaceae	Easy birth	Stem
<i>Nauclea orientalis</i> L.	Rubiaceae	Easy birth	Bark
<i>Physalis angulata</i> L.	Solanaceae	Prevent pain during menstruation	Leaves
<i>Ricinus communis</i> L.	Euphorbiaceae	Decoction before delivering a baby	Leaves

Plants used for respiratory illnesses

Four species of Manokwari medicinal plants were locally used for coughs, bronchitis, and asthma (Table 4). Bark from the stem was usually prepared as a decoction and infusion to treat these medical conditions in Merdey, Ransiki, Kebar, and Manokwari sub-regencies. Results indicated that species *Alstonia scholaris* was used widely in different tribes in Ransiki, Kebar, Wasior, and Manokwari to combat coughs and asthma.

The number of species recorded to treat these medical conditions was lower than the number of species found to treat diseases in any other category. This may be because respiratory illnesses are not considered as primary medical conditions in the Manokwari District. Some of the species have been reported to be used for similar medical conditions in different countries. For example, the bark of *Alstonia scholaris* was used to treat diseases from malaria and epilepsy to skin conditions and asthma (Shankar *et al* 1999); also, in Malaysia, the species is used for cases of fevers and coughs (Salleh 1997).

Plants Used as women's medicines

Plants used during delivery and menstruation problem are the most prominent group in this category (Table 5). Treatments for these medical conditions were mostly prepared as decoctions and were sometimes followed by applying or rubbing the prepared plants on to the stomach, so the mother would not feel pain during the delivery of a baby.

The indigenous people in Minyambouw sub-District used at least six species of traditional medicinal plants to treat childbirth and menstruation problems. The bark and leaves were the most preferred plant parts. However, for species *Biophytum petersianum*, the whole plant was used as fertility medicine. Based on the personal interviews of the present study, the indigenous people of Kebar sub-District believed that a decoction of this species can increase the fertility of a couple, but clinical investigations are needed in order to support such a view. The species also has been

traded locally. Sometimes people from outside the tribe buy a couple of kilograms of the whole plant of *Biophytum petersianum* as a fertility-enhancing drug.

There have been no previous reports of the species listed in Table 6 being used for medical conditions associated with women elsewhere in Indonesia, but some of them are used in other countries. The species *Ageratum conyzoides* L. is used in most African countries as a contraceptive, whereas in Trinidad, the species was used as an abortifacient (Durodola 1977). A similar use was reported for the species *Physalis angulata*, in Papua New Guinea (Kurtachi, Northern Bougainville) where the seeds of this species are used as a contraceptive in women (Cambie and Brewis 1997). People in Central America and Jamaica have used a tea prepared from the whole plant of *Physalis angulata* to prevent an abortion after a fall during pregnancy (Cambie and Brewis 1997).

Plants used for eye conditions

In this group, six species have been documented as being used to treat eye complaints including inflammation, irritation, and infection of the surface of the eye (Table 6). Treatments generally consist of dropping the potions into the eye. Table 7 shows that native people in Wasior sub-District used several plant species to treat these medical conditions, whereas people in Kebar used one species only to treat similar complaints.

Often drops are prepared by extracting liquids from the squashed leaves and/or stems of the plants and they are applied topically. When people in the Wasior sub-District use *Calophyllum inophyllum* to treat eye problems, the leaves are first soaked in a bucket of water for about 30-45 minutes prior to washing the eyes with the extracted water for approximately 1-2 minutes; the eyes are opened and closed several times during this process. Leaves were the preferred plant part used to treat eye ailments, possibly because leaves are easier to prepare as drops.

Plant name	Family	Medical conditions	Plant parts used
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<i>Ageratum conyzoides</i> L.	Asteraceae	Irritated eyes	Leaves
<i>Calamus</i> spp.	Arecaceae	Inflamed eyes	Stem liquid
<i>Calophyllum inophyllum</i> L.	Clusiaceae	Inflamed eyes	Leaves
<i>Cordyline fruticosa</i> A. Cheval.	Dracaenaceae	Irritated eyes	Leaves
<i>Dischidia</i> sp.	Asclepidaceae	Irritated eyes	Leaves
<i>Ficus</i> sp2.	Moraceae	Eye infection	Leaves

Table 7. Manokwari traditional medicinal plants species used to treat wounds and burns.

Plant name	Family	Medical conditions	Plant parts used
<i>Ageratum conyzoides</i> L.	Asteraceae	Wounds	Leaves
<i>Artocarpus altilis</i> (Park.) Fosb.	Moraceae	Wounds	Sap, bark
<i>Cyathea contaminans</i> L.	Cyatheaceae	Burns	Juvenile stem
<i>Cyperus rotundus</i> L.	Cyperaceae	Wounds	Leaves
<i>Diplazium esculentum</i> (Retz.) Sw.	Athyaceae	Wounds	Leaves
<i>Bambusa vulgaris</i> Schrad.	Poaceae	Wounds	Outer bark
<i>Melastoma malabathricum</i> L.	Melastomataceae	Wounds	Leaves
<i>Merremia peltata</i> Merr.	Convolvulaceae	Wounds	Leaves, twigs
<i>Mucuna novo-guineensis</i> Scheff.	Fabaceae	Old wounds	Stem
<i>Paspalum conjugatum</i> L.	Poaceae	Wounds	Leaves
<i>Pometia pinnata</i> Forst.	Sapindaceae	Burns and wounds	Juvenile bark
<i>Axonopus compressus</i> (SW.) P.	Araceae	Wounds	Leaves
<i>Spathoglottis papuana</i> F.M. & Bailey	Orchidaceae	Wounds	Bulbs

Table 8. Manokwari traditional medicinal plants used for other medical conditions

Plant name	Family	Medical conditions	Plant parts used
<i>Amomum</i> sp.	Zingiberaceae	Sexually transmitted diseases in men	Leaves
<i>Artocarpus altilis</i> (Park.) Fosb.	Moraceae	Gonorrhoea	Sap
<i>Canarium</i> sp.	Burseraceae	Hepatitis	Bark
<i>Drimys beccariana</i> L.S. Gibbs.	Winteraceae	Lethargy	Bark
<i>Ficus benjamina</i> L.	Moraceae	Bone fracture	Bark
<i>Gnetum gnemon</i> L.	Gnetaceae	Hepatitis	Bark
<i>Litsea</i> sp.	Lauraceae	Gonorrhoea	Bark
<i>Palaquium</i> sp.	Sapotaceae	Sexually transmitted diseases in men	Latex
<i>Pimelodendron amboinicum</i> Hassk.	Euphorbiaceae	Sexually transmitted diseases in men	Leaves, bark
<i>Pipturus repandus</i> (Bl.) Wedd.	Urticaceae	Epilepsy	Leaves
<i>Platyterium</i> sp.	Polypodiaceae	Hepatitis	Leaves
<i>Pometia pinnata</i> Forst.	Sapindaceae	Lethargy	Bark
<i>Epipremnum pinnatum</i> (L.) Engl.	Araceae	Hepatitis, sexually transmitted diseases in men	Leaves
<i>Schismatoglottis calyptata</i> Zoll. & Mor.	Araceae	Bone fracture	Leaves
<i>Selaginella</i> Palisot de Beauvois	Selaginellaceae	Broken legs	Stem juices
<i>Spathodea campanulata</i> Beauv.	Bignoniaceae	Tonic	Bark

Similar traditional uses of some species recorded in this group have also been reported in different countries. In Samoa, the leaves of *Cordyline fruticosa* was used to cure eye inflammation (Dittmar 1998), and in Tonga, leaves were used for eye complaints, eye infections, as well as toothache, gum infections, and gum abscesses (Weiner 1971). The leaves of this species contain thymidine and the flowers contain chelidonic acid (Wong 1976).

Plants used for wounds and burns

Extracts from 13 species of Manokwari medicinal plants (Table 7) were used to treat wounds and burns. Cuts and wounds may be bathed with potions of certain medicinal plants made simply by crushing the leaves, stem, or bulbs of specific plants, or by heating those parts before crushing and applying the juices. Sap of the stem of *Artocarpus altilis* may also be applied. Excessive bleeding may be stopped by applying the outer bark of *Bambusa vulgaris* or the juices of *Ageratum conyzoides*.

Burns may be treated by applying crushed stems of *Cyathea contaminans* and masticated juvenile bark of *Pometia pinnata*. The potion of the *Cyathea contaminans*

was prepared by crushing the juvenile part of the stem to a gel and applying directly on burns. *P. pinnata* is commonly used throughout the Manokwari District.

Furthermore, the medicinal plants recorded in this group also have been reported to be used to treat similar medical conditions worldwide. *Ageratum conyzoides* is used in Java, Indonesia, to cure similar ailments. In Malaysia and the Philippines it is used to treat cuts, boils, and wounds, and is thought to have anti-tetanus properties (Salleh 1997). In Central Africa, Cameroon and Congo, and elsewhere in Africa (Durodola 1977), *A. conyzoides* is used to cure pneumonia, but the most common use is to heal wounds and burns. The species is reputed to be a quick and effective cure for burns and is recommended by the Brazilian Drugs Central as an antirheumatic (Ming 1999). Pharmacological investigations by Ming (1999) have confirmed that *Ageratum conyzoides* has an effective analgesic action in rats when an aqueous extract of leaves (100 to 400 mg/kg) is used. Trials in Kenya, using aqueous extracts of the whole plant, have demonstrated muscle-relaxing activities, confirming its popular use as an antispasmodic (Achola et al. 1994). Similar results were obtained in experiments

conducted by State University of Campinas and Paraíba Federal University, Brazil. In clinical trials on patients with arthritis who were given an aqueous extract of the whole *A. conyzoides* plant, 66% of patients reported a decrease in pain and inflammation and 24% reported increased mobility; no side effects were apparent after a week of treatment (Ming 1999). In Samoa and Hawaii, the twigs and fruits of *Artocarpus altilis* are used as a cure for wounds (Dittmar 1998), whereas the people in Langkawi, Malaysia used the juvenile stem of *Cyathea contaminans* L. (Salleh 1997; Woodley 1991).

Other uses (OTH)

The 16 species in this group have diverse applications. Medical treatment ranges from treating sexual diseases of men, lethargy, hepatitis, and bone fractures (Table 8). Of these, only a few species stand out as being of some importance.

Medical conditions related to sexually transmitted diseases in men are the most common conditions treated. Preparations of medicinal plants are applied to affected areas. Table 8 indicates that many of the species listed can produce exudates (latex or sap) that are applied directly, whereas the bark of *Artocarpus altilis*, *Litsea* sp., *Palaquium* sp., and *Pimelodendron amboinicum* was crushed and then applied. There is no supporting information regarding the efficacy of these species in treating similar conditions in different regions. Hence, further phytochemical studies, as well as clinical investigations, are needed in order to prove their efficacy.

The species *Drimys beccariana* (akuai) has become a very popular medicinal plant in Minyambouw area and surroundings. The stem-bark of this species is normally used by the indigenous people, especially the Hatam tribe, as a tonic. In general, the bark is chewed or some it can be prepared as a decoction to drink to strengthen people and to provide energy for long distance travel, such as visiting family in different villages or visiting the capital city of Manokwari District. Crushed bark of *Ficus benjamina* is used for broken bones as a hard gypsum-like plaster bandage.

Parts of plants used and preparation

The indigenous people in Manokwari District have been shown to use almost all the parts of medicinal plants for treating a wide range of sickness, accidents, and injuries. Leaves and leaf extracts are the most common parts of the plant used by traditional healers and all the materials are collected from the rainforest (Figure 2). In most cases plant preparation is minimal: crushing fresh material and applying directly to the affected part of the body; or brewing a tea or infusion for drinking. For example, for treating coughs and malaria, the bark of *Alstonia scholaris* is scraped, boiled, cooled, filtered, and then drunk. A small amount of cold or hot water is usually added to the concoction, especially to make liquid medicine more palatable. Some traditional medicines are applied directly to the patient without initial preparation. For example, to cure wounds and sexually transmitted diseases in men, the latex of *Artocarpus altilis* is applied to the wounds or genital organs.

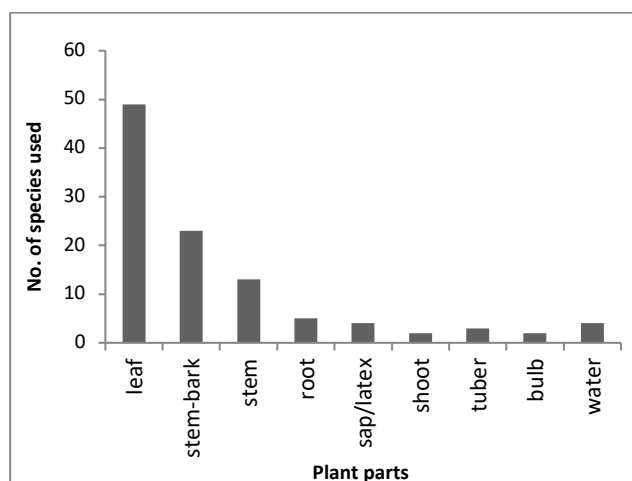


Figure 2. Plant parts are commonly used for traditional medicine by indigenous people from Manokwari District.

Although each traditional plant has its own dosage and frequency of use, most indigenous people in Manokwari District will continue to use the traditional medicines twice a day until the patient is totally healed. They do not recognise contra-indications during the healing process, except where the plants are used to heal particular diseases, which are related to the “supernatural”.

Local preservation of plant knowledge

Recently, with greater movement of young people away from the villages, a significant decrease in the plant knowledge of the younger generations has been noticed in many parts of the region. While one of the original intentions of this study was to determine the extent to which a similar trend is occurring in the Manokwari District area, this was difficult to assess because of the relatively small number of permanent residents less than 60 years of age. However, it was found that when members of the younger generation returned to visit their villages, many spent time with their parents and older relatives asking about plants, animals, and cultural traditions.

Knowledge of the medicinal uses of plants is an individually developed skill that is regarded as a person's particular interests or gift. Certain individuals are recognised as special authorities on healing, and are consulted on a regular basis for remedies for serious and/or persistent illnesses. It appears that most sick people first attempt to cure themselves, and if unsuccessful, they will then visit a traditional healer. If the healer's remedies also fail, only then will the person seek the help of a distant medical doctor. In most cases, when the indigenous people of the Manokwari District felt malaise or have aches, they called upon the services of a traditional healer.

Quite often returning villagers who have established permanent residences elsewhere also turned to the traditional healers for natural herbal remedies. Many villagers expressed strong distrust and/or disbelief in “[western] medical knowledge,” and only when desperate would they visit the area doctor in another village or travel to a city hospital. Many people simply refused to consult

doctors at all. The main factors contributing to such attitudes seem to be the equating of pills of undetermined origin and content with potent poisons, and to an abhorrence for invasive surgical procedures. Such beliefs have arisen from failed medical treatment of close relatives who have suffered a chronic or serious disease or have died. Undoubtedly, the frequency of such failed treatments may be due to the fact that most diseases were in advanced stages before patients subjected themselves to treatment. Cost is another factor, and traditional healers were readily accessible, whereas medical treatment often involved great financial expense and arduous travel.

CONCLUSIONS

The indigenous people in Manokwari have been using at least 99 plant species as sources of medicines; the plants are widely distributed among 93 genera and 59 families. Most of these traditional plants are commonly gathered from the local rainforest communities. The plants have been used by the native people to treat medical conditions grouped into several categories namely gastrointestinal disorders, dermatological conditions, illnesses associated with pain and/or fever, respiratory illnesses, women's medicines, plants used to counteract bites by venomous animal, wounds, burn, and eye remedies, and other uses.

The indigenous people in Manokwari have used almost part of the plants for treating several medical conditions, but leaf extract are the most common part used by traditional healers. Plant parts are prepared either by crushing down or apply fresh material and by direct application to the affected part of the body or brewing a tea of infusion for drinking.

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From: Ahmad Dwi Setyawan (unsjournals@gmail.com)

To: obedlense@yahoo.com

Date: Tuesday, 26 June 2012 at 10:35 am GMT+9

P. Obed,

Kami beritahukan bahwa makalah Bapak/Ibu dicetak pada **Biodiversitas vol. 13, no. 2, April 2012**. Bersama ini kami kirimkan "pdf-file" naskah tersebut.

Judul : **The wild plants used as traditional medicines by indigenous people of Manokwari, West Papua**

Penulis : **OBED LENSE**

Selanjutnya kami beritahukan bahwa tagihan untuk naskah tersebut sebesar **Rp. 250.000,00 (dua ratus lima puluh ribu rupiah)**, terdiri dari biaya pengadaan sebesar Rp. 150.000,00 (tagihan untuk anggota MBI) dan biaya pengiriman dalam negeri ke Papua dengan rata-rata sebesar Rp. 100.000,00. Namun, tagihan ini dinyatakan lunas karena naskah tersebut memenangi MBI Award tahun 2010.

Apabila terjadi kesalahan pada tagihan ini, akan segera dikirimkan revisi.

Demikian surat kami, atas perhatian dan kerjasamanya diucapkan terima kasih.

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Ahmad Dwi Setyawan

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