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# Biological screening of selected traditional medicinal plants species utilized by local people of Manokwari, West Papua Province

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## ABSTRACT

**Abstract.** *Lense O. 2011. Biological screening of selected traditional medicinal plants species utilized by local people of Manokwari, West Papua Province. Nusantara Bioscience 3: 145-150.* The aim of the research was to determine the presence of alkaloids and anti-microbial activity in extracts from selected medicinal plants from Manokwari District, West Papua, Indonesia. The method of alkaloid testing followed the standard phytochemical methods. The procedure of the Calibrated Dichotomous Sensitivity (CDS) test was used for the antimicrobial bioassays. Results of biological screening suggested that all but one of the 56 species tested contained different levels of alkaloids. Eleven species showed anti-microbial activity using bioassays of responses to two bacteria, *Salmonella typhi* and *Klebsiella pneumoniae,* and two fungi *Candida albicans*, and *Cryptococcus neoformans*; none of the plant extracts showed an antimicrobial effect against the bacteria *Escherichia coli.* Extract of *Planconella* sp. was the most active one as it showed activity against three different organisms (*C. albicans*, *C. neoformans*, and *S. typhi*).

**Key words:** biological screening, local people, Manokwari, traditional medicinal plant, West Papua.

**Abstrak.** *Lense O. 2011. Penapisan hayati beberapa jenis tumbuhan obat tradisional terpilih yang dimanfaatkan oleh masyarakat lokal Manokwari, Provinsi Papua Barat. Nusantara Bioscience 3: 145-150.* Tujuan penelitian ini adalah untuk mengetahui adanya alkaloid dan aktivitas anti-mikroba ekstrak beberapa tanaman obat terpilih dari Kabupaten Manokwari, Papua Barat, Indonesia. Metode pengujian alkaloid mengikuti metode fitokimia standar. Prosedur uji *Calibrated Dichotomous Sensitivity* (CDS) digunakan untuk uji hayati anti-mikroba. Hasil penapisan hayati menunjukkan bahwa ke-56 jenis yang diuji mengandung alkaloid dengan kadar yang berbeda-beda, kecuali satu jenis. Sebelas jenis menunjukkan aktivitas anti-mikroba berdasarkan respons uji hayati terhadap dua bakteri, *Salmonella typhi* dan *Klebsiella pneumoniae*, dan dua jamur *Candida albicans* dan *Cryptococcus neoformans*, tidak satupun dari ekstrak tanaman yang menunjukkan efek anti-mikroba terhadap bakteri *Escherichia col*i. Ekstrak *Planconella* sp. adalah yang paling aktif karena menunjukkan aktivitas terhadap tiga organisme yang berbeda (*C. albicans, C. neoformans,* dan *S. typhi*).

**Kata kunci:** penapisan biologi, masyarakat lokal, Manokwari, tumbuhan obat tradisional, Papua Barat.

## INTRODUCTION

Tropical rainforests with their high levels of diversity are considered to have great potential as a source of new drugs. The global trend of going "natural" or "green" has also contributed to the tropical rain forest being a target for such activities, combined with the added fear of forest depletion caused by logging, transmigration, and other developmental activities. Screening for biological activity using simple and fast bioassays is now being used to identify potentially useful plants. Phytochemical separations are routinely guided by bioassays which will ensure the isolation of bioactive agents irrespective of whether they belong to a certain class of compound or not.

The Manokwari tropical rainforest comprises a very rich and characteristic flora that covers more than 30,000 square kilometres of West Papua. Many of the plants in the forests have been used as traditional medicines by the local people living in the area in order to treat several tropical diseases including malaria, fever, dysentery, wounds, and fungal or bacterial infections (MacKinnon 1991). However, no phytochemical analyses of medicinal plants from the Manokwari region have been conducted.

Fungi and bacteria cause important human diseases in tropical regions, especially in immunocompromised or immunodeficient patients. Despite the existence of potent antibiotic and antifungal agents, however, resistant or multi-resistant disease strains are continuously appearing, imposing the need for continuous research for and development of new drugs (Silver and Bostian 1993). In an effort to discover new compounds, many research groups have screened plant extracts to detect secondary metabolites with relevant biological activities.

The aim of the the present study was to determine the presence of alkaloids and anti-microbial activities in extracts from selected medicinal plants from Manokwari District, West Papua, Indonesia.

## MATERIALS AND METHODS

### Collecting the samples

Samples of potentially useful plants were collected in the field from February to April 2000 in collaboration with the State University of Papua (UNIPA), Manokwari, West Papua Province, Indonesia. Specimens were collected at the same time for identification.. Samples for laboratory analysis were chosen from the plants that are used as medicine sources by traditional healers (Martin 1995). Plant parts such as leaves, fruits, flowers, bark, stems, and roots were collected for biological screening.

### Preparing and preserving the samples

Samples of fresh plant parts such as leaves, fruits, flowers, bark, stems, and roots were broken or cut into suitable sizes for transport. Plant parts such as roots and bark were chopped into pieces using clippers. All plants were air-dried before being transported to the laboratory, where they were dried in an oven at a maximum temperature of 50°C for 72 hours or more depending on the water content of the samples (Martin 1995).

### Analysis the samples

*Alkaloid screening*

The method of alkaloid testing followed the procedures of Culvenor and Fitzgerald (1963) and Frelich and Marten (1973). Seven and half gram of finely ground plant material was rapidly extracted with 75 mL of ammoniacal chloroform ($CHCl_3$). After filtration, the solution was extracted by adding 9 mL of sulphuric acid. Three milliliters of extract was then transferred to a test tube and 9 drops of silicotungstic acid added (12 g silicotungstic acid to 100 mL water). The presence of alkaloids in the extract phase was detected by the formation of a precipitate. Where the results were positive, the amount of alkaloid present was visually assessed and ranked into five classes according to the relative abundance of the precipitate (Collins et al. 1990; Barr et al. 1993).

*Anti-microbial screening*

The procedure of calibrated dichotomous sensitivity test (Bell et al. 1999) was used for the anti-microbial bioassays. In the laboratory, 2.5 g of dry finely ground plant material was grounded into a powder and then divided into samples for different mixed with 50% and 90% ethanol, and shaken for 24 hours. The extracts were filtered and left to stand for 24 hours under vacuum at 40°C. Under sterile conditions, 5 µL of extract was applied to a disc of filter paper and placed on an agar plate that had been inoculated with a single species of bacterium (*Salmonella typhi*, *Klebsiella pneumoniae,* and *Escherichia coli*) or fungus (*Candida albicans*, *Cryptococcus neoformans*), all of which are human pathogens.

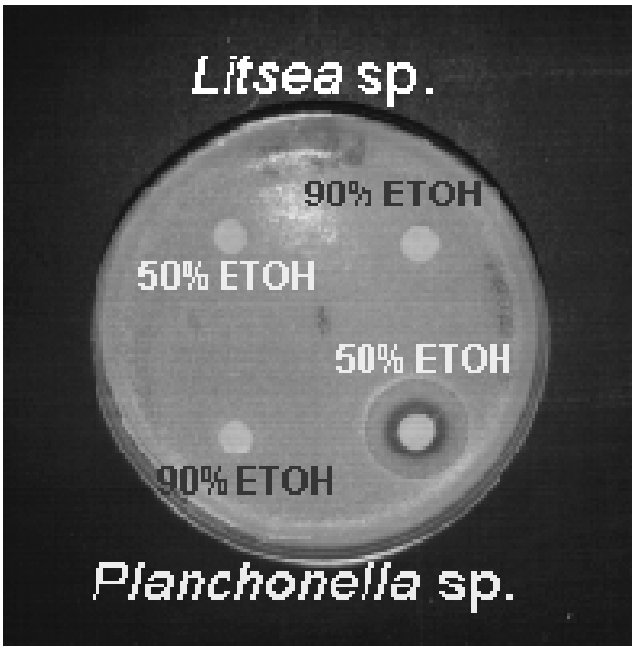


**Figure 1.** The activity of extracts of *Litsea* sp. and *Planchonella* sp. against *Candida albicans.* The filter paper discs represent the plant extracts that were extracted using 50% and 90% EtOH. The clear zone indicated the plant extract was effective against *C. albicans.*

After inoculation, inverted plates were incubated for 18-24 hours at 35°C. Inhibition of growth of the bacteria and fungi by the plant extracts was examined by measuring the diameter of the clear zone (a microbe-free circle) that might form around the impregnated filter paper disc. If the disc showed clear zones of 7 mm or more, the microbes were considered vulnerable to inhibition by the plant extract and that the plant displayed anti-microbial activity. In contrast, if the clear zone was 6 mm or less, it indicated that the microbes were resistant to the plant extract (Martin 1995). Figure 1 shows an example of agar plate used in anti-microbial activity screening. It shows that the extract of *Planchonella* sp. was effective against *C. albicans,* whereas the extracts of *Litsea* sp. showed no activity against *C. albicans.*

## RESULTS AND DISCUSSION

### Alkaloid screening

Fifty-eight ethanolic extracts of various parts of 56 plants used as traditional medicinal plants were investigated for the presence or absence of alkaloids. All but one of these (55 species; 98%) contained various levels of alkaloids (Table 1), but only six appeared to have a high level of alkaloid presence (Figure 2).

The results show a much higher percentage of plants giving a positive alkaloid response than similar studies elsewhere. For example, a survey conducted on endemic species in Tasmania, Australia, indicated only15% of the species gave a positive alkaloid reading (Bick et al. 1996). In a study on alkaloids of medicinal plants from Lombok,

**Table 1.** Manokwari medicinal plants species giving negative and positive test results for alkaloids.

| Plant species | Family | Localities | Medical conditions | Parts tested (results) |
|---|---|---|---|---|
| *Acorus calamus* L. | Araceae | Ransiki, Anggi | Dysentery | Rhizomes (++++) |
| *Adenanthera microsperma* | Mimosaceae | Manokwari | Epilepsy, diarrhoea, queasy, fever | Bark (++++) |
| *Ageratum conyzoides* | Asteraceae | Wasior, Minyambouw | Wound | Leaves (++++) |
| *Alpinia purpurata* | Zingiberaceae | Kebar, Ransiki | Earaches | Stem (+++) |
| *Alstonia scholaris* R.Br. | Apocynaceae | Ransiki, Kebar, Wasior, Manokwari | Fever, Malaria | Bark (+++++) |
| *Artocarpus communis* | Moraceae | Ransiki, Anggi, Kebar, Wasior, Merdey | Wounds, gonorrhoea | Bark (++++) |
| *Biophytum ptersianum* | Oxalidaceae | Kebar | Desire of having a child | Leaves (++++) |
| *Blumea saxatilis* | Asteraceae | Ransiki, Anggi | Cold, influenza | Leaves (+++) |
| *Calophyllum inophyllum* L. | Guttiferae | Ransiki | Irritated eyes | Leaves (++++) |
| *Canarium* sp.. | Burseraceae | Ransiki | Liver diseases | Bark (++++) |
| *Casuarina rumphiane* | Casuarinaceae | Manokwari | Malaria | Bark (++++) |
| *Coelogyne asperata* | Orchidaceae | Merdey | Chest pain | Bulb (+++) |
| *Colocasia* sp. | Araceae | Ransiki, Anggi | Childbirth | Bulb (+++) |
| *Commelina nudiflora* | Commelinaceae | Ransiki, Anggi | Dysentery | Leaves (+++) |
| *Cordyline fructiosa* | Liliaceae | Ransiki, Anggi, Minyambouw | Dysentery, irritated eyes | Leaves (+++) |
| *Costus speciosus* (Koen) Sw. | Zingiberaceae | Merdey | Ear pain, stomachaches, food poisoned | Stem (+++) |
| *Diplazium esculentum* (Retz.) Sw. | Polypodiaceae | Kebar | Headaches, wounds | Leaves (++) |
| *Disoxylon arborescens* Miq. | Meliaceae | Kebar | Malaria and strong fever | Bark (++++) |
| *Drynaria quercifolia* J.Sm | Polypodiaceae | Minyambouw | Fever, malaria | Leaves (+++) |
| *Dryopteris* sp. | Polypodiaceae | Wasior, Kebar | Snake bite | Leaves (+++) |
| *Endospermum oluccanum* | Euphorbiaceae | Ransiki | Fever | Bark (+++) |
| *Euodia* sp. | Rutaceae | Merdey | Asthma | Bark (++++) |
| *Ficus* sp. | Moraceae | Ransiki, Anggi, Kebar | Asthma | Bark (++++), Twigs (+++) |
| *Ficus* sp2. | Moraceae | Wasior | Abscess, chest pain | Leaves (+++), Roots (+++) |
| *Gigantochloa* sp. | Poaceae | Wasior | Toothaches | Outer bark (++++) |
| *Gnetum gnemon* | Gnetaceae | Merdey | New wounds | Bark(++++) |
| *Homalantus nutans* (Forst.f.) Guillemin | Euphorbiaceae | Ransiki,Anggi, Wasior, Kebar | Liver diseases | Leaves (++++) |
| *Horsfielda* sp. | Myristicaceae | Merdey | Stomachaches | Bark (+++) |
| *Instia palembanica* | Caesalpiniaceae | Merdey | Stomachaches | Bark (++) |
| *Lansium domesticum* Jack. | Meliaceae | Wasior | Dysentery | Bark (+++) |
| *Laportea interrupta* (L.) Chew. | Urticaceae | Kebar | Malaria | Leaves (+++) |
| *Litocarpus brasii* | Fagaceae | Kebar | Muscular pain | Bark (++++) |
| *Litsea* sp. | Lauraceae | Manokwari, Minyambouw | Scabies | Bark (++++) |
| *Loranthus* sp. | Loranthaceae | Merdey | Gonorrhoea | Leaves (++++) |
| *Macaranga tanariius* | Euphorbiaceae | Ransiki, Anggi,Kebar | Fever (babies) | Leaves (++++) |
| *Mucuna novaguinensis* | Fabaceae | Ransiki, Kebar | Diarrhoea, malaria, fever | Leaves (+++) |
| *Nauclea orientalis* | Rubiaceae | Minyambouw, Merdey | Easy birth | Shoot (++++) |
| *Octomeles sumatrana* Miq. | Dasticaceae | Ransiki, Anggi | Fever | Bark (++++) |
| *Palaquium* sp. | Sapotaceae | Merdey | Unspecified men sexual diseases | Bark (++++) |
| *Penthaphalaqium pachycarpum* A.C. Smith. | Clusiaceae | Ransiki, Anggi | Hinge pain | Bark (+++) |
| *Pimeliodendron amboinicum* HSK | Euporbiaceae | Ransiki, Anggi, Kebar, Merdey | Headaches, unspecified men sexual diseases | Leaves (+++) |
| *Piper* sp. | Piperaceae | Wasior, Ransiki, Anggi | Stomachaches | Leaves (+++) |
| *Pipturus repandus* (Bl). Wedd. | Urticaceae | Ransiki, Anggi, Merdey, Manokwari | Fever, diarrhoea, epilepsy | Bark (+++) |
| *Pisonia* sp. | Nyctaginaceae | Merdey | Headaches | Roots (+++) |
| *Planchonella* sp. | Sapotaceae | Merdey | Dysentery | Bark (++++) |
| *Polygonum* sp. | Polygonaceae | Wasior, Kebar | Scabies | Root (++++) |
| *Polygonum* sp. | Polygonaceae | Kebar | Dysentery | Leaves (++++) |
| *Pothos scandens* | Araceae | Merdey | Diarrhoea | Leaves (-) |
| *Pterocarpus indicus* Willd. | Papilionaceae | Kebar | Dysentery | Bark (++++) |
| *Rhaphidophora oblongifolia* Scott. | Araceae | Wasior | New wounds | Leaves (++++) |
| *Rhaphidophora pertusa* Roxb. | Araceae | Wasior, Merdey | Liver diseases, unspecified men sexual diseases | Leaves (+++) |
| *Riccinus communis* L. | Euporbiaceae | Ransiki | Malaria, decoction before delivering a baby | Leaves (++++) |
| *Schismatoglotis calyptra* Roxb. | Araceae | Kebar | Dislocated knee or arms | Leaves (+++) |
| *Scindapsus hederaceaus* | Araceae | Merdey | Colds of infants | Leaves (+++) |
| *Spathodea campanulata* | Bignoniaceae | Minyambouw | Tonic | Bark (++++) |
| *Spathoglottis* sp. | Orchidaceae | Merdey | Wounds | Bulbs (+++) |

Note: The symbol in the bracket in the last column indicate the level of alkaloids presented: (-) no alkaloid, (+) very low, (++) low, (+++) medium, (++++) medium high, and (+++++) high level of alkaloids presented.

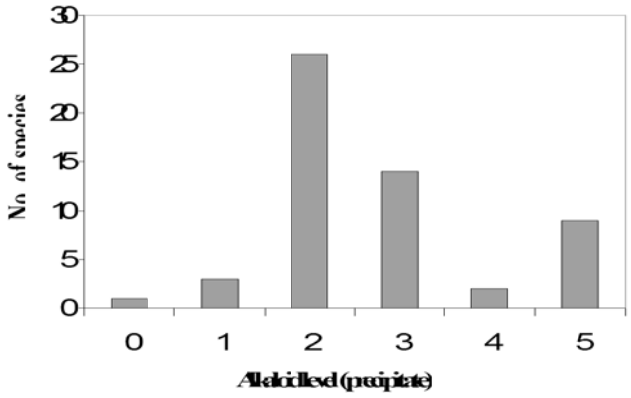


**Figure 2.** Frequency distribution of the qualitative amount of alkaloids in 56 species medicinal plants from Manokwari District giving positive tests for alkaloids (5 is high).

23% of the medicinal plants tested showed positive result for alkaloids (Hadi and Bremner 2001). In a similar alkaloid survey from Queensland, Australia, involving many tropical and sub-tropical species, 20 % of the species tested gave positive result (Hadi and Bremner 2001). In a phytochemical survey of medicinal plants in Sayap-Kinabalu Park, Sabah, Malaysia, where 60 species were tested for alkaloids, only eight species (13.3%) gave positive results (Said et al. 1998).

Some of the species tested for alkaloids have been reported to contain alkaloids and other active compounds. The rhizomes of *Acorus calamus* contain leucoantho-cyanins and 5,7-dihydroxyflavanol (Cambie and Brewis 1997). The active ingredient in *A. calamus* is b-asarone which belongs to the phenyl propanoid family (Baxter et al. 1960). The species of *A. calamus* contained the greatest amount of b-asarone (70-96%) (Streloke et al. 1989), including eugenol, methyl-eugenol, acorin, calamenol, calamene, calameone (Woodley 1991); cineole, linalol, pinene, resins, safrole and tannins are also reported (Cowan 1999).

Hadi and Bremner (2001) reported that the leaves, bark, and roots of *Alstonia scholaris* and *Ficus septica* contain unknown alkaloids. The seeds of these species are rich in hallucinogenic indole-alkaloids (alstovenine, venenatine, chlorogenine, reserpine, ditamine, echitamine) and chlorogenic acid (a mild bladder and urethra irritant, resulting in increased sensitivity of the genital region), whereas the only alkaloids present in the bark and latex are ditamine, echitamine, and echitenine.

Ming (1999) reported that *Ageratum conyzoides* contains alkaloids, mainly the pyrrolizidinic group, which suggest that it may be a good candidate for pharmacological studies. Alkaloid has been found in the species, with hepatotoxic activity including 1,2-desifropyrrolizidinic and licopsamine. Alkaloids also were found in a hexane extract of *A. conyzoides* in Africa (Wiedenfeld and Roder 1991). Menut et al. (1993) reported that this species contained high percentage of precocene 1, particularly those plants from Nigeria and Cameroon which were rich in precocene 1, while oil extracted from Vietnamese and Fijian (Suva) plants contained roughly the same amounts of both compounds. Terpenoids, steroids, flavonols, glucosides and polyoxygenated flavones have been isolated from plants from India, China, Nigeria and Northern Vietnam. Monoterpene a-pinene and eugenol have been detected in Indian plants, and α-farnesene, humulene and caryophyllene oxide have been identified in Fijian plants (Menut et al. 1993). Hormones ageratochromene and 7-methoxy-2, 2-methylchromene (precocene-1) form 60 % of the total essential oils from the flowers, leaves, and stems of a Fijian variety (Aalbersberg and Singh 1991).

The seeds of *Lansium domesticum* are known to contain an amount of an unnamed alkaloid, 1% of an alcohol-soluble resin (Morton 1987), and triterpenes (Bunyapraphatsara and Saralamp 1982). Bunyapraphatsara and Saralamp (1982) found only anti-inflammatory activity confined to the fractions containing triterpenes in seed extracts. The non-polar triterpene fraction showed systemic activity in a rat carrageenin-induced model of inflammation while the polar fractions reduced ear inflammation. The findings confirmed the efficacy of the seeds of *L. domesticum* in reducing ear inflammation (Bunyapraphatsara and Saralamp 2001).

Cowan (1999) reported that the seeds of *Ricinus communis* contained up to 3 % of the toxalbumin ricin. This is one of the most toxic substances known. They also contained alkaloid ricinine, cyanogenic glycosides, flavonoids, steroidal sapogenin, garlic acid, and potassium nitrate, and the oil is rich in ricinoleic, stearic, undecylenic acid, and ricinine (Grainge and Ahmed 1988).

Moreover, some other genera documented in this study have been reported to contain alkaloids and other compounds. The rhizomes of *Alpinia galanga* (L.) Willd., reported to contain kaempferia, galangin, a volatile oil, and galangol (which yields cineole), pinene, and eugenol (Perry 1980). The extract of stem and leaves of *Blumea balsamifera* (L.) DC. contain alkaloids and tannins flavonoids (Grainge and Ahmed 1988; Bhuiyan et al. 2009). Fruits of Piper *guineense* Schum. & Thonn. contain the amides piperine, N-iso-butyloctadeca-trans-2-trans-4-dienamide, sylvatine, α-,β-dihydropiperine and trichostachine, and *P. nigrum* has pipercide, dihydropipercide, and guineensine (Miyakado et al. 1989). The essential oil from the berries is composed of the terpenes: phellandrene, pinene, and limonene (Oliver 1986).

Said et al. (1998) reported that the leaves of *Lithocarpus confragosus* contained saponin (3+); the leaves and the bark of *Litsea elliptibacea* contained alkaloid (2+) and saponin (2+); the leaves of *Ficus hemsleyana*, *F. lepicarpa, F. rubrocuspidata,* and *F. stolonifera* contained saponin (2+, 2+, 3+, and 3+ respectively), and *Palaquium* sp. (leaves) contained saponin (3+).

**Anti-microbial activity screening**

Of the 56 plant extracts tested in an agar diffusion assay, 11 species were effective against the two gram-negative bacteria (*Klebsiella pneumoniae*, and *S. typhi*) and two fungi (*C. albicans*, *C. neoformans*) assayed.

*Planchonella* sp. was the most active species, showing activity against 3 different organisms (*C. albicans, C. neoformans,* and *S. typhi*; Table 2 and Figure 3) followed by *Adenanthera microsperma* and *Dysoxylum arborescens,*

both of which were effective in two bioassays (*C. neoformans* and *Klebsiella pneumonaniaea*). *C. neoformans* was the most susceptible of the two yeasts tested, with 7 extracts from a total of 11 extracts displaying activity against this organism. Against *C. neoformans,* the extracts from *Ficus* sp2. showed very significant inhibition (22.75 mm inhibition zone), followed by *Dysoxylum arborescens* (20.25 mm inhibition zone) and *Laportea interrupta* (17.50 mm inhibition zone). On the other hand, the extracts from *Alpinia purpurata* and *Lithocarpus brassii* showed less significant inhibition (7.5 mm inhibition zones) against *C. neoformans* and *C. albicans* respectively. None of the plant extract was effective against *Escherichia coli.*

The results of the laboratory-based anti-microbial activity screenings of plant species from Manokwari District suggested why the some traditional medicinal plants might be effective against certain medical conditions. The bark of the stem of *Planchonella* sp, *Adenanthera microsperma*, and the leaves of *Loranthus* sp. are very commonly used by the native people in Manokwari District to treat dysentery, diarrhoea, and fever. The plant extracts of these species were effective against *S. typhi* which is one of the pathogenic microbes causing fever, diarrhoea, and headaches (Wasfy et al. 2000). The use of the bark of stems of *Lithocarpus brassii* in treating ringworm has also been supported by the anti-microbial screening results. The extracts of this species were confirmed effective against *C. albicans* which is an opportunistic organism (yeast) causing an itchy rash and occurs most often in warm, moist areas, such as under the arms, between skin folds, and in the groin (Bartie et al. 2001). *Candida* also causes mouth infections, particularly in babies and elderly.

**Table 2.** Manokwari medicinal plants species giving positive tests of Anti-microbial activity against *Candida albicans* (Ca), *Cryptococcus neoformans* (Cn), *Salmonella typhi* (St), *Escherichia coli* (Ec), *Klebsiella pneumoniae* (Kp)

| Plant name | Medical conditions treated | Part tested | Diameter of inhibition zones | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 50 % EtOH | | | | | 90% EtOH | | | | |
| | | | Ca | Cn | St | Ec | Kp | Ca | Cn | St | Ec | Kp |
| *Acorus calamus* | Dysentery | Rhizomes | | 16.00 | | | | | | | | |
| *Adenanthera microsperma* | Epilepsy, diarrhoea, nausea, and fever | Bark | | | 9.00 | | | 8.17 | | | | |
| *Alpinia purpurata* | Earaches | Stem | | 7.88 | | | | | 7.50 | | | |
| *Colocasia* sp. | Childbirth | Bulbs | 8.50 | | | | | | 8.50 | | | |
| *Disoxylon arborescens* | Fever, malaria | Bark | | 20.50 | | | | | | | | 16.00 |
| *Ficus* sp2. | Eye irritation, toothaches | Leaves | | 22.70 | | | | | | | | |
| *Instia palembanica* | Dysentery | Bark | | 11.38 | | | | | 12.50 | | | |
| *Laportea interrupta* | Muscular pains | Leaves | | 17.50 | | | | | | | | |
| *Litocarpus brassii* | Ringworm | Bark | 8.13 | | | | | 7.50 | | | | |
| *Loranthus* sp. | Fever in babies | Leaves | | | 9.00 | | | | | 8.00 | | |
| *Planchonella* sp. | Dysentery, diarrhoea | Bark | 12.25 | 8.00 | 10.25 | | | | | | | |

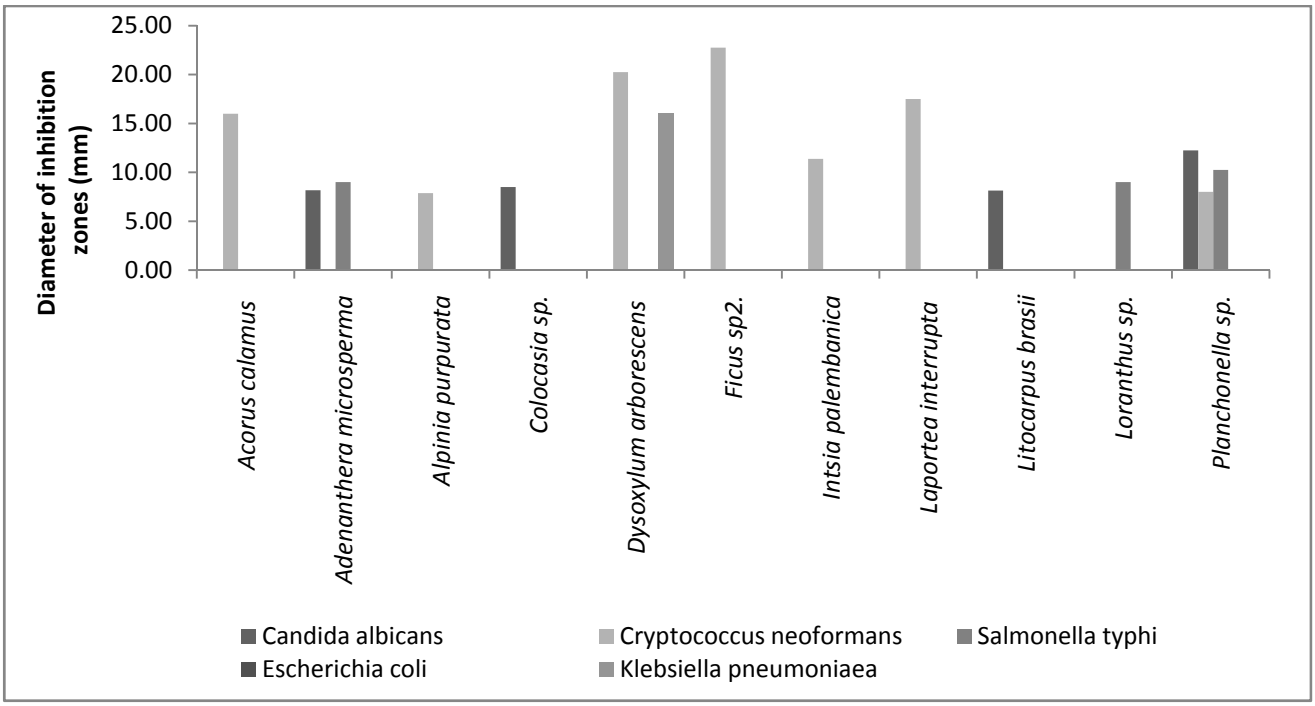


**Figure 3.** The activity of extracts of Several Manokwari medicinal plants against 5 different bioassays tested.

In addition, the anti-microbial screening indicated that the extracts of fresh leaves of the nettle *Laportea interrupta* and the bark of the stem of *Dysoxylum arborescens* were very effective against *C. neoformans* that can cause fatigue and fever (symptoms of pneumonia; Kopecka et al. 2000). This finding agrees with the use of *Laportea interrupta* and *Dysoxylum arborescens* in this region to treat muscular pains for fatigue and fever, respectively (Table 2). However there is no previous information regarding preparations of antibiotics from *Laportea* sp. to treat this pathogen, although Foster and Duke (1990) reported that it has shown antibacterial and central nervous system depressant activity.

## CONCLUSION

Initial work on Manokwari medicinal plants has resulted in fifty-six species being collected and screened for the presence of alkaloids and anti-microbial activity. Results indicated that at least 55 species of the 56 species rainforest species analysed were shown to contain different level of alkaloids. Anti-microbial activity tests indicated that 11 species were effective against three Gram-*negative (Escherichia coli, Klebsiella pneumoniae*, and *Salmonella typhi*) bacterial species and two fungi (*Candida albicans*, *Cryptococcus neoformans*). *Planconella* sp. was the most active species as it showed activity against three different organisms (*C. albicans*, *C. neoformans*, and *S. typhi*).

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