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Medicinal plants of the eastern region of Madagascar

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Abstract

Sixty-eight plants used in the traditional medicinal practices of the Betsimisaraka and Tanala peoples of the eastern region of Madagascar are reported. Preparations and utilizations of these medicinal plants are as varied as the plants themselves. Some of the plants discussed are known to science, but because of the diversity of tribal groups in Madagascar, new preparations and utilizations of these plants were discovered based on the ethnobotanical data collected from the Betsimisaraka and Tanala. Many of the plants discussed remain to be chemically tested. Ethnopharmacological information is in danger of being lost in Madagascar as slash and burn agriculture destroys much of the forest, and the elder traditional healers, often illiterate, pass away without handing down their knowledge. Copyright © 1997 Elsevier Science Ireland Ltd.

Keywords: Folk medicine; Ethnobotany; Madagascar rain forest; Traditional medicine; Pharmacology

1. Introduction

Separated from the African continent for 165 million years, Madagascar (Malagasy Republic) is home to a wealth of unique plant and animal species (De Schneidaner, 1982). Located approximately 400 km off of the coast of Mozambique in southeastern Africa, it is the fourth largest island in the world. Its population, while possessing great biological richness, is burdened by economic poverty. Due to inaccessibility and the prohibitive costs of Western medicine, the majority of the country's 13 million inhabitants depend upon traditional medicine to meet their health care needs. The expansion of knowledge of Malagasy medicinal plants, and the local production of pharmaceuticals based on the derivatives of such plants, offers an affordable alternative to Western medicine for the Malagasy people. Much of the ethnobotanical knowledge and medicinal plants in Madagascar is in danger of being lost. Increasing degradation and cultivation of secondary forest coupled with deforestation and slash and burn agriculture in primary forest is reducing the abundance of known medicinal plants, and limiting the potential for new discoveries. Furthermore, ethnobotanical information is not always passed down by word of mouth from one generation to

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the next, so the need to record and utilize the current wealth of ethnobotanical knowledge remains important for ethnopharmacological purposes.

While Madagascar had many visitors during its two millennia of human settlement, particularly the Arab traders between the 11th and 14th centuries (Dewar and Wright, 1993), the first known efforts to systematically record ethnobotanical information from the Indian Ocean Islands were made by Western researchers in the middle of the 19th century (Leclerq, 1864; Daruty, 1886). Later, ethnobotanical information specific to Madagascar was published (Lasnet, 1900a,b; Ramisray, 1901; Dandouau, 1913; Boiteau, 1937a,b). More recently, studies have focused on particular regions or plants of Madagascar, and efforts to catalog and compile previously gathered ethnobotanical information have been made (Boiteau et al., 1968; Rabesandratana, 1978; Quansah, 1988; Ratsimamanga-Urverg et al., 1991a,b,c).

Unfortunately, despite the abundance of Malagasy ethnobotanical literature, there remains a paucity of first-hand ethnological information (Quansah, 1988). A number of the earlier ethnobotanical studies were conducted without field study accompanied by the collection of voucher specimens, and much of the contemporary literature is derived from primarily laboratory-based studies. The present study, by combining the collection of voucher specimens with information gathered from interviews with traditional healers, aims to add integrated ethnobotanical research to the existing literature.

2. Methodology

Ethnomedical information was collected from August 1993 to June 1994 in two regions in eastern Madagascar: (1) the region of the Masoala Peninsula in northeastern Madagascar, including the undisturbed primary rain forests of the western side of the peninsula near Ambanizana (15°38′S, 49°95′E), as well as the disturbed habitats around Maroantsetra (15°25′S, 49°40′E) and Antalaha (14°90′S, 50°30′E); (2) the region of Ranomafana National Park (21°20′S, 47°20′E) in southeastern Madagascar, including both disturbed habitat near the village of Ranomafana and primary rain forest within and surrounding the Park (Fig. 1). Masoala and Ranomafana are inhabited by two different Malagasy tribes, the Betsimisaraka ('the many inseparables') and the Tanala ('people of the forest'), respectively. Two primary techniques were employed in the collection of ethnopharmacological data: (a) interviews were conducted with traditional healers and local residents who rely on medicinal plants for their health care in villages such as Ambanizana and Ranomafana and with local medicinal merchants in towns such as Antalaha, Maroantsetra and Fianarantsoa; b) treks were made throughout pri-

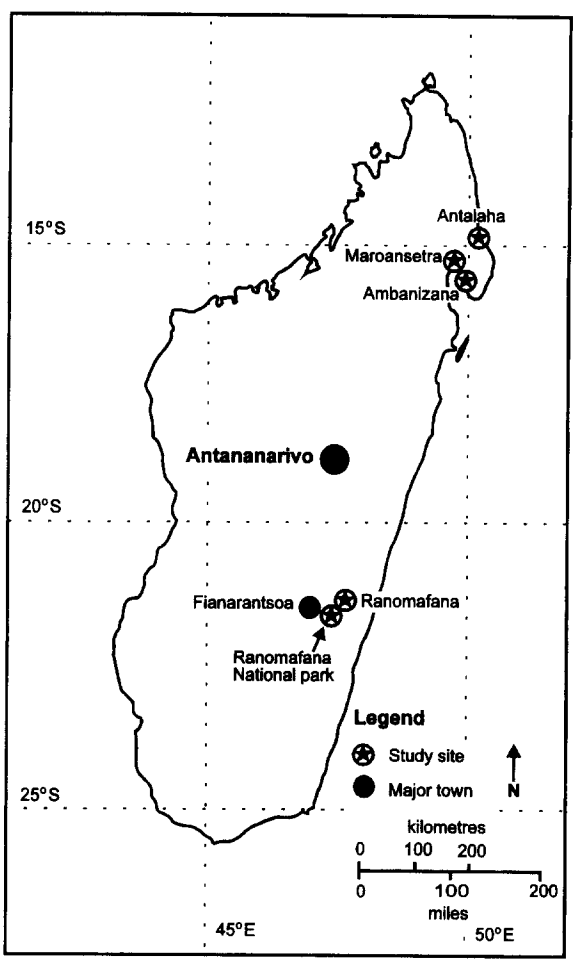

Fig. 1. The study sites where data collection took place.

mary and secondary forest with local botanists, traditional healers and villagers familiar with medicinal plant collection and usage. The preparation and utilization of the plants were discussed and recorded, and an interpreter was used to translate the local Malagasy dialects into French. The interpreter transcribed or verified Malagasy spellings for the vernacular names of collected specimens. Voucher specimens were collected, identified, and all fertile specimens were deposited at the Department of Botany, Parc Botanique et Zoologique de Tsimbazaza in Antananarivo (TAN). Finally, the PetitJean et al. (1990) database was utilized in Antananarivo. Data on the history of chemical analysis of each plant were retrieved from the database as were data pertaining to previously recorded preparations and utilizations of each collected plant. Previously recorded information was then compared with the information gathered from the present study.

3. Results

A total of 68 plant species were recorded to have medicinal use (Table 1). Of these 68 species, 50 either do not appear in the ethnobotanical literature to date or have at least one medical use that has not yet been formally documented (PetitJean et al., 1990). These newly discovered preparations and utilizations stem from the ethnomedical knowledge held among the culturally diverse Malagasy. Regionally separated cultural groups often use and prepare plants in different manners.

Thirty-four of the medicinal plants used in the study regions are species introduced to Madagascar and many are found in secondary forest or disturbed habitat, indicating that ethnobotanical practice has evolved as degradation or introduction of exotic species took place. This, however, does not minimize the ethnobotanical importance of primary forest which harbors currently utilized and potentially significant plants with medicinal properties. Rather, it illustrates that medicinal practice on the island is evolving as new species are incorporated into the ethnopharmacological system.

Of the 68 medicinal species, 39 appear to have been studied biologically and chemically, based on data in the PetitJean et al. database (PetitJean et al., 1990).

4. Discussion and conclusions

Twenty-nine of the 68 plants collected remain to be studied chemically and pharmacologically. Such studies are believed to lead to the discovery of potentially valuable pharmaceuticals. Although the other 39 have been studied and shown to have active compounds, ethnobotanical information, as presented in this study, aids scientists in honing in on the most significant properties of a given species. This was true in the discovery of the wound-healing properties of Madagascar's *Lantana camara* (Verbenaceae), a plant introduced from tropical America, which serves as the basis for a French drug, Madécasol, utilized as a cicatrizant (Gladding, 1995).

Because the native Malagasy flora is so rich and because Madagascar has a rich ethnological diversity, the amount of ethnobotanical information in Madagascar is extensive. *Dianella ensifolia* (Liliaceae), for example, is utilized differently by the Tanala and Betsimisaraka peoples. At Ranomafana, the Tanala prepare a tea from the leaves which is used against dysentery, while in Maroantsetra, the Betsimisaraka prepare a tea from the roots and stem which is used to reduce fever. Furthermore, certain plants are used for treating men (e.g. *Pachytrope dimepate*, Moraceae, is used to treat jaundice in men), while others are used exclusively for women (e.g. *Lygodium lanceolatum*, Schizaeaceae, is used to treat general fatigue in women), revealing the specificity with which medicinal plants are prescribed. Further analysis of such gender-specific plants could enhance our understanding of the different effects of various compounds on the male and female systems.

The eastern rain forests of Madagascar host a diversity of flora that begs further study. In particular, the Masoala Peninsula is an important area for further research. It remains largely unstudied due to its relatively sparse settlement and

Table 1
Medicinal plants of the eastern region of Madagascar[a]

Botanical name and family	Plant part	Preparation; Traditional use
I. LYCOPSIDA		
Lycopodiaceae		
Lycopodiella cernua[b] L. (Tanatrandraka); R (Novy 58)	LF, RT, ST	Tea; for stomach ulcers
II. FILICOPSIDA		
Schizaeaceae		
Lygodium lanceolatum[b] Desv. (Famahitra ankanga); A (Novy 82)	LF	Tea; for general fatigue in women
III. ANGIOSPERMAE		
DICOTYLEDONAE		
Aizoaceae		
Mollugo nudicaulis[b,c] Lamk. (Aferontany); M (Novy 1)	LF, RT	Tea; for malaria
Amaranthaceae		
Amaranthus spinosus[c] L. (Anampatsy); Ant (Novy 2)	RT	Tea; for nervous tension regulation, stomach ulcers liver maladies
Iresine herbstii[c] Hook. (Jean-Robert); R (Novy 3)	LF	Tea; for dysentery
Anacardiaceae		
Anacardium occidentale[b,c] L. (Voambarika, Mabibo); Ant (Novy 4)	LF, FR	Tea; for diabetes
Annonaceae		
Annona muricata[c] L. (Corossol); Ant (Novy 5)	LF	Tea; to treat heart palpitations, malaria, liver maladies
Xylopia buxifolia H. Baill. (Azoambo mandinidravina); M (Novy 6)	LF	Tea; for jaundice, weight loss
Apocynaceae		
Catharanthus trichophyllus[b,c] Baker (Pervanche); Ant (Novy 7)	LF, RT, ST	Tea; to treat liver maladies, stabilize blood composition
Caricaceae		
Carica papaya[b,c] L. (Papaya); Ant (Novy 9)	LF	Tea; for stomach ulcers
Chenopodiaceae		
Chenopodium ambrosioides[c] L. (Taimborontsiloza); R (Novy 113); Ant (Novy 10)	RT	Tea; as a vermifuge
Combretaceae		
Terminalia fatraea (Poiret) DC. (Voafàtra); M (Novy 11)	BK	Tea; for intestinal colic, indigestion
Terminaliopsis tetrandra P. Danguy (Mantadia); M (Novy 12)	BK	Tea as a wash and beverage; to treat excessive salivation, skin and mouth boils
Compositae (Asteraceae)		
Acanthospermum hispidum[c] DC. (Bakakely); Ant (Novy 16)	LF, RT, ST	Tea; for dysentery
Ageratum conyzoides[b,c] L. (Ahiboay); R (Novy 17)	LF	Juice as a coagulant
Ageratum conyzoides[b,c] L. (Fotsivoana, Hanitra-pantsaka); Ant (Novy 18)	LF	Tea; for diarrhea
Bidens pilosa[b] L. (Tsipolitra); R (Novy 19)	LF	Soup; to treat hypertension
Elephantopus scaber[b,c] L. (Ahiboka); A (Novy 20)	LF	Tea for stomach ache, indigestion; juice for fever (with dysentery)
Helichrysum faradifani[b] Sc. Ell. (Ahibalala); R (Novy 21)	LF	Tea; for malaria
Mikania scandens Willd. (Vahia); R (Novy 22)	LF	Cold tea as a wash; to treat scabies
Spilanthes acmella[b,c] Murr. (Kimotidoha); R (Novy 24)	LF	Soup; as a fortifier for infants

Table 1 (continued)

Botanical name and family	Plant part	Preparation; Traditional use
Connaraceae		
Agelaea pentagyna[b] Lamk. (Vahimainty); M (Novy 26)	WD	Tea; for spinal curvature, urine retention, general fatigue
Convolvulaceae		
Ipomoea pes-caprae (L.) R.Br. ssp. *brasiliensis* (L.) Oostrstr. (Tsomangaranto); A (Novy 27)	RT	Tea or poultice directly applied; to treat syphillis
Ipomoea pes-caprae (L.) R.Br. ssp. *brasiliensis* (L.) Oostrstr. (Tsomangaranto); M (Novy 28)	LF	Tea; for spinal curvature, backaches
Euphorbiaceae		
Denteromallotus acuminatus Pax et Hoffm. (Antevaradrano); A (Novy 31)	ST	Tea or crude material to chew; for malaria
Euphorbia hirta[b,c] L. (Tsikatsakatsa); M (Novy 32), Ant (Novy 33)	LF, RT, ST	Tea; for urine retention, spinal curvature, general fatigue
Jatropha curcas[b,c] L. (Falavelona); A (Novy 34)	LF	Tea externally applied; to treat infected wounds
Guttiferae (Clusiaceae)		
Garcinia mangostana[c] L. (Mangoustan); M (Novy 39)	LF	Tea; for stomach ulcers, liver diseases
Harungana madagascariensis[b] Lamk. (Arongana); R (Novy 40)	LF, BK	Tea; for dysentery
Harungana madagascariensis[b] Lamk. (Harongana); M (Novy 41)	BK	Tea; for jaundice
Lauraceae		
Persea gratissima[c] Gaertn. (Avacado); Ant (Novy 43)	LF	Tea; for stomach ulcers
Leguminosae (Fabaceae)		
Abrus precatorius[b,c] L. (Voamason'amboatorana); R (Novy 44)	ST	Crude material to chew; for bronchitis
Cajanus indicus[b,c] Sprengel (Amberivatry); R (Novy 45)	LF	Crushed, heated, externally applied; to treat sprains
Cassia occidentalis[b,c] Sond. (Voantsironiangatra); Ant (Novy 46)	RT	Tea; for malaria, kidney disease, fatigue
Cassia occidentalis[b,c] L. (Vantsirokonangatra); Ant (Novy 47)	RT	Tea; for indigestion, colic
Caesalpinia bonduc[b] L. (Vatolalaka); A (Novy 48)	LF, ST, SD	Tea (LF, ST) or cold drink (SD); for malaria
Mimosa pudica[c] L. (Ramirena, Fatsimandry); R (Novy 50); M (Novy 51)	LF	Tea; for urine retention, spinal curvature, general fatigue
Tamarindus indica[b,c] L. (Madiro); M (Novy 115)	LF, BK	Tea; for jaundice
Teramnus labialis[b,c] Spreng. (Teloravina); Ant (Novy 52)	LF	Tea as a wash; to treat conjunctivitis
Linaceae		
Hugonia castanea H. Bn. (Vahifotsy); M (Novy 56)	LF, WD	Tea; for general fatigue, spinal curvature
Loranthaceae		
Bakerella clavata (Desrouss.) S. Balle (Tongolahy); R (Novy 57)	LF, WD	Tea; for dysentery
Malvaceae		
Hibiscus diversifolius[c] Jacq. (Tsirangodrangobalalana); Ant (Novy 59)	LF, WD	Tea; for bronchitis, chronic coughing
Sida rhombifolia[b,c] L. (Tsindahory); R (Novy 60)	LF, RT	Juice externally applied; for abscesses
Melastomataceae		
Clidemia hirta[b,c] D. Don (Trotrobato); M (Novy 61)	LF	Juice, as a cicatrizant; tea, for common colds
Clidemia hirta[b,c] D. Don (Mazambody); R (Novy 62)	LF, RT	Tea; for stomach complaints
Meliaceae		
Melia azedarach[b] L. (Voandelaka); M (Novy 63)	LF	Juice; as a vermifuge
Menispermaceae		
Burasaia madagascariensis[b] Thouars (Azondahy); M (Novy 64)	RT	Tea; for malaria, general fatigue, spinal curvature

Table 1 (continued)

Botanical name and family	Plant part	Preparation; Traditional use
Moraceae		
Ficus megapoda[b] Bak. (Aviavy, Mandresy beravina); M (Novy 66)	LF	Tea; for jaundice
Ficus megapoda[b] Bak. (Mandresy); R (Novy 67)	LF, FR	Tea (LF); as an appetite restorer; (Fr); to treat voice loss from over-coughing
Pachytrophe dimepate[b] Bureau (Odipaso); M (Novy 68)	LF, BK	Tea; for jaundice in men
Myrsinaceae		
Maesa lanceolata[b] Forst. (Voarafy); R (Novy 70)	LF	Tea; as a memory restorer
Myrtaceae		
Psidium cattleianum[b,c] Sabine (Goavitsinahy); R (Novy 71)	LF	Juice; for dysentery
Psidium guajava[b] Berg. (Goavabe, Goavy); A (Novy 72)	LF, FR	Juice diluted in water; for dysentery
Passifloraceae		
Passiflora foetida[c] L. (Bongambosy); Ant (Novy 73)	LF	Tea; as tension regulator
Rubiaceae		
Paederia thouarsiana Baillon (Vahamantsina); M (Novy 114)	LF	Tea or juice; for liver diseases, stomach ulcers
Rutaceae		
Toddalia asiatica[b] Lamk. (Anakatsimba); R (Novy 79)	LF	Tea and steam bath, for malaria; tea, as an appetite restorer; gargle, for toothache
Sapindaceae		
Nephelium litchi[b,c] Comb. (Lychee); Ant (Novy 80)	LF	Tea; for diarrhea
Sarcolaenaceae		
Xyloolaena richardii Baill. (Voantaimbody); M (Novy 81)	BK	Tea; for anemia
Solanaceae		
Solanum auriculatum[b,c] Aiton (Sevabe); R (Novy 83)	FR	Juice externally applied; to treat cracked skin
Umbelliferae (Apiaceae)		
Centella asiatica[b] L. (Talapetraka); Ant (Novy 85)	LF	Tea or crude material to chew; for stomach ulcers
Phellolophium madagascariensis[b] Bak. (Tsileondreoaho); R (Novy 86)	LF	Tea as a wash; for scabies
Verbenaceae		
Lantana camara[b,c] L. (Radriaka); R (Novy 87)	LF	Tea as a beverage and wash; for scabies
Lantana camara[b,c] L. (Fankataviakoho); M (Novy 88)	LF	Juice, as a cicatrizant; tea, for common colds
Lantana camara[b,c] L. (Fankataviakoho); A (Novy 89)	LF, ST	Tea and steam bath; for fever and shakes
MONOCOTYLEDONAE		
Araceae		
Pothos scandens L. (Vahimitampina); M (Novy 8)	LF	Juice; as a vomit inducer, for acid stomach
Commelinaceae		
Commelina benghalensis[c] L. (Tsimativonoina); R (Novy 13)	ST	Soaked in water and externally applied; for conjunctivitis
Commelina madagascarica Clarke (Tsimativonoina); R (Novy 14)	ST	Soaked in water and externally applied; for conjunctivitis
Commelina madagascarica Clarke (Velon'ahantana); A (Novy 15)	LF, RT, ST	Tea; for fatigue, dehydration, as a vermifuge
Dioscoreaceae		
Dioscorea bulbifera[b] L. (Aranarana, Hòfika); A, (Novy 29), R (Novy 30)	LF, FR	Juice and crushed leaves externally applied; to treat abscesses, infected wounds
Flagellariaceae		
Flagellaria indica L. (Vahizô); M (Novy 36)	LF, WD	Tea; for spinal curvature, general fatigue

Table 1 (continued)

Botanical name and family	Plant part	Preparation; Traditional use
Gramineae (Poaceae)		
Eleusine indica[b] Gaertn. (Tsimpipiny); Ant (Novy 37)	LF, RT, ST	Juice and crushed leaves externally applied; to treat sprains, strained joints
Stenotaphrum dimidiatum L. (Ahipisaka); A (Novy 38)	LF	Tea; for general fatigue, dehydration
Liliaceae		
Dianella ensifolia L. (Rangazaha, Voamasonomby); M (Novy 53)	RT, ST	Tea; for persistent fever
Dianella ensifolia[b] L. (Voanananana an'ala); R (Novy 54)	LF	Tea; for dysentery
Sansevieria trifasciata[c] Prain (Folera Amandroto); M (Novy 55)	LF	Juice from heated leaves externally applied; to treat ear infections
Musaceae		
Musa paradisiaca[c] L. (Banana); R (Novy 69)	FL, FR	Tea (FL), for urinary tract maladies; gargle (burnt peel), to treat sore throat; cold beverage (burnt peel), for dysentery
Taccaceae		
Tacca leontopetaloides (L.) Kuntze (Tavolotady); M (Novy 84)	LF	Tea; for diarrhea
Zingiberaceae		
Curcuma longa[c] L. (Tamotamo); R (Novy 90)	LF	Tea; for yellow fever

[a]Malagasy vernacular name(s) are given in parentheses following the botanical name. Abbreviations for collection site follow the Malagasy vernacular name(s): R, Ranomafana; M, Maroantsetra, Masoala; A, Ambanizana, Masoala; Ant, Antalaha, Masoala. The collector and collection number of the voucher specimen is indicated within the second set of parentheses. Abbreviations used for plant parts are as follows: LF, leaves; FL, flowers; FR, fruits; SD, seeds; ST, stems; WD, wood; RT, roots; BK, bark. All preparations are taken by mouth unless otherwise specified.
[b]Plants have been studied biologically and chemically.
[c]Plants introduced to Madagascar.

the steep slopes of the montane forest on the western side of the peninsula. An understanding and documentation of ethnopharmacological-knowledge is crucial to Madagascar's progress toward improved self-sufficiency in health care and to discoveries of treatments for globally significant diseases. The current importance and potential importance of medicinal plants has been internationally recognized. The World Health Organization (WHO) initiated programs world-wide to increase the medical self-sufficiency of developing countries and to utilize the vast stores of indigenous ethnobotanical knowledge within these countries. Madagascar, with the support of WHO, established a Centre National Appliqué pour la Recherche Pharmaceutique (CNARP). The CNARP, through bioassays and structure elucidation of medicinal plants, works to develop local pharmaceuticals derived from indigenous plants.

Medicinal plants have a link with conservation. The valorization of medicinal plants, in both primary and secondary forests, may increase local incentives to preserve and manage this habitat. If income derived from domestic and international trades of medicinal plants collected from the forests is greater than potential income from cultivation, local people may choose to maintain and manage forests as sources of medicinal plants. Furthermore, agreements between local institutions and international pharmaceutical companies can be made, by which local institutions collect and process plant samples, then deliver them to the multinational companies for evaluation as prospective medicines. The developing country is paid a fee for the provision of the processed plant material, in addition to a share of royalties for each pharmaceutical derived from the samples supplied. Such an agreement was made between Merck and Company and the Instituto Nacional

de Biodiversidad in Costa Rica (INBio) in 1991 (Blum, 1993).

Furthermore, in addition to providing an alternative source of income for local populations, the sustainable harvesting of medicinal plants and the development of pharmaceuticals based on their derivatives, offer a number of benefits to a wide range of people: (1) affordable and accessible health care; (2) a potential foreign currency earner for Madagascar (currently a net importer of pharmaceuticals despite the famous rosy periwinkle, *Catharanthus roseus*, Apocynaceae, a Malagasy plant used to combat leukemia; El Sayed et al., 1983); (3) new pharmaceuticals available to the world. It is hoped that further ethnobotanical research would be conducted in the eastern region of Madagascar that would include documentation of the indigenous knowledge as well as of the botanical information (voucher herbarium specimens).

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