

## **THE PACIFIC ISLANDS: A NATURAL TREASURHOUSE OF BIORESOURCES AND ISLAND BIOTECHNOLOGY**

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**Keywords:** Biotech resource bank, biotrade initiative, medicinal plants, IPRS, women and traditional intellectual property knowledge

### **Contents**

1. Introduction
  2. The Pacific Region and Medicinal Plants
  3. Aboriginal and Maori Medicine
  4. Pacific Island Medicinal Plants and Intellectual Property Rights
  5. Safety
  6. Biodiversity trade in the contemporary Pacific
  7. Trade Considerations – Green Pharmaceuticals
  8. Gender
  9. Kava and Nonu
  10. Conclusion
- Acknowledgements  
Glossary  
Bibliography  
Biographical Sketches

### **Summary**

Traditional medicines, the mainstay of medical treatment for virtually all minor ailments in many developing countries, have been tapped for the production of new therapeutics in the sustenance of human health and well-being (see also – *Bio-Cultural Diversity and Medicine*). Vulnerable to the vicissitudes of globalization issues such as intellectual property rights, trade and gender are of relevance in the Pacific region that is a source of some unique traditional healing systems.

### **1. Introduction**

The calming remedy and the therapeutic serenity in a world of socio-cultural development in the Pacific region, and more particularly the South Pacific region, has been captured in the Pulitzer Prize-winning novel *Tales of the South Pacific* by James Michener, and in the cinematic musical *South Pacific* by Richard Rodgers and Oscar Hammerstein Jr. This region of geographical and political significance, whose strategic location has been described as the *Pacific Rim* or the *Pacific Arc*, is spread wide across some 165.384 million km<sup>2</sup> of the Pacific Ocean that is home to about 30,000 islands.

These in turn constitute some 22 countries and territories with a land surface of 550,000 km<sup>2</sup> contained in either single island states or in groups of large and small dispersed islands, and which are inhabited by a total population of some 8.5 million inhabitants.

The Pacific region, with its exclusive economic zone of 15 million km<sup>2</sup>, possesses a unique and unrivalled combination of geographically located bioresources of cultural and socioeconomic significance that today is being threatened by the novel all-encompassing waves of globalization (see also– *Inventions, Patents and Morality*). The world of medicinal plants is part and parcel of these threatened and vulnerable indigenous resources in the small island states and territories of the Pacific region.

## 2. The Pacific Region and Medicinal Plants

*Your food shall be your medicine and your medicine shall be your food.*

*Hippocrates (460-377 B.C.)*

The island states and territories of the Pacific region, collectively called Oceania<sup>1</sup>, have been grouped into three distinct socio-cultural regions (Table 1) namely, Micronesia, Melanesia and Polynesia.

<b>(a) Island States and Territories of the Pacific Region</b>		
<i>Melanesia</i>	<i>Micronesia</i>	<i>Polynesia</i>
Group of islands northeast of Australia, New Caledonia and including the independent countries of Fiji, Papua New Guinea, the Solomon Islands and Vanuatu	Group of islands east of the Philippines, the Mariana Islands, and including Palau, the Federated States of Micronesia, Marshall Islands, Kiribati and Nauru	Group of numerous islands including all of French Polynesia and the Austral Islands, the Easter and Pitcairn Islands, Wallis and Futuna and the Cook Islands, Niue, Samoa, Tuvalu and Tonga
<b>(b) Governance in the Pacific Region</b>		
<i>Independent States</i>	<i>States in Free association</i>	<i>Territories</i>
Fiji, Kiribati, Nauru, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu	Cook Islands (New Zealand); Federated States of Micronesia, Palau and the Marshall Islands (USA)	Easter Island (Chile); French Polynesia, New Caledonia, and Wallis and Futuna (France); Tokelau (New Zealand); American Samoa, Guam and Marianas (USA)

Table 1: Island States and Territories of the Pacific Region

Source: WorldAtlas.com

The World Health Organization (WHO) defines traditional medicine to include diverse

health practices, approaches, knowledge and beliefs incorporating plant, animal and/or mineral based medicines, spiritual therapies, manual techniques and exercises applied singularly or in combination to maintain well-being, as well as to treat, diagnose or prevent illnesses. This review does not attempt to cover all of traditional medicine nor all of the occurrence and use of herbal and medicinal plants in all the Pacific island states and territories. Attention has been given to activities concerning the use of herbal medicines<sup>3</sup> and medicinal plants in the Cook Islands, the Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, the Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

National activities in the larger well-developed states of Australia and New Zealand and their territories and those of Chile, France, the UK and the USA are not dealt with as these have been covered elsewhere.

The Pacific region enjoys widespread geographic and geological diversity in terrestrial and marine environments. Naturally endowed with a biodiversity of endemic, rare, endangered and threatened species this valuable bioresource is constantly at risk of irreparable loss resulting from exposure to the growth and expansion of the tourist industry that is in search of newer havens conducive to corporal and mental relaxation. Fragile and valuable natural ecosystems in these Pacific island states are susceptible to imminent disruption and destruction. Furthermore, several island states on account of their small size, limited natural resources of economic significance and geographical isolation have a limited range of options in overcoming their vulnerability in a worldwide market-oriented economy. Of economic significance for the sustenance and development of several Pacific island communities, traditional intellectual property concerning medicinal plant resources is being tapped for use in emerging new markets as an alternative to the rising costs of commercialized healthcare and globalizing market-economy pressures.

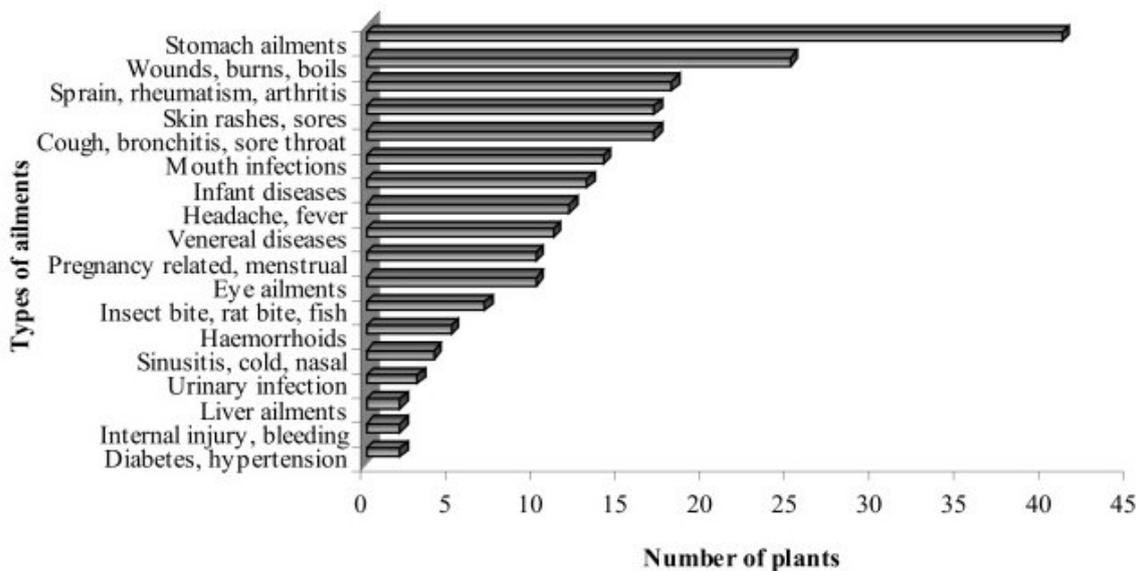


Figure 1: Number of plants used in the Pacific region in treatment of different ailments

TIP or traditional knowledge has been accumulated through the experiences of self-taught village practitioners and observations of rural users of medicinal plants in past and present generations. Today this intellectual property, often described as traditional knowledge, is an active contributor to the understanding of current day cultural heritage and societal practices concerning the conservation of health and human resources through the use of medicinal plants (Figure 1).

Management and use of traditional medicinal plants for sustenance of human health resources and technical development in these islands result from such *folklore science*. Indigenous and traditional knowledge - in itself a precious and priceless heritage – which, akin to that witnessed with fermented foods, has been transmitted orally or through sketch work from generation to generation on a familial and tribal basis (see also– *Conventional Plant Breeding for Higher Yields and Pest Resistance*).

Humankind since time immemorial has depended upon plants as a source of food and medicine for their well-being, shelter, protection and survival against climatic forces and changing environments. Thus, entrepreneurial rural and village cultures worldwide constitute a rich source for anthropological, botanical, ecological research vis-à-vis the search for new drugs, foods, pesticides, natural products, etc. to meet the demands of the age of global consumerism.

Like the Asian and the Caribbean regions, the Pacific region is rich in traditional medicinal knowledge that has been accumulated for use over a span of some 3000 years. Home to a large number of varied cultural and ethnic groups, the Pacific islands possess a wealth of bioresources. Micronesia, Melanesia and Polynesia are acknowledged treasure houses of traditional medicine and domesticated medicinal skills (Figure 1). Folk medicine in Tonga has been used in rural areas for obstetric and gynecological conditions and disorders..

Medicinal applications and decoctions refined and ‘*standardized*’ through repeated domestic use have contributed to the development of self-sustaining traditional healthcare systems in the conservation of early and contemporary human health resources in the Pacific region. (Table 2). Moreover, resort is being to use the medicinal plants as nutraceuticals and dermaceuticals in light of the rising costs of allopathic medicine in contemporary healthcare systems in developed societies.

Traditional medicine in the Pacific region, having evolved from the applications of a wide range of medicinal plants, is a much coveted heritage whose preciousness has been fiercely guarded and secretly preserved by family and tribal descendents (see also – *Bio-Cultural Diversity and Medicine*). Some methods of treatment and preparation of medicines are generally known whereas other techniques and accompanying knowledge are not as they are integral components of the cultural heritage and intellectual property of communal healers and tribal island practitioners.

Moreover, such heritage and property is the *raison d’être* of their livelihoods and an indisputable factor for their self-sustaining existence. Notwithstanding the attraction, the introduction, and efficiency of modern medicine, many Pacific island communities are unwilling to forego their confidence, cultural customs and reliance in relation to their

traditional medicines that have contributed to their healthcare for decades through use of one or more parts of one or more medicinal plants (Figure 2).

Botanical Name	Local Name ( <i>in italics</i> ) in Pacific Island States	Plant Part(s) used	Medicinal Uses	Pacific island countries
<b>FLOWERING PLANTS: DICOTYLEDONS</b>				
<b>ACANTHACEAE</b>				
<i>Blechnum brownie</i>	Yap - <i>malai</i> (island of Federated States of Micronesia (FSM))	Stem, Leaves	Sap squeezed out from stems and leaves is applied to framboesia lesions of the body part that is wrapped in a poultice leaf of <i>Morinda citrifolia</i>	FSM
<b>AMARANTHACEAE</b>				
<i>Achyranthes aspera</i>	Ifaluk- <i>gogo</i> , Satawal- <i>eeg'gohu</i> , Ulithi - <i>koi</i> , Woleai - <i>gugu</i> (islands of FSM); Samoa - <i>tamatama</i> ; Tonga - <i>tamatama</i>	Leaves	Juice from leaves dripped onto wounds to prevent tetanus, and to help heal sub-incision wounds	FSM, Samoa, Tonga
<b>ANACARDIACEAE</b>				
<i>Mangifera indica</i>	Kiribati - <i>te mangko</i> ; Yap - <i>manga</i> (island of FSM); Samoa - <i>mago</i>	Bark, Leaves	Bark infusion used to treat mouth infections in children; fruits are rich source of vitamins A and C	Widespread in most Pacific Islands
<i>Spondias dulcis</i>	Cook Islands - <i>vi</i> ; Fiji - <i>wi</i> ; Samoa and Tonga - <i>vi</i>	Bark, Leaves	Bark infusion used to treat stomach ache and diarrhoea, leaf infusion used as drip in	Fiji, Samoa, Tonga

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[The Pacific region is a natural treasury of a wealth of bioresources and island biotechnology. numerous cultures such as those of the Aborigines and the Maoris constitute a resource base of alternative and traditional plant-based medicines--see 11(a) and 11(b) below].

**11a Articles from Books and Journals** [Aspects of traditional medicines, the mainstay of medical treatment for virtually all minor ailments in many developing countries, have been tapped for the production of new therapeutics in the sustenance of human health and well-being of the peoples of the small Pacific islands. Vulnerable to the vicissitudes of natural disasters and climate change these islands are also confronted by contemporary globalization issues such as intellectual property rights, trade and gender are of relevance in the Pacific region - list of books and journals cited in 11a and webpages 11b]

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### Biographical Sketches

**Edgar DaSilva**, a graduate of the University of Bombay in microbiology and chemistry, was awarded, in 1962, the Bachelor of Science Degree (First Class with Honours). In 1966, he obtained the Master of Science Degree, and in 1969 his Doctoral Degree for research studies on the cyanobacteria. As a NORAD Fellow, his research study, on the marine algae at the Norwegian Seaweed Research Institute, Trondheim, Norway, in 1970, was followed by a teaching assignment at the University of Helsinki, Helsinki, Finland. Two years later, he joined the Institute of Physiology, University of Uppsala, Uppsala, Sweden as a UNESCO fellow. He is a former Vice-President of the World Federation for Culture Collections (WFCC), author of several scientific publications, and member of well-known microbiological societies. Moreover, he has also been a keynote plenary speaker at several international events in, Argentina, China,

Kuwait, Nigeria, South Africa, Sweden, Thailand, USA, etc. on biopolicy issues in regional co-operation, microbiological education, and on globalization and sustainable development.

At UNESCO since 1974 in various capacities within the Division of Scientific Research and Higher Education and the Division of the Basic Science Dr. DaSilva has been instrumental in the planning and implementation of several UNESCO regional and international programmes in applied microbiology as well as in the development of the global networks dealing with management and use of microbial resources and training opportunities in the fields of marine and plant biotechnology. Moreover he mobilized several extrabudgetary programmes in close cooperation with UNEP and UNDP and Donor Member States for activities in national development in biotechnology and regional cooperation in microbiology.

He also was the Director, Division of Life Sciences that was subsequently transformed into a Section of the Life Sciences within a new Division of the Basic and Engineering Sciences prior to his retirement from UNESCO.

Currently Dr. DaSilva has had teaching assignments as Visiting Professor at the International Centre for Biotechnology (ICBiotech) in Osaka University and its outreach station, and teaching assignments at the UFS, and at the Outreach station of ICBiotech at Mahidol University, Thailand and at the University of the Free State, Republic of South Africa.

A fellow of the World Academy of Art and Science and following a keynote lecture to the Biotechnology Division of the Royal Swedish Academy of Engineering Sciences and the Biofocus Foundation, Dr. DaSilva was awarded the Biopolicy Award in 2003.

**Dr. Murukesan Krishnapalli** currently holds the position of Agricultural researcher with the College of Micronesia USDA Land Grant Programs at Yap Island Campus. He possesses a Ph.D. in Plant Science and PG Diploma in Environmental Education and Management besides an International Certificate in ISO 14001 Environmental Management System internal auditing. He worked for environment related projects in New Zealand, Sweden and Seychelles and with the Gujarat Ecology Commission in the World Bank funded Biodiversity Project. Current research interests are on agrobiodiversity conservation, simplified home hydroponics gardens, enhanced production of giant swamp taro through the elimination of burrowing nematodes and groundwater quality studies in Yap islands.