ETHNOPHARMACOLOGICAL STUDY OF SALT MARSH PLANTS FROM MUTHUKADU BACKWATERS

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INTRODUCTION

Salt marshes form in sheltered coastal areas where sediments accumulate and allow growth of angiosperm plants (Pennings & Bertness 2001) that comprise the foundation of the ecosystem. Salt marshes develop between terrestrial and marine environments, resulting in biologically diverse communities adapted for harsh environmental conditions including desiccation, flooding, and extreme temperature and salinity fluctuations. Marshes act as nurseries to a wide variety of organisms, some of which are notably threatened or marketed as important fisheries species.

Rapid growth of marsh vegetation and utilization of incoming nutrients make salt marshes highly productive systems, often yielding 2 kg of aboveground production per square meter, annually (Marinucci 1982, Dame 1989). In addition to providing habitat and food sources for many organisms, salt marshes benefit humans and surrounding ecosystems by sheltering coasts from erosion and filtering nutrients and sediments from the water column.

Salinity in salt marshes is highly variable because of the influx of both fresh and saltwater into the environment. Freshwater enters upland marsh areas from terrestrial streams and rivers, increasing during periods of high precipitation. Saltwater inundates marshes during high tides, with dry seasons and high evaporation further increasing salinity. Salinity gradients caused by these processes contribute to zonation in marsh plants based on salt tolerance among species.

Most angiosperms have a limited ability to thrive in saline waters, and diversity of vegetation decreases with increasing salinity (Odum 1988, Odum & Hoover 1988). Seeds and seedlings are especially vulnerable to salt stress, further contributing to zonation in plants. However, many salt marsh plants have developed mechanisms to tolerate high salinities. Some plants increase succulence by retaining water or exclude salt at the roots, while

others excrete salt through specialized glands or sequester it into leaves that are shed periodically (Poljakoff- Mayer, 1975, Rozema et.al., 1981, Hacker and Bertness,1995, Mitch and Gosselink, 1995, Dawes, 1998)

Since very old times, herbal medications have been used for relief of symptoms of disease [Maqsood, et.al., 2010]. Despite the great advances observed in modern medicine in recent decades, plants still make an important contribution to health care. Much interest, in medicinal plants however, emanates from their long use in folk medicines as well as their prophylactic properties, especially in developing countries. Large number of medicinal plants has been investigated for their antioxidant properties. Natural antioxidants either in the form of raw extracts or their chemical constituents are very effective to prevent the destructive processes caused by oxidative stress [Zengin, 2011]. Although the toxicity profile of most medicinal plants have not been thoroughly evaluated, it is generally accepted that medicines derived from plant products are safer than their synthetic counterparts [Vongtau, *et.al.,* 2005 and Oluyemi, *et.al.,* 2005].

A large proportion of the human population depends on traditional medicine. Medicinal plants have become the focus of intense study recently in terms of conservation and as to whether their traditional uses are supported by actual pharmacological effects or merely based on folklore. With the increasing acceptance of traditional medicine as an alternative form of health care, the screening or medicinal plant for active compound is very important. The situation is alarming in developing as well as developed countries due to in discriminate use of antibiotics. The drugresistant bacteria and fungal pathogens have further complicated the treatment of infectious diseases in immune compromised, AIDS and cancer patients [Diamond, 1993]. It is likely that plant extract showing target sites other than those used by antibiotics will be active against drug-resistant microbial pathogen. However, very little information is available on such activity of medicinal plants (Lee, *et al.*, 1998).

Plants, as the source of medicine, have been playing an important role in the health services around the globe [Thomson, 2010]. About three quarters of the world's population relies on plant and their extracts for health care [Kunwar and Bussmann, 2008]. A good number of our population particularly those living in rural areas depend largely on herbal remedies for the treatment of different types of diseases. It indicates the importance of the individual plants in the health care system.

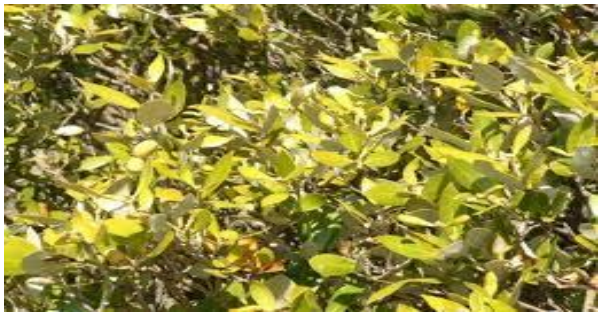
Ethnopharmacology can be defined as the interdisciplinary scientific exploration of biologically active agents traditionally employed or observed by man [Holmstedt, 1995]. Its objectives are to rescue and document an important cultural heritage as well as evaluate the agents employed [Holmstedt, and Bruhn, 1995]. One common approach in this field is a literature search using several published genetic resources. The application of new bioinformatics database systems about herbal texts holds great promise for identifying novel bioactive compounds for pharmacotherapy [Buenz, *et.al.,* 2004]. Some International Databases, such as Natural Products Alert (http://w-ww.napralert.org/Default.aspx), provide information about pharmacological activities, ethnopharmacological data, chemical compounds and data from tests on

animals and humans for thousand of species from all over the world. Phyto chemistry can contribute to the synthesis of new drugs with therapeutic properties [Naranzo, 1995]. Nature provides enormous potential for the discovery of new bioactive compounds; at least a million different compounds could be isolated [Verpoorte, 1998].

For a long period of time in history, plants have been valuable and indispensable sources of natural products for the health of human beings and they have a great potential for producing new drugs (Nascimento, 2008; Littleton, 2005). Even today people who live near to the forests use plant products to cure chronic diseases. Tropical and subtropical areas of the world are bestowed with abundant flora and herbs which have untapped properties, such as antimicrobial, antiviral and antifungal. According to the World Health Organization, plants are a source of compounds that have the ability to combat disease, antimicrobial, antiviral and antifungal activities (Gazim, 2008). In addition, medicinal plants have been used for centuries as remedies for human ailments and diseases because they contain components of therapeutic value (Panda, 2009). Also they are less toxic to humans and environmentally friendly due to fewer pollutants produced in production and have minimal health hazards (Opra and Wokocha, 2008). However literature related to the ethno-medicinal importance of salt marsh plants are scarce, knowledge of the chemical constituents of plants is desirable, not only for the discovery of therapeutic agents, but also because such information may be of value in disclosing new sources of such economic materials as tannins, oils, gums, precursors for the synthesis of complex chemical substances, etc. In addition, the knowledge of the chemical constituents of plants would further be valuable in discovering the actual value of folkloric remedies (Farnsworth, 1966).

The aim of the study is to elaborate the ethnopharmacology of salt marsh plants in this case, 6 variety of plants (*Avicinnea marinus, Aviccinia officinalis, Sessuvium prostracastrulam, Saligornia branchiate, Suaeda maritime, and Suaeda monoica*) found in the shore of Muthukadu back waters,Tamil Nadu.

AVICENNIA MARINA



Scientific Name: *Avicennia marina* (Forrsk.)Vierh
Synonym: Sceura marina Forssk
Local Name: Qurm, Gurm
Arabic Name(s): Shorah, Qurm, Mangrove

Common name: Mangrove, Grey mangrove,Tivar
Family: Avicenniaceae (Verbenaceae)

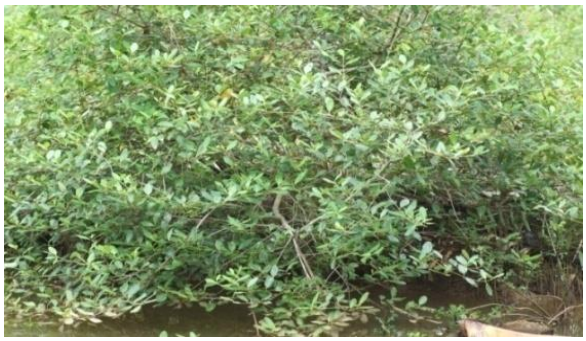
Description of the Plant:

Small evergreen tree, up to 10m high, stem erect with fine pale gray scales. Leaves simple leathery, opposite, ovate, petiolate with entire margin and acute tip, dark glossy green on the upper surface, dull greyish on the lower surface with excreted salt crystals. As *Avicennia* is growing in a specialized habitat, which is poorly aerated, it is adapted to life in this habitat by the presence of erect leafless outgrowths of the roots called pneumatophores or breathing roots up to 50 cm long, they stick out above water and absorb air, which thought to oxygenate the roots.

Action:

Bark astringent and used as aphrodisiac, for scabies, antifertlity agent and has tanning properties. Flowers for perfumes. Leaves are aphrodisiac and used for toothache, Leaves and seeds forage for camels and animals.

AVICINNEIA OFFICINALIS

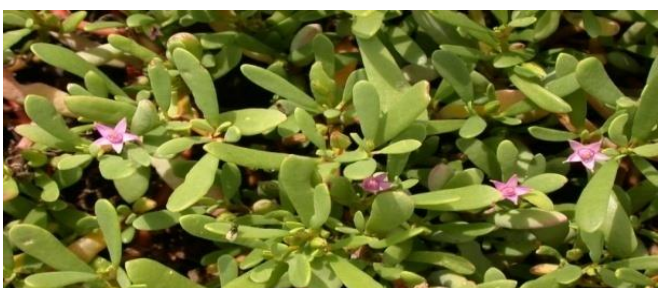


Family- Avicenniaceae
Habitat- This species is found in Bangladesh, India, Indonesia, Malaysia, Brunei, Myanmar, Philippines, Singapore, Sri Lanka, Thailand, Viet Nam, and southern Papua New Guinea
English- Grey Mangrove, White Mangrove
Folk: Kanna (Tamil), Tavarian (Gujarat), Orayi (Malayalam)
Description of the plants:

The flower, the largest among the *Avicennia* species has a diameter of 6 to 10 mm when expanded. It is orange yellow to lemon yellow in color.

Action- Fruits are plastered on to boils and tumours, poultice of unripe seed stop inflammation, roots used for its aphrodisiac, bark is used to treat skin problems especially scabies, resin for snake bite and contraceptive by women, seed for ulcers. This plant contains pentacyclic triterpenoids such as lupeol, betulin, betulinaldehyde, betulinicacid, beta-sitosterol and Iridoid glucosides having c-11 carboxylic acidgroup were also present and other compounds present are flavanoids ,alkaloid, steroids, tannins, wax esters are the most considerable compounds.

SESUVIUM PORTULACASTRUM



Family: Aizoaceae
Habitat: Coastal dunes and beaches, Worldwide in Tropical and Subtropical regions.
English: Sea Purslane, Shoreline Purslane
Folk: Dhapa, Orputu, Vancaravacci, Vangaredukura, Jadu palang
Description of Plant: *Sesuvium portulacastrum* is a sprawling perennial herb up to 30 centimetres (12 in) high, with thick, smooth stems up to 1 metre (3.3 ft) long. It has smooth, fleshy, glossy green leaves that are linear or lanceolate, from 10–70 millimetres (0.39–2.76 in) long and 2–15 millimetres (0.079–0.591 in) wide. Flowers are pink or purple.
Action:

It has been utilize for the treatment of epilepsy, conjunctivitis, dermatitis, haematuria, leprosy and purgative, toothache and also as antimicrobial agent. Extract of this plant and the essential oil from the fresh leaves of S. portulacastrum showed antibacterial, antifungal as well as antioxidant activity. The ethanolic extract of the medicinal plant S. portulacastrum showed potential against the causative agents and pathogens related to various gastrointestinal disorders leading to indigestion, dysentery, and diarrhoea. Moreover the ethanolic extract of the medicinal plant S.portulacastrum showed potential against the causative agents of nosocomial infections, Staphylococcus aureus and E. coli.

SUAEDA MARITIMA

Family: Amaranthaceae
Folk: Sawad, Umiri in Pitchvaram, Mattaumiri in Muthupet, Tamil nadu
English: Common Sea Blite, Shrubby Sea Blite
Habitat: It is the shrub with continuous unjoined stems found in western region of Saudi Arabia [Youseef,*et.al.*, 2009]. Both in the Pichavaram and the Muthupet mangroves Suaeda maritima can be seen growing as monospecific patches in large areas in coup felled areas.
Action:

The juice of this herb is used for treatment of liver diseases by Arab practitioners [Patra, et.al., 2011]. The leaves are also used as remedy for liver, heart, and lipid disorders [Lin, *et.al.*, 2008]. The ethanolic extracts of S. maritima leaves significantly attenuated concanavalin (a hepatotoxin) induced biochemical (serum AST, ALT, APT, and bilirubin) and histopathological changes in liver [Ravikumar, *et.al.*, 2011]. The extract of plant also showed significant antioxidant, anti-inflammatory, antiviral, and antibacterial activities [Ravikumar, *et.al.*, 2011 and Singh, et.al., 2013]which may contribute to its hepatoprotective activity. It is nontoxic edible plant which is used in salad and as fodder for animals. The LD_{50} of ethanolic extract of S. maritima in rats was found to be 3 g/kg b.w. [Ravikumar, *et.al.*, 2011]. Phytochemical studies on plant of S. maritima showed the presence of alkaloid, flavonoid, sterols, phenolic compounds, and tannins [Singh, *et.al.*, 2013] .

SUEADA MONOICA

Family: (Chenopodiacea)
Habitat: is a salt marsh mangrove herb similar to *Suaeda maritima* (L). Dumort in appearance, growing in hypersaline soils. It is distributed throughout the East west coast mangroves in India *viz.*, Sunderbans in West Bengal state, Bitharkanika and Mahnadhi in Orissa state, Coringa, Godavari and Krishna in Andhra Pradesh State, Pichavaram, Muthukadu, Karangadu and Muthupet in Tamil Nadu state.
Folk: Vellaikirai (or) Nilavumari (seaside Indian salt wort).
Description of Plant: It is a shrub but much smaller in size (0.3-0.7mm in length) when compared to *Suaeda maritima*. Leaves simple, succulent, linear, young twigs are slender ribbed.
Action:

The leaves have been used as edible green leaves. The ash obtained from burnt plant parts have been exported without knowing the purpose. Traditionally, the leaf from *Suaeda monoica* is known to use as a medicine for hepatitis [Bandarnayake, 1998] and scientifically it is reported to be used as ointment for wounds [Padmakumar and Ayyakannu, 1992] and possess antiviral activity [Premanathan, et.al., 1992] because of the presence of triterpenoids, sterols [Ghosh, et.al., 1985 and Subramanya, et.al., 1992]. The present attempt has been made to find out the hepatoprotective evaluation of crude ethanolic extract from leaves of *S. monoica* for possible development of hepatoprotective herbal medicine.

SALICORNIA BRACHIATA

Family: Chenopodiaceae
Habitat: Throughout India, Sunderbans, Pichavaram and Mudhupet and in Sri Lanka - Jaffna, Hambantota and Kirinda.
Folk: Kozhikal in Pichavaram, Pavazhappoondu in Muthupet, Batura, Katula, Kattu Umari
Description of plant:

Herb, head erect or decumbent of about 20 to 45 cm high. Stems succulent and much branched. Each segment of the stem from a lette cup at the apex. The "cup" has short teeth covering the base of the next segment. Fruits utricle, ovoid, membranous, enclosed in spongy perianth; seed pale brown, hispid with white hairs.

Action:

Ash of this plant is used to cure itches and the leaf and stem extracts are used for treating hepatitis. The extracts of leaf of *S. brachiata* showed potent antioxidant activity. The plants rich in tannins have significant activity in cancer prevention and are used in treating intestinal disorders. Flavonoids are known to possess a wide range of biological activities such as antioxidant, antimicrobial, anti-inflammatory and anticancer activities. Several species of Salicornia possess antibacterial and antihypertensive properties and are quoted in folk medicine for relief of toothache and chronic rheumatism (Rizk, 1986), constipation, obesity, diabetes and cancer.(Park, 2000 and Deepa *et.al.*, 2013)

BIOACTIVE COMPOUNDS FROM MANGROVES

The common chemical constituents present in the mangroves are aliphatic alcohols and acids, amino acids, alkaloids, carbohydrates, carotenoids, hydrocarbons, free fatty acids including polyunsaturated fatty acids, lipids, pheromones, phorbol esters, phenolics and related compounds, steroids, triterpenes and their glycosides, tannins and other terpenes [Revathy, et.al., 2013]. Even though several chemical studies have been conducted on mangrove plants, reports pertaining to their activity-structure relationship are very few. Some common salty marsh plants found in tropical and sub tropical regions, their traditional uses, general chemical constituents, *in virto* bioactivity etc are given in Table 1.

Table 1: Common mangroves with *in vitro* bioactivity

S.No	**Mangroves**	**Traditional uses**	**General Chemical composition**	***In vitro* activity**	***Reference***
1.	***Avicennia***	cure for skin diseases	terpenoids,	cytotoxic	Fauvel et.al.,

	marina		steroids naphthalene derivatives, flavones, glucosides	antibacterial antifungal antioxidant	1993 Gurudeeban, et.al., 2012 Han L, Huang XS, 2008 Feng Y et.al., 2006
2.	***Avicennia officinalis***	aphrodisiac, diuretic, cure for hepatitis, leprosy,	arsenic, alkaloids, saponins, tannins, tri terpenoids	antibacterial anti-ulcer	Bandaranayake, 2002 Sharma and Garg, 1996
3.	***Suaeda maritima***	Cure for hepatitis Immunity booster	carbohydrate, alkaloids, glycosides, flavonoids sterols, phenolic and tannins compounds.	antiviral, antibacterial activity, anti-inflammatory and antioxidant	Patra et.al., 2011 Singh et.al., 2013 Bandaranayake, 1998 Ravikumar, et.al., 2011
4.	***Sesuvium portulacastrum***	remedy for fever, kidney disorders ,scurvy and in the treatment of various infections,hepatoprotecti ve activities, epilepsy, conjunctivitis, dermatitis, haematuria, leprosy and purgative, toothache	saponins, alkaloids, polyphenols, terpenoids	antibacterial and anticandidal activities and moderate antifungal activity. Antioxidant, to treat various gastrointestinal disorders leading to indigestion, dysentery, and diarrhoea, fights against nosocomial infections	Kokpal, et.al., 1990 Robert and Frank, 1997 Michael, et.al., 2006 Chandrasekaran et.al., 2011
5.	***Suaeda monoica***	medicine for hepatitis, ointment for wounds and possess antiviral activity	triterpenoids and sterols, saponins, phenols, alkaloids	antiviral activity, anti-bacterial, anti-inflammatory, anti-oxidant	Bndarnayake, 1998 Padmakumar and Ayyakannu, 1992

					Premanathan, et.al., 1992 Ravikumar, et.al., 2010
6.	***Saligornia branchiata***	to treat itches	High amount of phenols and flavonoids,	Antibacterial, antiallergic, anti-inflammatory, antimicrobial, antiviral, antioxidant, oestrogenic, enzyme inhibition, vascular and cytotoxic antitumour activity	Kathiresan, et.al., 2001 Ravindran, et.al., 2005 Manikandan, et.al., 2005 Stanley, 2008

DISCUSSION

From this review study, it is clear that the medicinal plants play a significant role against on various diseases. Different medicinal herbs and plants extracts have potent hepatoprotective activity in various animal models. The hepatoprotective activity is probably due to the presence of flavonoids, phenolic compounds, polyphenols etc in all few herbal plants. The results of this study indicate that extracts of leaves and plants extracts of some medicinal plant have good potentials for use in hepatic disease.

CONCLUSION

A phytotherapeutic approach to modern drug development can provide many invaluable drugs from traditional medicinal plants. Search for pure phytochemicals as drugs is time consuming and expensive. Numerous plants and polyherbal formulations are used for the treatment of liver diseases. However, in most of the severe cases, the treatments are not satisfactory. Although experimental evaluations were carried out on a good number of these plants and formulations, the studies were mostly incomplete and insufficient. The therapeutic values were tested against a few chemicals-induced subclinical levels of liver damages in rodents. Development of such medicines with standards of safety and efficacy can revitalize treatment of liver disorders and hepatoprotective activity.

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