ISSN: 2457-0761

JBC-APRF-4(2): 328-328, 2020

JOURNAL OF BIODIVERSITY AND CONSERVATION

Wetland flora of Odisha against skin infections

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ARTICLE INFO

Article History

Received: 23 March 2020

Received in revised form: 18 May 2020

Accepted: 25 May 2020

Keywords: Wetland flora, Skin infection, Traditional therapeutic practices, Community conservation

ABSTRACT

Skin infections are very common throughout the world and from primitive, plants are used against them. Among the plant wealth, wetland floras are neglected and overlooked. They play a vital role in ecological balance and provide food and medicines. Keeping this in view, an attempt has been made to document the traditionally used wetland floras against skin infections and validated scientifically through phytochemistry. A survey was made during October 2019-February 2020 in selected areas of Odisha. Results revealed that 50 plants were enumerated which are used to treat various types of skin infection. Enumerated plants are photographed and collected for experimental work and phytochemical analysis showed the presence of responsible bioactive compounds in them for curative properties against skin infections. Present study highlights the importance of wetland flora and brings attention towards their value additions & community conservation.

INTRODUCTION

Skin diseases are one of the common infections affecting people worldwide from ancient times. Micro-organisms responsible for skin infections might be bacteria, fungi, parasite and virus (Jagtap et al., 2010; Panda et al., 2016). Human skin is the largest organ and covers the outer part of the body. It constitutes the first line defense of our body (Tabassum and Hamdani 2014). It is divided into 3 main layers (epidermis, dermis & hypodermis). The skin infection is a common ailment and it affects all ages

from the infant to the elderly and cause harm in number of ways. Five most common types of skin infection are (**Figure 1**).

Rashes: It is an area of red and inflamed skin caused by allergies, reactions, and medications such as acne, dermatitis, eczema, hives, *Pityriasis rosea* and psoriasis (Tabassum and Hamdani 2014).

Viral infections: Viral infections are a multiplying of a harmful virus inside the body and create infections like *Herpes simplex, Shingles (herpes zoster) warts, Chicken pox* & *Measles* (Tabassum and Hamdani 2014).

Bacterial infections: A bacterial infection is a proliferation of a harmful strain of bacteria on or inside the body. The most common type is *Staphylococci* and *Streptococci* (Tabassum and Hamdani 2014). Epidermal infections caused by *Staphylococcus aureus* and *Staphylococcus pyogenes* include Impetigo and Ecthyma. A dermal infection consists of erysipelas, cellulitis, necrotizing fasciitis (Chiller et al. 2001), Impel folliculitis, Cellulitis and Lyme disease (Tabassum and Hamdani 2014).

Fungal infections: These type of infections are caused by fungi and it is most likely to develop in damp areas of the body such as feet and armpit like Athlete's foot, Lock itch and Ringworm (Tabassum and Hamdani 2014).

Infections by parasite: These types of infection are caused by a parasite. These infections can spread beyond the skin to the blood stream and organ. These infections occur after exposure to parasites such as lice and scabies (Tabassum and Hamdani 2014).

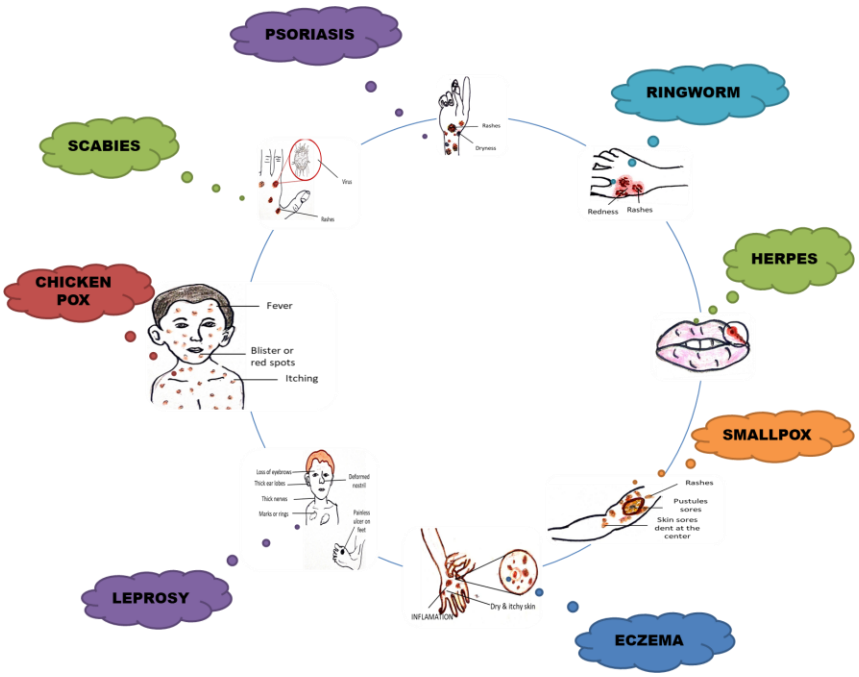

Figure 1: Some common skin infections

Plants are the major sources of medicines and are used to cure many diseases and disorders throughout the world (Liang et al. 2008; Sule et al. 2010; Silva et al. 2014; Limoli et al. 2014; Kim et al. 2018; Oladeji et al. 2020). Traditionally medicinal resources, especially wetland plants have been found to play significant role in managing skin infections. Most of the traditional medicines were prepared by

the healers (Vaidyas) from fresh resources collected from the wild. Many wetland plants are included in traditional herbal formulation(s) which heals the skin diseases like *Centella asiatica, Mikania micrantha, Trapa natans, Mimosa pudica, Thespesia populnea, Cleome rutidosperma, Ipomoea carnea* etc. Wetland is considered as the most biologically diverse ecosystem in the world and their residents have evolved varieties of interesting adaptations to survive and thrive. The World Wetland day is celebrated on 2nd February. Wetland is distinguished by natural or artificial and the water within a wetland may be static or flowing, fresh, brackish or saline (Bassi et al. 2014). Range of ecosystems that benefit the humanity including water filtration, storm protection, groundwater storage and they protect our shores from wave actions reduce the impacts of floods, absorb pollutants and improve water quality (Bassi et al. 2014). They have a wide range of food values, economic values, social values and medicinal values. The wetland ecosystem is the most indispensable component as the countless species of flora and fauna rely on this habitat (Gibbs 2011). Ramsar Convention is the oldest of the modern global inter-governmental & environmental agreement. The treaty was negotiated through the 1971s by countries and non- governmental organizations concerned about the increasing loss and degradation of wetland habitat for migratory water birds and wetland flora. Distribution of wetlands in India, 37 sites have been recognized under the International Treaty in 2019 (The Hindu newspaper 2020). The Pantanal in Brazil is the world's largest freshwater wetland, a jewel of South America (Schuyt and Brander 2004). In Odisha, the major wetlands are Bhitarkanika (lies between the latitude 20°30' and 20°50' N and longitude 86°45' and 87°10' E in the Northeast of the Mahanadi delta in Kendrapada district)**,** Anshupa, a largest freshwater lake of the state (lies between the latitude 20°26'06" to 20°28'03" N and longitude 85°35'09" to 85°36'06" E) (National wetland atlas: Orissa 2010), Chillika, a brackish water lagoon located in the Southern part of Odisha coastal plain (National wetland atlas: Orissa 2010), Kanjia Lake, sweet water lake of about 134 acres of area located in Nandankanan of Cuttack district near Bhubaneswar (National wetland atlas: Orissa 2010) and Mahanadi, a major river of Odisha and the 6th largest river in India of about 494 km in the state. Its catchment area spread over to 65,580 sq. km in the state. The other wetlands of the state are Brahmani, Baitarani, Bansadhara, Nagabali, Salandi, Indrabati Kolab etc (National Wetland Atlas: Orissa 2010).

MATERIALS AND METHODS

For enumeration of wetlands floras used against skin infections, a survey was made between November 2019 to February 2020 (**Plate 1**) in selected areas of Odisha state (Ansupa Lake, Dhenkanal, Khordha and Puri districts). A semi-questionnaire survey was made with locals as per standard methods of ethno-biological approaches (Christian and Brigitte, 2004) and plants were enumerated as per botanical name followed by local name(s) and family. The plants were photographed and samples were collected for phytochemical analysis. The plants were identified at Biodiversity and Conservation Lab., Ambika Prasad Research Foundation, Odisha by Dr. Sanjeet Kumar. The qualitative analysis of bioactive

compounds was analyzed using standard procedure of Kumar et al. (2013).

RESULTS AND DISCUSSION

In Odisha, local people collect wild wetland plant resources from wild as a means of livelihood and a source of income (Misra et al., 2012). These wetland plants possess significant medicinal values for many diseases that affect human health (Panda & Misra 2011). Documentation of ethnobotanical practices play a significant role in conserving traditional knowledge on medicinal plants from the local communitites (Kumar & Narain 2010). From survey we found that many wetland plants have been used for the skin infections in study areas. In present works, submerged aquatic, merged, floating, semi aquatic and plants found near water bodies were enumerated and results revealed that *Centella asiatica, Croton bonplandianus, Hemidesmus indicus, Ichnocarpus frutescens, Mikania micrantha, Mimosa pudica, Nymphoides hydrophylla, Thespesia populnea, Trapa natans, Eclipta prostrata, Ipomoea carnea, Solanum nigrum, Parthenium hysterophorus, Cleome rutidosperma, Bergia ammannioides, Glinus oppositifolius, Enhydra flutuans, Eichhornia crassipes* and *Pistia stratiotes* etc are used against skin infections (**Plate 2**). These wetlands plants are used traditionally in the form of whole plant, leaves and roots against skin infections (**Figure 4**). There are diverse types of secondary metabolites found in the wetland plants which are responsible to cure skin infections. They are mostly phenolic compounds, flavonides, alkaloides, saponins etc (Brezinova & Vymazal 2017). In Table 1, it is clearly specified that some common type of skin infections like leprosy, eczema, herpes, ringworm, scabies, chicken pox, small pox and psoriasis are cured using wetland floras (**Figure 1**).

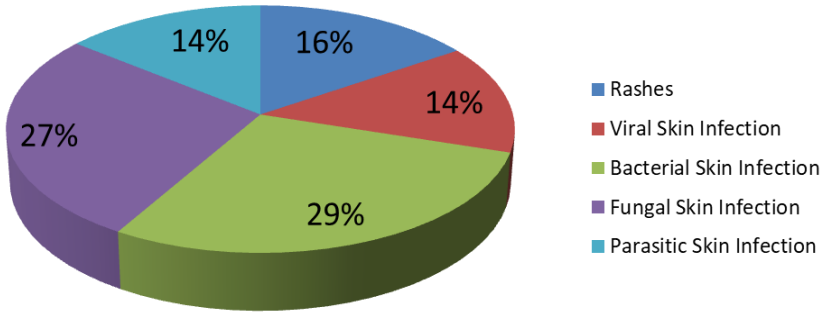

Figure 2 : Percentage distribution of plants used against different types of skin infections

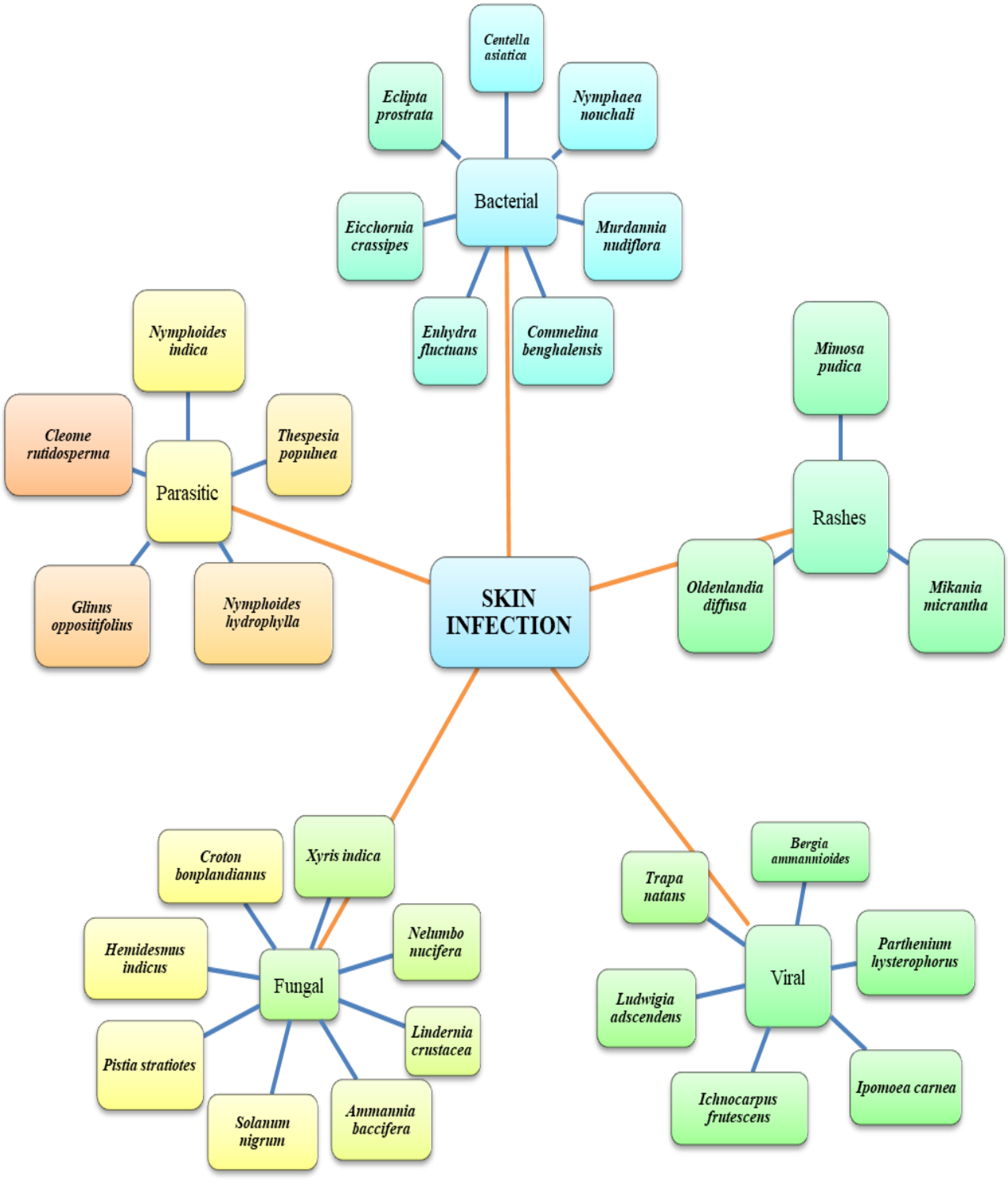

Figure 3 : Some wetland floras used to treat various types of skin infections

Enumerated wetland plants are used against fungal and viral skin infections and less against rashes (**Figure 2**). It was observed that *Xyris indica, Nelumbo nucifera, Lindernia crustacea, Ammannia baccifera* etc are used against fungal infections and *Trapa natans, Bergia ammannioides, Parthenium hysterophorus*

etc are used against viral infections. It was noted that *Centella asiatica*, *Nymphaea nouchali*, *Murdannia nudiflora*, *Enhydra flutuans* etc are used against bacterial infections. *Nymphoides indica*, *Thespesia populnea*, *Glinus oppositifolius*, *Cleome rutidosperma* etc. are used against parasitic infections and rashes are cured by *Mimosa pudica*, *Mikania micrantha*, *Oldenlandia diffusa* etc. (**Figure 3**).

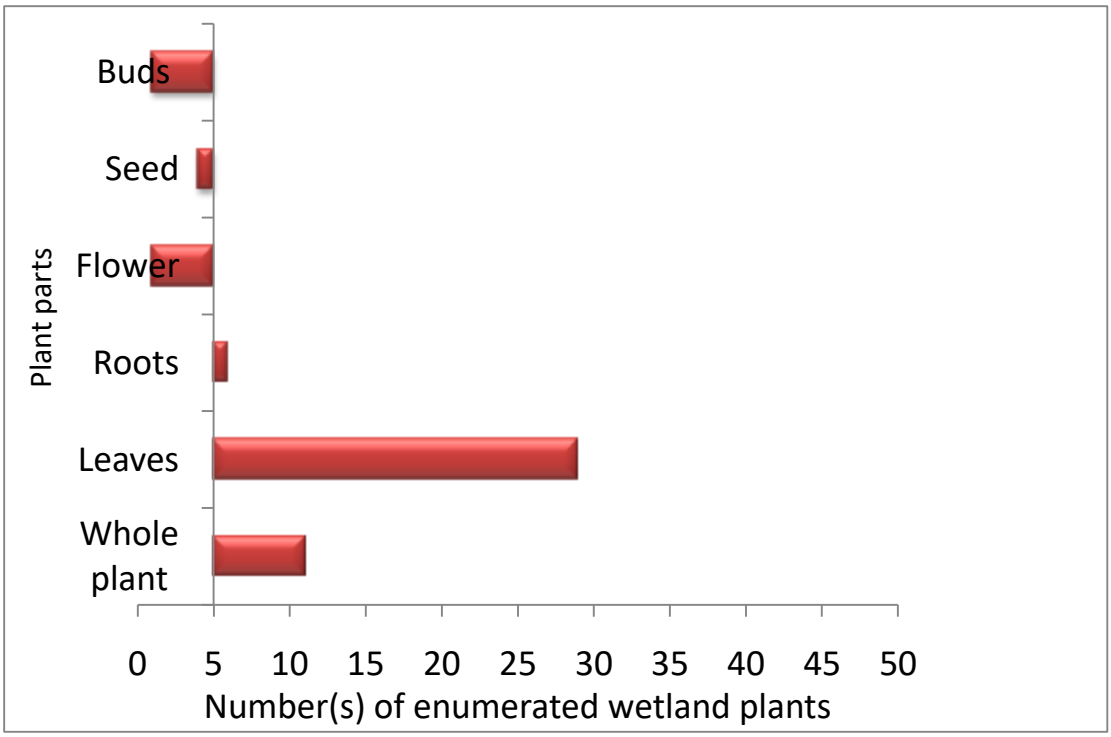

Figure 4: Parts of plants used against skin infections

Details are listed in **Table 1**. Many researchers are studied on wetland floras and their ethnomedicinal practices and documented like Umair et al. (2019) studied about the wetland flora of Chenab reverine area of Pakistan wehereas in the year 2011, Jain et al. worked on wetland flora of Northeastern part of India and found that *Alternanthera philoxeroides* (Cut), *Cardamine hirsuta* (Cut), *Colocasia esculenta* (Cut), *Ipomoea aquatica* (Insect bite), *Marsilea minuta* (Boils), *Polygonum molle* (Wounds) and *Stellaria media* (Skin infection) are used to cure different types of skin diseases by different communities of Northeast, India. Present study provide information on the wetland floras against skin infection and recommand that they might be the best altervatives of synthetic drug(s) for the various skin infectios as they are easily available throught the world. The bioactive compounds like flavonoids, tannin, phenolic compound and saponin are present in studied plant parts showed the potent medicinal value against skin infection. It was noted that leaves were the most preferable part used (**Figure 4**). The present study also bring attention towards its conservation.

Plate 1: Field work for collection and identification of wetland floras

Plate 2: Some wetland flora against skin infection : A: *Pistia stratiotes* , B : *Centella asiatica*, C: *Trapa natans*, D: *Croton bonplandianus* , E: *Mikania micrantha*, F: *Mimosa pudica*, G: *Nymphoides hydrophylla*, H: *Ichnocarpus frutescens*, I: *Andrographis paniculata*, J: *Evolvulus nummularius*, K: *Sida acuta*, L: *Lantana camara*

Table 1: Some wetland flora used against skin infection

Plants	Family	Local name	Part (s) used	Compound (s)	Mode of uses	Types of skin diseases
Acmella calva (Walter) Rich.	Asteraceae	Akarkara	Whole plant	Flavonoides, saponins & tannins	Plant extract	Psoriasis
Aeschynoomene aspera L.	Fabaceae	Shola	Leaves	Flavonoids, phenols, terpenoides & saponin	Leaves extract	Smallpox
Ammannia baccifera L.	Lytheraceae	Dadmari	Leaves	Flavonoides, tannins & phenolic compounds	Leaf paste	Ringworm
Andrographis paniculata (Burm.f.) Nees	Acanthaceae	Chireita	Leaves	Flavonoids	Leaf paste	Leprosy, scabies, eczema, ringworm
Barleria prionoites L.	Acanthaceae	Dasakeranta	Roots and leaves	Flvonoids, sapponin & tannin	Leaves and root paste	Leprosy
Bergia ammannioides Roxb.	Elatinaceae	Dasakeranta	Whole plant	Tannins, terpenoids & flavonoids	Crude extract of whole plant	Sores
Calotropis gigantea (L.) Dryand	Asclepiadaceae	Dhala arakha	Latex	Flavonoids, steroids & saponins	Latex	Eczema, ringworm,
Cassia alata (L.) Roxb.	Fabaceae	Jadumari	Leaves	Tannins, alkaloids & flavonoids	Deoction of leaves	Ringworm infection, scabies, herpes, eczema
Cassia occidentalis (L.) Link	Fabaceae	Chakunda	Leaves	Steroids, tannins, flavonoids & saponin	Paste of leaves	Sores, itch, ringworm
Centella asiatica (L.) Urban.	Apiaceae	Thalkudi	Leaves	Phenolic compounds	Leaf powder paste	Skin infections

Cleome rutidosperma DC.	Cleomaceae	Anasorisha	Root	Terpenoids, saponins & Phenolic compounds.	Juice of root	Parasitic skin infection
Commelina benghalensis L.	Commelinaceae	Kansiri	Leaves	Flavonoides	Leaf juice with oil	Leprosy
Croton bonplandianus Baill.	Euphorbiaceae	Gandha tulsi	Leaves	Terpenoides	Leaf extract	Ringworm
Cynodon dactylon (L.) Pers.	Poaceae	Duba	Whole plant	Flavonoids & tannins	Plant crude extract	Sores
Datura metel L.	Solanaceae	Dudura	Leaves	Phenolic compounds	Burned leaves	Pimples
Eclipta prostrata (L.)L.	Asteraceae	Keshadura	Leaves	Tannin & Saponin	Mixture of leaf juice with a pinch of salt	Eczema.
Eicchornia crassipes (Mart.) Solms	Pontederiaceae	Bilati dala	Leaves	Flavonoids, terpenoids & tannins.	Crude extract	Skin infection
Elephantopus scaber L.	Asteraceae	Mayura chandrika	Leaves	Saponin & tannin	Decoction of leaves	Leprosy
Enhydra fluctuans Lour	Asteraceae	Madhu-ranga	Leaves	Phenolic compounds	Leaf paste	Small pox
Evolvulus nummualaris (L.)L.	Convolvulaceae	Bichamalia	Whole plant	Tannin & flavonoids	Paste of whole plant	Scabies
Glinus oppositifolius (L.) Aug. DC.	Molluginaceae	Phanija	Whole plant	Flavonoids	Paste	Parasitic skin infection
Hemidesmus indicus (L.) R. Br	Apocynaceae	Anatamula	Root	Saponins, Tannins & terpenoids	Fresh plant part juice	Ringworm
Ichnocarpus frutescens (L.) W. T . Aiton	Apocynaceae	Shyama lata	Root	Saponin	Root powder	Leprosy
Ipomoea aquatica Forssk.	Convolvulaceae	Kalama saga	Buds	Phenolic compounds	Paste of buds	Ring worm

Ipomoea carnea Jacq.	Convolvulaceae	Amari	Leaves	Flavonoides	Leaf extract	Fungal skin infection
Jatropha gossypifolia L.	Euphorbiaceae	Baigaba	Seeds	Flavonoids & tannins	Seed oil	Ringworms
Lantana camara L.	Verbenaceae	Nagaairi	Leaves	Flavonoids	Fresh leaves	Measles
Lawsonia inermis L.	Lythraceae	Mehendi	Seeds	Saponin	Paste of seeds	Ringworm
Lindernia crustacea (L) F.Muell.	Linderniaceae	-	Leaves	Flavonoides, phenolic compounds & tannin	Leaf paste with lemon	Ringworm
Ludwigia adscendens (L) H.Hara	Onagraceae	Jagal	Whole plant	Flavonoids	Whole plant paste	Ulcer
Mikania micrantha Kunth.	Asteraceae	Salamari	Leaf	Alkaloides & saponin	Leaf juice	Skin rashes and itches.
Mimosa pudica L.	Fabaceae	Lajakuli	Whole plant and leaves.	Saponin	Paste	Eczema
Murdannia nudiflora (L.) Brenan	Commelinaceae	Kanduli	Whole plant	Flavonoides & saponin	Paste	Leprosy
Nelumbo nucifera Gaertn.	Nelumbonaceae	Padma	Root	Flavonoides & phenolic compounds	Root powder	Ringworm
Nymphaea nouchali Burm. f.	Nymphaeaceae	Nila kain	Seeds	Saponins, tannins & flavonides	Seed decoction	Skin infection
Nymphoides hydrophylla (Lour.)	Menyanthaceae	Panisuili	Stalk, leaf	Flavonoides & tannin	Decoction	Parasitic skin infection
Nymphoides indica (L.) Kuntze	Menyanthaceae	Kumudini	Leaves	Flavonides	Paste	Scabies
Oldenlandia diffusa Willd.	Rubiaceae	Bongam joi	Whole plant	Saponin	Paste	Sores
Paederia foetida L.	Rubiaceae	Pasaruni	Leaves	Saponin	Boiled leaves	Ringworms

Parthenium hysterophorus L.	Asteraceae	Gajar grass	Whole plant parts	Terpenoids	Decoction.	Skin infection
Pistia stratiotes L.	Araceae	Borajhangi	Leaves	Flavonoides	Paste	Ringworm
Plumbago zeylanica L.	Plumbaginaceae	Dhala chita	Leaves	Phenolic compounds	Paste	Scabies
Polygonum barbatum L.	Polygonaceae	Garaara	Roots	Flavonoids	Root paste	Scabies
Ricinus communis L.	Euphorbiaceae	Jada	Leaves and seeds	Saponins	Seed powder	Bacterial skin infection
Sida acuta Burm.f.	Malvaceae	Bajramuli	Leaves	Tannins, terpinoides	Paste	Sores
Solanum nigrum L.	Solanaceae	Nunununia	leaves	Flavonoids	Leaf paste	Ringworm
Thespesia populnea (L.) Sol. ex Correa	Malvaceae	Habali	Leaves	Flavonoids & tannins	Decoction	Scabies
Trapa natans L.	Trapaceae	Panisingada	Whole plant	Flavonoides	Paste	Leprosy
Wedelia chinensis (L.) Pruski	Asteraceae	Bhringraj	Whole plant	Saponin	Decoction	Skin infection
Xyris indica L.	Xyridaceae	NIL	Whole plant	Saponin	Paste	Ringworm, itches and leprosy

CONCLUSION

In present scenerio, whole world is facing the problems of microbial infections & anti-microbial resistance due to mal practices of synthatic drugs and other anthropogenic activities. Researchers are searching sources for extraction of new bioactive compounds to fight against novel microbial infections. In this aspect, present study highlights the importance of wetland flora as a prime source. They possess diverse bioactive compounds which reflects their sound traditional practices against microbial infections like different types of skin infections. The study validate that many wetland flora are have sound curative properties against skin infections. Therefore, need to do more advance work in the line of reverse pharmacology as well as have to make strategy to conserve them through community conservation.

ACKNOWLEDGEMENTS

Authors are thankful to the local community & Forest officials of study areas. Authors are also thankful to Chief Executive Officer & Project Director, Ambika Prasad Research Foundation, Odisha & HOD, School of Life Sciences, Rama Devi Women's University, Bhubaneswar, India

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