Review Article

Bryophytes : A Traditional Treasure

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ABSTRACT

Bryophytes are globally famous for their medicinal properties. They have been used in different parts of the world by different tribals and common people for treating different ailments. This article is an attempt to club the ethanobryological information.

Keywords: Bryophytes, ailments, antimicrobial.

INTRODUCTION

Traditionally bryophytes have been used in China, Europe, North America and Indian, to treat many ailments. In Zhejiang, total 145 medicinal bryophyte species have been reported that account 45 genera (15.3%) and 29 families (37.2%) found in the province.[1] Due to rich sources of terpenoids in liverworts, they have confirmed cytotoxic, anti-inflammatory, anti-fungal and anti-microbial activities.[2-4] Methanol extracts of *Neckera complanata* and *Mnium undulatum* have confirmed antimicrobial activity against eight species of bacteria and against three species of fungi.[5] Methanolic extract of *Marchantia palmata* has been proved antimicrobial against *E. coli*.[6] Methanol extracts of *Targionia hypophylla* was found to be effective against five plant pathogenic fungi: *Aspergillus niger, Botrytis cinerea, Trichoderma viridae, Penicillium chrysogenum,* and *Penicillium expansum.*[7] Growth of *Drechslera maydis*, the causal organism of Southern corn leaf blight was inhibited by the ethanolic extract of *Bryum cellulare*.[8] Essential oils of *Pseudoscleropodium purum*, *Eurhynchium striatum* and *Eurhynchium angustirete* have confirmed antituberculosis activity against *Mycobacterium smegmatis*.[9] Marchantin A, a cyclic bisbibenzyl ether, isolated from *Marchantia emarginata* subsp. *tosana* is anticancer.[10] The marchantins obtained from Marchantiales have anti-influenzic effect against both influenza A and B viruses. [11] Phytochemicals, marchantin, perrottetin and paleatin B obtained from *Marchantia paleacea* possess anti-HIV activities.[12] Although there is not much research on these plants but still our trials rely on bryophytes for the cure of different diseases.

Bryophytes used traditionally for treating ailments.

Shilajit, a blackish brown exudate obtained from mountain ranges especially the Himalayan range is documented as a 'rasayan' (meaning rejuvenator and immunomodulator in Sanskrit) in Ayurveda. Shilajit acts as an anti-aging agent and produces rejuvenation.[13] It has been used in treating different diseases from human body systems like gastrointestinal, urinary, respiratory, neurology, immunology and cancer.[14] *Barbula, Fissidenc, Minium, Thuidium* and species of liverworts like *Asterella, Dumortiera, Marchantia, Pellia, Plagiochasma* and *Stephenrencella*-Anthoceros bryophytes are major constituents of shilajit. In the villages of Pithoragarh of Northwest Himalaya regions, a paste of *Riccia* spp. and jaggery is applied for treatment of ringworms.[15] In Kangra Valley, Himachal Pradesh in India, Gaddi tribes use thalloid liverwort *Plagiochasma appendiculatum,* locally known as "Patharshali" for the cure of burns, boils, and blisters of skin.[16] *Plagiochila beddomei* Steph is used by Melghat region of India for treating skin diseases.[17] In Utah, the Gasuite Indians uses *Bryum, Mnium, Philonotis*, by crushing them into a paste and applying the poultice to reduce the pain of burns.[18] The Alaskan Indians mix *Sphagnum* leaves with tallow or other grease to make ointment for cuts.[19] American Indians used *Polytrichum juniperinum, Bryum, Mnium* and *Philonotis* mosses to heal burns, bruises and wounds.[20] *Polytrichum juniperinum* is used in preparation of many medicines by people of Northern Cheyenne Indians of Montana.[21] *Riccia discolor* used as to cure ring worm. The burned ash of mosses is mixed with fat and honey and used as an ointment for cuts, burns and wounds in the Himalayan region.[22,23] Singh reported the use of *Conocephalum conicum, P. appendiculatum, B. argenteum* and *Mnium marginatum* by traditional healers for burn infection. Fresh leaves of *Marchantia palmata* are applied to cure acute inflammation caused by heat or hot water. Juice of *Marchantia polymorpha* is used for the cure of pimples on face and body.[25] In Utah, the Gasuite Indians used *Bryum, Mnium, Philonotis*, and various matted hypnaceous forms, crushing them into a paste and applying the poultice to reduce the pain of burns.[26] *Fissidens laxitextus* is used for diuretic activity, hair growth, burns, and choloplania. *Funaria hygrometrica* have been used in all bryogeographical region of India to treat hemostatis, pulmonary tuberculosis, vomitus cruentus, bruises, and athlete's foot dermatophytosis.[27] *Polytrichum* are used for hair growth. In China and Bolivia, native people use the paste of *Philonotis* to

reduce the pain of burns.[28] Sphagnol, a distillate of peat tar, is supposed to be useful for the treatment of several skin diseases like eczema psoriasis pruritus hemorrhoids, chilblains scabies acne and other form of skin diseases.[29, 30] Dried *Sphagnum* is sold to treat haemorrhages and S. teres is used to treat eye diseases.[31] *Reboulia hemisphaerica* for blotches, hemostasis, external wounds, and bruises. [32, 33] *Marchantia polymorpha* with vegetable oils is used on bites, boils, burns, cuts, eczema, and wounds. [34]

Rhodobryum roseum, is used traditionally in Chinese medicine to cure cardiac disease.[35] *Cratoneuron filicinum* is used for treating malum cordis (heart disease) and *Weissia viridula* have been used as antipyretic and antidotal; for rhinitis.[36] *Polytrichum* and *Fissidens* species were used as diuretic and hair growth stimulating drugs in China. [37] In China and Bolivia, *Fissidens osmundoides* is to treat inflammation of the pharynx and larynx caused due to bacterial infection. [38] *Plagiopus oederi* is usedas a sedative; for epilepsy, apoplexy, and cardiopathy. *Oreas martiana* cures pain, hemostasis, external wounds, epilepsy, menorrhagia, and neurasthenia. [39] *Taxiphyllum taxirameum* is used for haemostasis and external wounds.[40] *Leptodictyum riparium* is used for uropathy and antipyretic.[41] A mixture of *Conocephalum conicum* and *Polytrichum commune* is boiled to make a tea for treating the common cold. This species also reputedly helps dissolve stones of kidney and gall bladder. [42]

Philonotis angusta protective medicine for women after childbirth. *Fissidens crenulatus* for stone in the bladder, phthisis, dysentery and lactagogue. [43] *Mnium cuspidatum* is used for treating hematostasis and nosebleed.[44] *B. plumosum* has valuable medicinal importance.[45] *Cratoneuron commutatum* treats heart diseases and also have antibacterial activity. [46] *Haplocladium microphyllum* treats cystitis, bronchitis, tonsillitis, and tympanitis. *Polytrichastrum formosum* showed the highest insecticidal activity (70.33%) against *Sitophilus granariu, Radula appressa* and *Thysananthus spathulistipus* have shown NO inhibitory activity.[47,48] A tea prepared of *Polytrichum commune* is believed to help in liquefying kidney and gall bladder stones Roque (1941).[49] In France, *Marchantia polymorpha* was used to enhance diuresis. [50]

In India a paste of *Frullania ericoides* is roasted in coconut oil and then applied for treating head lice and it also used for hair nourishment. A paste of liverwort, *Targionia hypophylla* and Pteridophyte, *Mayil sikkai* is used for treating Scabies, itches and other skin diseases in Western Ghats, Kerala, India.[51]

Riccardia multifida showed antileukemic activity. *Barbula indica* is active against human epidermoid carcinoma. [52]

Kani Tribes of Agasthiyarmalai Biosphere Reserve (India) are dependent on bryophytes for treating many human and cattle diseases. Leaves of *Riccardia multifida* crushed with peppers are taken orally treating stomachache and warmed leaf juice is used as a lotion for Rheumatic swellings in cattle.

Leaf extract of *Barbula indica* is used to relieve menstrual pain and decoction of whole plant treats intermitted fever.

Tender leaves of *Fissidens flaccidus* are used to cure mouth ulcers and its leaf juice treats leucorrhoea and malaria.

A paste of *Fissidens flaccidus*, garlic and pepper is given twice daily for treating gastrointestinal problems in cattle. *Atrichum undulatum* along with pepper is used for treating postnatal complaints.

Bark of *Atrichum undulatum* along with neem oil treats baldness and dandruff. *Hyophila attenuate* is used for treating earache, fungal skin infections.

Leaf decoction is administered with a pinch of pepper powder daily to cure cold, cough and neck pain. Aerial parts of *Frullania acutiloba* crushed along with cumin seeds are used for burning micturition.

A mixture of aerial parts, cumin seeds and sugar is administered for pus oozing in ear. *Entodon flavescens* is used to cure earache, cold and also used as smoke filters by the tribal's. A mixture of *Entodon flavescens*, pepper and garlic is administered for inducing fertility in women (Lubaina).

Information about ethano-bryologically important bryophytes are summarized in Table 1.

CONCLUSION

In 21st century, still tribals and locals believe in traditional medicinal knowledge not only treating diseases of their cattle but treating themselves too.

Throughout world tribals and natives use bryophytes for treating different kind of skin, heart, eye and reproductive problems. But the most unfortunately bryophytes are ignored by the researchers and scientists.

These plants posses key for the treatment of deadly diseases. It is appeal of time for researchers and scientists to pay attention toward these ignored plants.

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Table 1: Bryophytes with ethano-medicinal properties.

Plant Species	Disease	Formulation	Country
Asterella	Shilajit	Oral intake	India
Atrichum undulatum	1. Postnatal complaints 2. Baldness and dandruff	1. Stem bark extract is administered with a pinch of pepper powder daily once for one week. 2. Paste of dry stem bark powder mixed with neem oil is applied.	India
Barbula	Shilajit	Oral intake	India
Barbula indica	1. Constipation in cattle 2. Menstrual pain 3. Intermittent fever	1. Plant extract is administered twice or thrice daily 2. Leaf extract is administered twice a day for three days; 3. Decoction is administered daily once for five days.	India
*Bryum*Sp.	Burns/Bruises/wounds	Paste	North American Indians
Bryum argenteum	Burn/cuts/wounds/ skin disorders/ Burn infection	Patch of plant material	India
Conocephalum conicum	Burn/cuts/wounds/Skin disorders/ Bites/Boils/Burns/Cuts/Eczema/wounds.	A mixture of *Conocephalum conicum* and *Marchantia polymorpha* with vegetable oils	China
Cratoneuron commutatum	Heart diseases/antibacterial activity	NIA	China
Cratoneuron filicinum	Malum cordis	NIA	China
Dicranum scoparium	Insecticidal against *Sitophilus granarius*	Methanol, hexane and esterified methanol extracts	Turkey
Dumortiera,	Shilajit	Oral intake	India
Entodon flavescens	1. Earache 2. Cold 3. For inducing fertility in women 4. Smoking filter	1. Leaf juice is used as ear drops 2. Eaf juice is administered daily twice. 3. same quantity of pepper and garlic is administered daily once for three days after completion of menstrual period	India
Fissidens	1. Shilajit 2. Diuretic/Hair growth	Oral intake	India China
Fissidens flaccidus	1. Mouth ulcers 2. Leucorrhoea 3. Malaria 4. Flatulence in cattle	1. Tender leaves as curry 2. Leaf juice is taken daily twice until cure 3. leaf juice is administered daily twice for three days 4. Leaf paste with garlic and pepper is given twice daily.	India
Fissidens crenulatus	Bladder/Phthisis/Dysentery/lactagogue	NIA	India
Fissidens laxitextus	Diuretic activity/Growth of hair/Burns/Choloplania	NIA	India
Fissidens osmundoides	Inflammation of the pharynx and larynx caused due to bacterial infection	NIA	China Bolivia

Frullania acutiloba	1. Burning micturition, 2. Pus oozing in ears 3. Ephemeral fever	1. Extract of aerial parts crushed with cumin seeds is taken. 2. Aerial parts crushed with cumin seeds and sugar is administered. 3. Paste prepared from whole plant crushed with turmeric and common salt is fermented in two litres of toddy for 12 h, the fermented toddy is administered daily once for four days.	India
Frullania ericoides	1. Head lice 2. Nourishment of hair	1. About 50 g of the whole plant is made into a paste and roasted in coconut oil and applied over the hair in alternate days.	India
Funaria hygrometrica	Hemostatis/Pulmonary tuberculosis/Vomitus cruentus (hematemesis)/Bruises/Athlete's foot/ Dermatophytosis	NIA	India
Haplocladium microphyllum	Bronchitis/cystitis/tonsillitis/tympanitis	NIA	China and Bolivia
Homalothecium lutescens	Insecticidal against Sitophilus granarius	Methanol, hexane and esterified methanol extracts	Turkey
Hyophila attenuata	1. Earache/To increase potency/nervous diseases/fungal skin infections 2. During cold/cough/neck pain	1. Leaf juice 2. Leaf decoction is administered with a pinch of pepper powder daily.	India
Hypnum cupressiforme	Insecticidal against *Sitophilus granarius*	Methanol, hexane and esterified methanol extracts	Turkey
Leptodictyum riparium	Uropathy/antipyretic	NIA	India
Marchantia Palmata	Oduring acute inflammation caused by heat or hot water.	Fresh leaves	India
Marchantia polymorpha	1. Bites/Boils/Burns/Cuts/Eczema/wounds. Relieving inflammation on skin on eruption of pimples on face and body 2. 2.Liver Diseases 3. Enhances Diuresis	1. A mixture of *Conocephalum conicum* and *Marchantia polymorpha* with vegetable oils 2. NIA 3. NIA	India China France
Marchantia,	Shilijit	Oral intake	India
Mnium	Heal burns/Bruises/wounds	Crushing them into a paste and applying the poultice to reduce the pain of burns	North American Indians
Mnium cuspidatum	Hematostasis/nosebleed	NIA	India
Mnium marginatum	Burn/Cuts/wounds/Skin disorders	Patch of plant material	India
Mnium marginatum	Healers for Burn infection	NIA	India
Oreas martiana	Hemostasis/External wounds/Epilepsy/Menorrhagia/Neurasthenia	NIA	China
Pellia,	Shilijit	Oral intake	India
Philonotis	Heal burns/Bruises/Wounds	Crushing them into a paste and applying the poultice to reduce the pain of burns	North American Indians

Philonotis angusta	Medicine for women after childbirth	NIA	India
Plagiochasma appendiculatum	1. Burns/boils/blisters/ 2. Shilijit	1. Paste 2. Oral intake	India India
Plagiochila beddomei	1. Skin diseases 2. Wound healing	1. Paste 2. Aqueous and methanolic extracts	India
Plagiopus oederi	Epilepsy/apoplexy/cardiopathy	NIA	India
Polytrichastrum formosum	Insecticidal activity*Sitophilus granariu*	Methanol, hexane and esterified methanol extracts	Turkey
Polytrichum	Diuretic/Hair growth	NIA	China
Polytrichum commune	Common cold/liquefying kidney and gall bladder stones	A tea	China
Polytrichum juniperinum	Medicinal uses/Heal burns/Bruises/Wounds	Paste	North american Indians
Radula appressa	NO inhibitory activity	NIA	China
Reboulia hemisphaerica	Blotches, hemostasis, external wounds, and bruises	NIA	India
Rhodobryum roseum	Cardiac disease	Oral	China
Riccia	Ring worm	Paste of *Riccia* and Jaggery	India
Riccia discolor	Cuts/burns/wounds	Paste of *Riccia discolour* honey and fat	India
Riccardia multifida	1. Rheumatic swellings in cattle 2. Stomachache	1. Slightly warmed leaf juice is used as a lotion 2. Leaves crushed with peppers are taken orally.	India
Sphagnum	1. Acute haemorrhage and eye disease 2. Cuts 3. Eczema, psoriasis, pruritus, hemorrhoids, chilblains, scabies, acne and other forms of skin diseases, and is also beneficial for allaying irritation arising from insect bites	1. Dried plant material 2. A salve for mixing *Sphagnum* leaves with tallow or other grease 3. 'Sphagnol', a distillate of Peat Tar, is useful in	China Alaskan Indian
Stephenrencella	Shilajit	Oral intake	India
Targionia hypophylla	Scabies/ itches/ other skin diseases.	A paste of whole thallus, along with the leaves of Mayil sikkai (Actiniopteris radiata, Pteridaceae), and mixed with two tablespoons of coconut oil and smeared over the body of the children.	India
Taxiphyllum taxirameum	Haemostasis/External wounds.	NIA	India
Thuidium	Shilajit	Oral intake	India
Thysananthus spathulistipus	NO inhibitory activity	NIA	China
Weissia viridula	Antipyretic/antidotal	NIA	China

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