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RESEARCH PAPER

Journal of Biodiversity and Environmental Sciences (JBES)

ISSN: 2220-6663 (Print) 2222-3045 (Online)

Vol. 12, No. 5, p. 57-63, 2018

<http://www.innspub.net>

OPEN ACCESS

Evaluation of informants consensus factor of medicinal uses of bryophytes in Swegalai Valley KPK, Pakistan

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Article published on May 13, 2018

Key words: Bryophytic species, Evaluation; Medicinal uses; Consensus factor; Swegalai Valley.

Abstract

Bryophytes have an important role in treatment of various disorders. This work is one of the first struggles to calculate the ethno medicinal information in Swegalai which offer better choice for the choosing of broadly used medicinal plants looking for bioactive compounds to treat various disorders. This investigation tried to explore the medicinal uses of bryophytic plant species and to assess the consensus factor among inhabitants of Swegalai Valley to evaluate the possible for novel drugs of herbal origin. The work was carried out in 2017 using semi structured questionnaire with people. In current work we highlighted 4 species under 4 families for medication of 6 groups of diseases. There was uncountable agreement among the informers regarding medicinal uses of bryophytes with Informants Consensus Factor (ICF) value ranging from 0.94 to 0.98, with an average value of 0.96. The research noted that most of the informants agreed in the usage of *Funeria hygrometrica* Hedw. to make ointments for treatment of burns, cut, wounds (ICF 0.98) that displayed the highest fidelity level (100%). The results of the study also indicated that *Funeria hygrometrica* might be used for the improvement of new, cheap, effective, and eco-friendly herbal formulations for healthcare management. Resident's views and our observations confirmed that *Funeria hygrometrica* Hedw. is an infrequent bryophytic plant in the study area. Illegal and unsustainable collection of thal us from this plant by the local crude drug traders, overgrazing, changing in the environmental conditions are considered as major causes of its depletion from nature.

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Introduction

Bryophytes play a significant role in curing various disorders (Miller and Miller, 1979) Such as oil from hairy calyptra of *Polytrichum commune* was used by the women's of ancient time on their hair (Glime, 2007). Bryophytes effectively used in traditional Chinese medicinal system. Several ethnic groups of various regions of the world used these plants to treat various illnesses in their day to day life. Different people in India used *Plagiochasma appendiculatum* for curing skin disorders and thalloid *Targionia hypophylla* used by Irular tribe of the Attappady valleys of Kerala state to cure skin diseases due to look like of thallus of this liverwort to the rough surface of the infected part. The thallus of *Frullania ericoides* is practiced for hair-related disorders by tribal people of Sub continent (Remesh and Manju, 2009) Moreover the active ingredients of bryophytes are broadly applied as antibacterial, antifungal, cytotoxic, antitumor and insecticidal and in medicinal and agricultural sectors as well (Asakawa, 2007).

The phytochemical investigations of bryophytes show a greater range of biologically active compounds like carbohydrates, lipid, protein, steroids, polyphenols, terpenoids, organic acids, sugar alcohols, fatty acids, aliphatic compounds, acetogenins, phenylquinones, and aromatic and phenolic substances which demonstrates important bioactivities (Pant and Tewari, 1990). These small plants have a remarkable role in keeping ecosystems because they provide an important buffer system for other plants.

They are also used as indicator species, erosion control, bioindicators of heavy metals in air pollution, aquatic bioindicators, radioactivity indicators, as material for seed beds, fuel, medicines and food sources, pesticides, moss gardening, treatment of waste, construction, clothing, furnishing, packing, genetic engineering and for soil conditioning and culturing (Saxena, 2004).

By the way bryophytes are seeds or flowers less plant

species therefore they are located under cryptogams. They are less recognized to most people due to the small size subsequently less biomass made bryophytes mistreated for extensive applications (Harris, 2008). They are found ubiquitously in the world from desert to ice cold polar region except seas. Knowledge about medicinal properties of bryophytes is ghettoized and not present in well written form. In this investigation, we have been tried to documents information concerning to medicinal properties and ethno medicinal uses of bryophytes in Swegalai valley; up to our knowledge it is ever the first documented report from KPK, Pakistan.

Materials and methods

The Swegalai Valley is located in the western part of district Swat adjacent to the border of District Dir lower. The Swegalai valley is located in the West of district Swat at 34°45'13.04"N Latitude and 72°14'17.48"E Longitude at 3210 ft above sea level. The area is bordered by the high mountains, Gadi, Kabal in the east, Parai, Barikot in the South and district Dir lower in North.

The area was visited four times in various seasons of the year of 2017. Voucher specimens for each species have been collected and processed using standard herbarium techniques (Alexiades, 1996). The specimens were identified referring several Floras, viz., Hooker (1872-1897). The updated nomenclature of the identified species followed Siddiqui *et al.* (2007) and Ahmed *et al.* (2009). Voucher specimens are deposited at HU. Ethnomedicinal data has been collected through Participatory Rural Appraisal (PRA), which is based on communication with indigenous people and direct observation in the ground (Martin, 1995). The data have been recorded through semi-structured interviews with populaces involved in the plants management (Alexiades, 1996). A total of 100 residents have been interviewed. During the field survey, information on uses of bryophytes to cure several diseases of human being, parts used, of medicine have been collected. Based on the information obtained from the informants in the

study area, all the reported diseases have been classified into 6 groups.

The degree of similarity among information conveyed by various informants was calculated by the Informants' Consensus Factor, ICF (Trotter and Logan, 1986) by smearing the given formula:

$$ICF = \frac{Nur - Nt}{(Nur - 1)}$$

Nur = number of use reports from informants for a specific plant-use category/ group; Nt = number of taxa or species that are used for that plant use category for all informants.

ICF Values vary between 0 and 1, where '1' indicates the highest level of informant agreement. The fidelity level (FL), the percentage of informants using

the use of a certain plant species for the same main determination, was considered for the most frequently reported diseases or ailments as: $FL(\%) = \frac{Np}{N} \times 100$ Where, Np = number of informants that claim a use of a plant species to cure a specific disease; N = number of informants that use the plants as a medicine to cure any given disease (Alexiades, 1996).

Results and discussion

In the present research work 4bryophytic plant species belonging to 4 families in Swegalai Valley have been recorded for curing of 6 classes of illnesses. For each species botanical name, family, local name, ailments to be treated, and part(s) used were recorded (Table1).

Table 1. Documentation of medicinal plants with scientific name, local name, parts used, and ailments.

S.No	Botanical Name	Family	Local Name	Part Used	Ailments
1	<i>Funeria hygrometrica</i> Hedw.	Funariaceae	Pasham	Whole thalus	Making oinments for burns, cut, wounds, Cardiovascular diseases, Blood pressure
2	<i>Marchantia polymorpha</i> (L)	Marchantiaceae	Lewa	Whole thalus	Abscess or Boils, oinments for wounds, Antifever agents, laxative, diuretics, Blood pressure
3	<i>Ricciaglauca</i> (L).	Riciaceae	Leew	Whole thalus	Anti-fever agents, laxative, diuretics, Blood pressure, oinments, Abscess or Boils
4	<i>Shagnum fimbriatm</i> Wilson.	Sphagnaceae	Jargotay	Whole thalus	Cardiovascular diseases, Blood pressure, Antifever agents,

It was noticed that the collection of plant as medicinal part from the wild were not sustainable. According to inhabitants, this type of activity is done by the

collectors related to illegal trade of medicinal plants. *Funeria hygrometrica* Hedw is vulnerable to this type of activity in the study area.

Table 2. Categories of disorders and informant consensus factor (ICF) for each grouping.

Diseases Category	Use report (Nur)	Taxa (Nt)	*ICF
Making oinments for burns, cut, wounds	100	2	0.98
Cardiovascular diseases	90	2	0.98
Abscess or Boils	85	2	0.98
Anti-fever agents,	80	2	0.98
Laxative, diuretics	70	2	0.98
Blood pressure	60	4	0.94

*ICF= Informants consensus factor

ICF values were established to recognize the agreement among the informants of Swegalai valley for consumption of bryophytic species to cure certain

malady categories. The ICF values are designated in the Table 2. It is identified that the ICF values vary from 0.98 to 0.94 with an average value of 0.96.

Making ointments for treatment of burns, cut, wound has the highest ICF value 0.98 with 100 use-reports for 2 bryophytic species. The species responsible for this high consensus was *Funeria hygrometrica* Hedw. With 100 of the 100 defined events, linked by ineffectiveness Cardiovascular

diseases (ICF = 0.98; 90 use-reports, 2 species), Abscess or Boils (ICF = 0.98; 85 use-reports, 2 species), Anti-fever agents (ICF= 0.98, 80 use reports, 2 species) and so on. Medicinal plants believed to be effective in treating specific ailment have high ICF values.

Table 3. Highest frequently used plants for various illness groups based on highest FL (%) in each disease category (Total informants = 100).

Scientific Name	Disease category	Use report	Fidelity level (%)
<i>Funeria hygrometrica</i> Hedw.	Making ointments for burns, cut, wounds	100	100
<i>Marchantia polymorpha</i>	Cardiovascular diseases	90	90
<i>Ricciaglauca</i> (L).	Abscess or Boils	85	85
<i>Shagnum fimbriatum</i>	Anti-fever agents	80	80

The high ICF value for making ointments for treatment of burns, cut, wounds and so on perhaps unveiled that these ailments are common in the study area. High ICF values also designate that the species conventionally used to treat these ailments are worth searching for bioactive compounds. The least agreement (ICF=0.94) between the informants was observed for plants used to cure Blood pressure diseases. The low ICF value as noted in our study could be due to the absence of communication among people in different parts (Table: 2; Fig: 1).

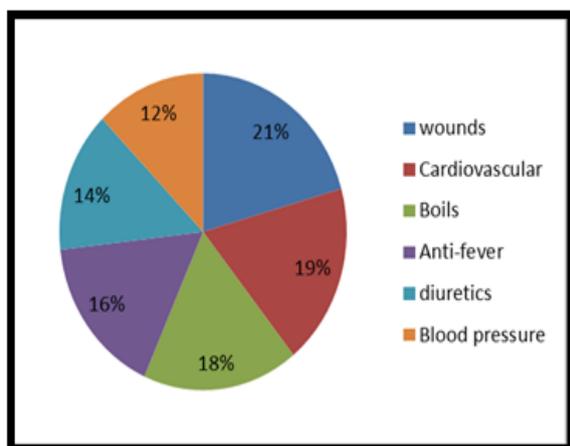


Fig. 1. Categories of disorders and informant consensus factor (ICF) for each grouping.

To discover traditionally important medicinal species in the civilization, Fidelity Level (FL) of plants has been forecasted based on use reports which have been cited by 50 or more informants for being used against

a given disease. The FL values are shown in Table 3 ; Fig: 2. The examination demonstrated that the highest FL value found in *Funeria hygrometrica* Hedw. tracked by *Marchantia polymorpha* L, *Riccia glauca* (L), *Shagnum fimbriatum*. The least FL values were found in the case of *Shagnum fimbriatum*. FIC and FL studies presented that the most commonly used species in the study area is *Funeria hygrometrica* Hedw (ICF = 0.98) with 100 use-reports and FL value (100%). When choosing the most ideal plant species for each ailment category, we took the high Fidelity Level (%) in each group of ailment.

The existing work is one of the first struggles to calculate the ethno medicinal information in Swegalai which offer better choice for the choosing of broadly used medicinal plants looking for bioactive compounds to treat disorders. The study described 4 medicinal plants with their uses from the Swegalai. The efficiency and safety of all the stated ethno medicinal plants require to be evaluated by phytochemical and pharmacological examination. Plants with high informant consensus factor use report and fidelity level should be given priority to carry out bioassay and toxicity investigations. From this work we suggest *Funeria hygrometrica* Hedw for further ethno pharmacological studies, meanwhile this species has the high ICF and FL values.

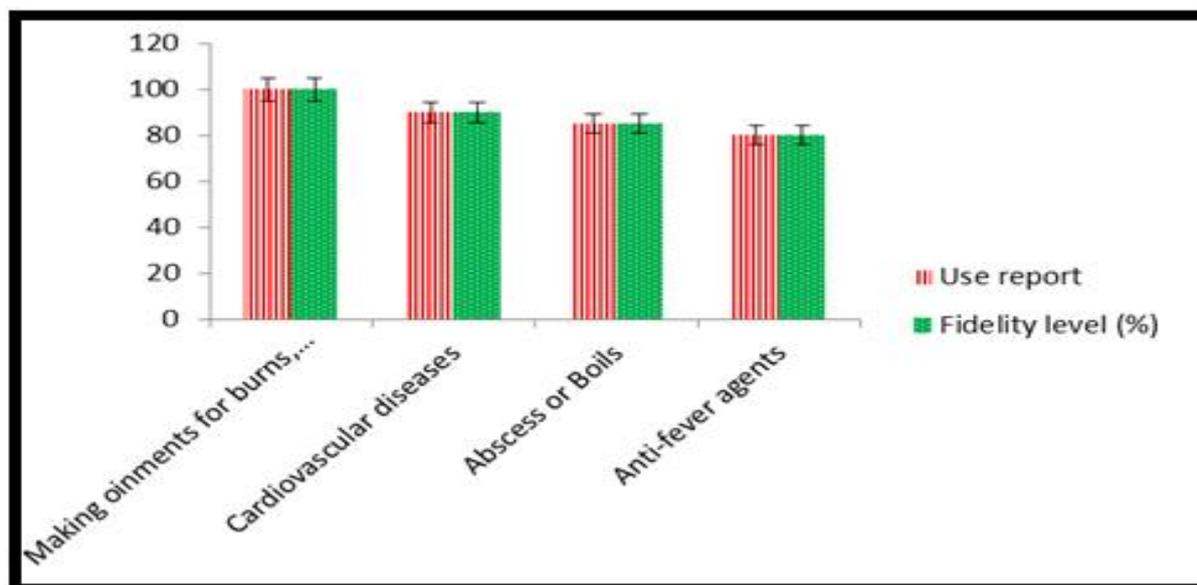


Fig. 2. Highest frequently used plants for various illness groups based on highest FL (%) in each disease category.

The results presented that this species may be used for the development of new, cheap, effective, and eco-friendly herbal formulations for healthcare managements (Ghorbani, 2005).

Additional use of these herbal formulations for healthcare management will require safety and effectiveness testing. According to inhabitants and our observations in the field, *Funeria hygrometrica* Hedw is now a very rare plant in the area. Illegal and unsustainable collection of this plant by the local crude drug traders, environmental fluctuation and overgrazing is one of the major causes of depletion of this species from nature. There is crucial want to formulate suitable conservation strategies for naturally growing ethno medicinal plants to overcome their depletion from natural resources and to make these practices more ecofriendly.

Conclusion

This work conveys sign that medicinal plants have a vital role in the healthcare system of Swegalai Valley. People still suffer to depend on these plants for the treatment of healthcare problems. The existing paper denotes significant ethno botanical information on bryophytic medicinal plants which offers baseline data for future pharmacological studies.

Acknowledgment I am thankful to all the informants of the research area for sharing their knowledge and their Cooperation during field study is duly acknowledged.

Conflict of interest

The authors declare to have no conflict of interest.

Author's contribution

NM collected plants and carried out written work, NA and SFW, NA and IH helped in interpretation of the results, and wrote and critically reviewed the manuscript. All authors have read and approved the final manuscript.

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