

Antimicrobial activity and polyphenol content of some bryophytes from Lonavala

P. S. Kadam
Prof. Ramkrishna More College,
Akurdi, Pune-44

Abstract: Bryophytes are group of vascular plants which include 25000 species they grow in damp shady locations. They are small herbaceous plants that absorb water and mineral nutrients mainly through leaves. These plants are rich in vitamins, proteins and minerals. They contain pools of secondary metabolites like phenols, flavonoids which are unique phytochemicals. In the present study polyphenols and anti-microbial activity was assessed from the bryophytes viz. Anthoceros erectus, Asterella angusta, Cyathodium tuberosum, Plagiochasma articulata and Targiona hypophylla grown in Malavli area of Lonavala. It was observed that the polyphenol content was maximum in Anthoceros and least in Targiona. The anti-bacterial activity using agar well diffusion method against two bacterial strains was highest in Targiona hypophylla and least in Cyathodium tuberosum.

Keywords: Polyphenols, anti-bacterial, *Anthoceros erectus*, *Asterella angusta*, *Cyathodium tuberosum*, *Plagiochasma articulata* and *Targiona hypophylla*

Introduction:

Bryophytes are non-vascular plants. They are group of small, simple, green and land dwelling plants comprising of hornworts, liverworts and mosses. These plants grow in a variety of habitats and their plant body is thalloid they are very small plants but have an interesting feature that is they are not attacked by bacteria or fungi or by pests. Bryophytes are potential source of medicine as they possess secondary metabolites such as polyphenols, hence have been assessed for more than 400 years in China, Europe and North America various types of bryophytes have been used to treat cardiovascular system diseases, bronchitis, tonsillitis and skin diseases, cuts, burns and wounds. *Riccia* sp. is used to cure ring worms. *Marchanta* is used as medicine in boils and abscesses. A large number of bryophytes possess anti-microbial and anti-fungal activities due to biologically active compounds present in them polyphenolic compounds contribute to antibiotic properties. A large number of biologically active substances are present in the bryophytes, hence are used in ethnopharmacology and as medicinal plants (Singh et al. 2006, Cheng et al. 2012, Asakawa et al. 2013). Bryophytes are well known for antimicrobial activity (Cheng et al. 2012).

Plants need phenolic compounds for growth reproduction resistant to pathogen and these compounds form a class of secondary metabolites. Bryophytes are regular producers of polyphenols. Literature search revealed that very little work has been carried out on these grounds of Indian

bryophytes therefore it was considered worthwhile to carry out the present investigation.

Material and Methods:

Five different bryophytes *Anthoceros erectus*, *Asterella angusta*, *Cyathodium tuberosum*, *Plagiochasma articulata* and *Targiona hypophylla* were collected from Malavli area of Lonavala identified and brought to the laboratory they were thoroughly washed with distilled water and used for estimation of polyphenols according to Folin and Denis (1915) method and anti-bacterial activity was assessed using agar well diffusion method.

Results and Discussion:

The polyphenol content of *Anthoceros erectus*, *Asterella angusta*, *Cyathodium tuberosum*, *Plagiochasma articulata* and *Targiona hypophylla* is depicted in Fig. 1 and the results reveal that the polyphenol content is maximum in *Anthoceros*, which is followed by *Cyathodium*, *Asterella*, *Plagiochasma* and *Targiona*. Manoj and Murugan in 2011 have observed that a pool of phenolic acids in liverwort *plagiochila*. Stephphenols and flavonoids were found to be present in high levels. Total phenol content was shown to provide the highest correlation between the phenolic acids and total phenols in the plants suggesting their role as precursor of many of the secondary metabolites. Linnacuate, coumarate, gallate, ferulate and hydroxyl lxezeent has proven antioxidant significance of plant. Marko et al. 2001 have observed polyphenol concentration as a potential group of organic compounds with pharmacological activity.

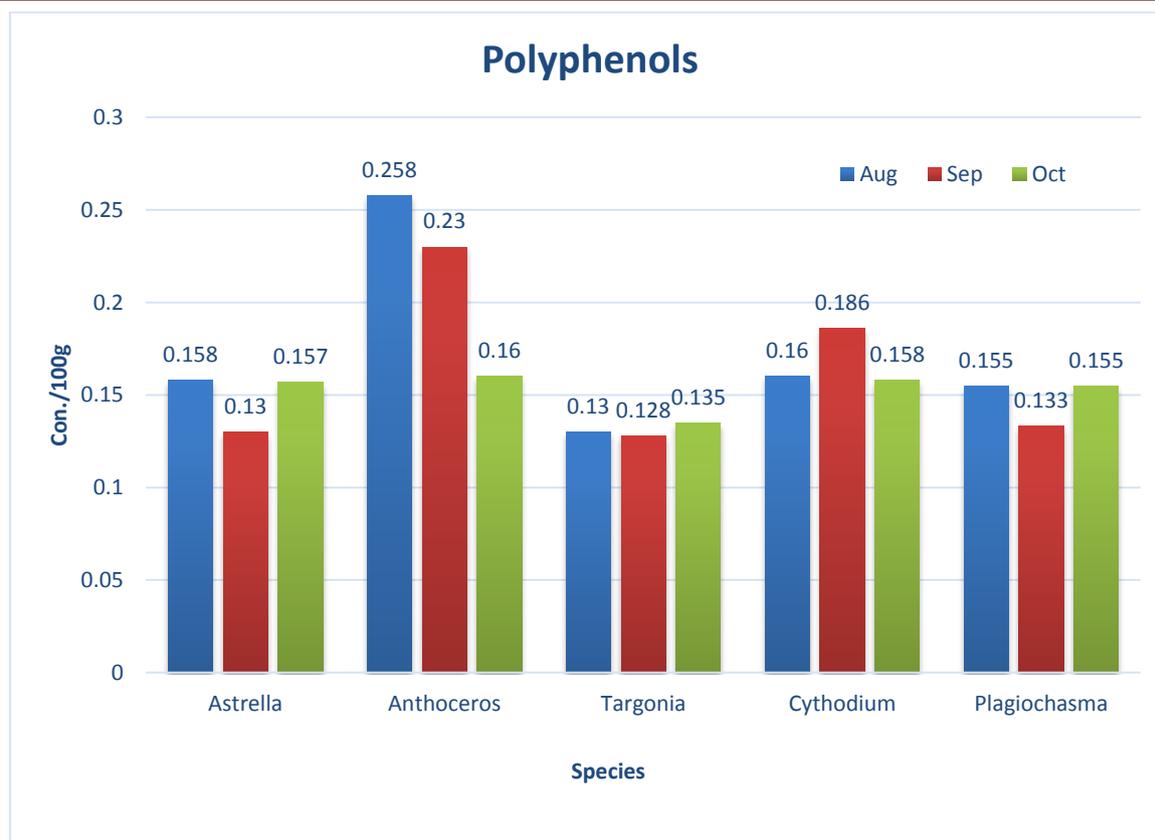


Figure 1: The polyphenol content in different species

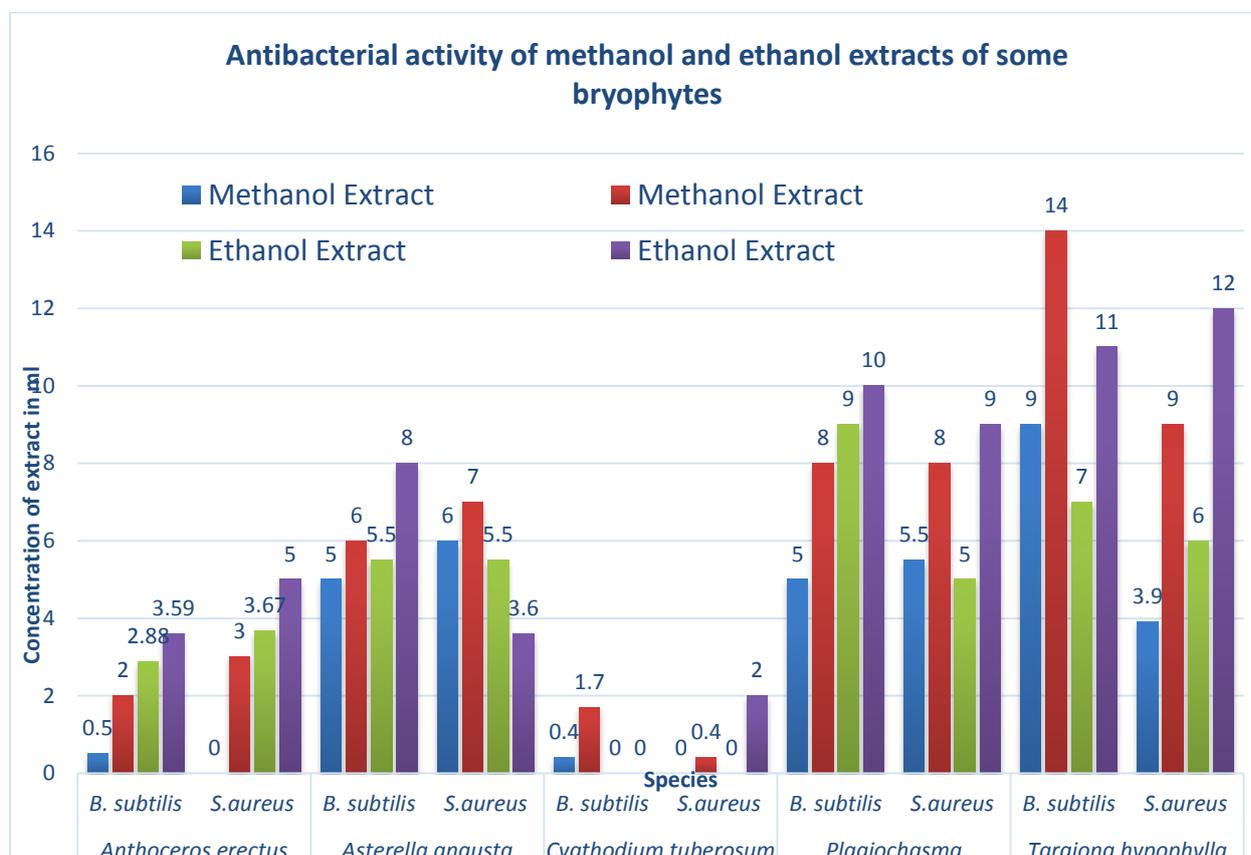


Figure 2: The antibacterial activity of methanol and ethanol extracts of some bryophytes

Krishnan and Murugan 2013 have observed high amount of phenols and phenolic acids in the extracts of *Marchantia polymorpha* and are of the opinion that they have remarkable antioxidant activity. L Klavina 2015 has observed higher polyphenol concentrations in bryophytes using ethanol extracts.

Anti-bacterial activity is depicted in Fig. 2 the results reveal that Methanol extracts of bryophytes had greater potential for anti-bacterial activity in *Asterella* and greater potential for anti-bacterial activity in *Targiona* and *Plagiochasma* in ethanol extract. Sawant and Karadge 2010 have investigated that most promising results were observed for invitro microbial activity by *T. hypophylla* and that of *Cyathodium* were rather inactive similarly vizma et al. 2012 have observed the antimicrobial activity of aqueous and ethanolic extracts of bryophyte species and nine *Marchantia* species tested against *S. aureus* and *B. ceseus*. It was observed that 73% of ethanolic extracts and 39% of aqueous extracts exhibited anti-bacterial activity against *S. aureus*. B.L Chaudhary and Prem

Kumar 2011 have observed that antibacterial activity of *S. ligulatum* extract in different solvents (viz. petroleum ether, benzene, acetone, methanol, ethanol) on test bacteria showed remarkable antibacterial activity against all test bacterial cultures. *B. cereus*, *S. aureus*, *E. coli*, *Enterobacter aerogenes*, *K. Pneumoniae*.

The present reported that bryophytes showed varying levels of polyphenols and activity against the test bacteria. The above extracts reveal future investigation as antibacterial agents is necessary.

Conclusion:

Bryophytes contain numerous secondary metabolites this the present study indicates that extracts obtained from bryophytes have remarkable antimicrobial activity and variable amount of polyphenol content which could be a potential source of medicine hence there is a need of purification and characterization of active principles which could be useful for drug development.

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