Carotenoids and Polyphenols from the Bryophytes of Malavali Area

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Abstract: Carotenoids and polyphenols are currently the most understood and have received great deal of attention in research. Bryophytes are the oldest land plants and are found growing in a variety of habitats they have leafy or thalloid plant body and have ecological, pharmacological importance.

In the present study carotenoids and polyphenols were estimated from the bryophytes viz. Anthoceros erectus, Astrella angusta, Cyathodium tuberosum, Plagiochasma articulata and Targionia hypophylla grown in Malawali area of Lonavala Pune, a popular hill station which has rich biodiversity Periodical field surveys were carried out and the carotenoids and polyphenols were estimated. It was found that the carotenoid content was maximum in Astrella angusta and minimum in Targionia hypophylla and polyphenol content was highest in Anthoceros erectus as the growth increases.

I. INTRODUCTION

Lower plants are used as an alternative source of food when there is food shortage as these plants are rich in vitamins proteins and minerals. These plants contain pools of secondary metabolites like phenols, flavonoids which are unique phytochemicalsBryophytes are the oldest and are the second largest phylum of land plants. They grow in a variety of habitats and possess dominant leafy or thallloid plant body and not much is known about the role of bryophytes.

Carotenoids are organic pigments that are found in the chloroplasts and chromoplasts of plants and some photosynthetic organisms. Carotenoids other are widespread in plants and in photosynthetic bacteria and two essential functions are served by them. First, they can contribute to photosynthesis. They do this by transferring some of the light_energy they absorb to chlorophylls, which then use this energy to drive photosynthesis. Second, they can protect plants which are over-exposed to sunlight.

Polyphenols are a group of chemical substances which are widespread found in plants characterized by the presence of more than one phenol units or building blocks per molecule and are of great significance. They are generally divided into hydrolysable tannis and phenyl propanoids such as lignin flavonoids which induce several thousand compounds. The most abundant polyphenols are the condensed tannins found in all families of plants and comprise in upto 50% of the dry weight of the leaves. Phenolic compounds are plant secondary metabolites that constitute one of the most common and widespread groups of substances in plants. As stated by Harborne (1989), the term "phenolic" or "polyphenol" can be precisely defined chemically as a substance which possesses an aromatic ring bearing one (phenol) or more (polyphenol) hydroxyl substituents, including functional derivatives (esters, methyl ethers, glycosides, etc.): as a general rule, the terms phenolics and polyphenols refer to all secondary natural metabolites arising biogenetically shikimate-phenylpropanoids-flavonoids from the pathways, producing monomeric and polymeric phenols and polyphenols. Phenol itself is a natural product but most phenolics have two or more hydroxyl groups. Unless they are completely esterified, etherified or glycosylated, plant phenolics are normally soluble in polar organic solvents.

Plants need phenolic compounds for pigmentation, growth, reproduction, resistance to pathogens and for many other functions. These compounds form one of the main classes of secondary metabolites.

Bryophytes are regular producers of polyphenols including flavonoids, but it is in the vascular plants that the full range of polyphenols is found.

Generally, the role of phenolic compounds in defence is related to their antibiotic, antinutritional or unpalatable properties. Besides their involvement in plant- animal and/or plant-microorganism relationships, plant phenolics have also key roles as the major red, blue and purple pigments, as antioxidants and metal chelators, as signalling agents both above and below ground between plant and other organisms, and as UV light screens.

II. MATERIAL AND METHODS

The different bryophytes like *Anthoceros, Astrella, cyathodium, Plagiochasma* and *Targionia* were collected from Malavali area of Lonavala identified and brought to the laboratory. Theywere thoroughly and used for estimation of carotenoids and polyphenols. The total carotenoids were determined according to Kirk and Allen(1965)and estimated according to the method of Liaasen and Jensen (1971)the total polyphenols were estimated according to Folin and Denis (1915).

III. RESULTS & DISCUSSIONS

In the present study the carotene content is maximum in *Asterella* followed by *Anthoceros, Cyathodium, Plagiochasma* minimum in *Targionia* and as the growth period goes on increasing the carotene content decreases. Fig 1

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Sawant U.J 2012 has observed the carotenoid content of the bryophytes Anthocerous, Astrella, Cyathodium, Plagiocasma and Targiniaand is between 7.79 - 10.16 mg/100g fresh weight CerdBendzetal 1968 have isolated 10 carotenoids from Fontenalisantipyretica. N pandey and singh have carried out the pigment concentration of 10 bryophytes from NainitalKumaun and they are of the opinion that there was remarkable difference among liverwoods and mosses as the study was carried out during the rainy season Karunen&Ihantola 1977 have found the carotenoid content of more than 60 species and their content was 555.98 \pm 11.6 µg/g leaves the carotenoid concentration of 10 bryophytes ranged from 0.87 - 2.44 mg/g and this concentration was low relative to values reported for higher plants by Paul etal1977 and they are of the opinion that bryophytes thriving in dark accumulated more carotenoids which is similar to the present work Mariannetal 2004 have worked on 39 species of mosses and 16 species of liverwoods and found that the carretenoid content was 4.79 upon 6.75. B. Czeczuga 1987 has studied the carotenoid content in leaves of mosses grown under various light intensities and concluded that the total carotenoid content is increased in the plants growing in the shade indicating that carotenoid play a significant role as antenna absorbing light in the plants Our studies have also revealed that the carotenoid content is maximum in rainy season that is when the

plants grow in the shade in the months of August, September, October which is similar to the above study

The polyphenol content of Anthocerous, Astrella, Cyathodium, Plagiocasma and Targiniais depicted in fig 2 The polyphenol content has shown a decrease in the month of September but slightly increases in October Cythodium shows maximum content of polyphenols followed by plagiochasma and Targionia Sawant U.J. has also observed the concentration of polypheonols was highest in plagiochasma the carotenoids content of these bryophytes was in between 7.79-10.16 mg/100g weight.Manoj and Murugan in 2011 have observed that a pool of phenolic acids in liverwort plagiochilaSteph phenols and flavonoids were found to be present in high levels total phenol content was shown to provide the highest correlation with FRAP assay They have observed a positive correlation between the phenolic acids andtotal phenols I the plants suggesting their role as processor of many of the secondary metabolites linnacuate, coumarate, gallate, ferulate and hydroxyl lxezeent has proven antioxidant significance of plant

Similarly phenols alter the permeability of the membrane that could result in the coupling of oxidative phosphorylation, inhibition of active transport and loss of metabolites due to membrane damage

They are of opinion that P. beddomei is a potentially valuble source of bioactive material which will be expected to protect peroxidative damage in living systems in relation to ageng and carcinogenous by the additive roles of natural antioxidaunts like phenolics and flavonoids

Polyphenols and terpenoids were observed in the sp. Of bryophytes by Marko etal2001 in polytrictummarchantia according to Ding 1982 nearly 40 bryophytes containing secondary metabolites polyphenols are used as crude drugs by Chinese people and they have isolated the chemical constituents from bryophytes Kruse etal 2001 have found the most important allelocheminclude phynoliccopoundflyonidsterpenoids alkaloids steroids carbohydrates and amino acids. Plant secondary metabolides are of great significance in plant development they are involved in diverse processes they serve as flower pigments act as constitutive protection agents against invading organism function as signal molecules act as allelophaticcompunds and affect cell and plant growth (Macowe and Ndakidenii 2007

Bryophytes as a pontential source of medicinal compounds Pregledniclasale- Review UD

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