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NOTE

Comparative Study of the Terpenoid Compositions of Himalayan Thalloid Liverworts

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Himalayan liverworts (Order Marcantiales) were collected from Nainital and adjoining areas (height: 2000 m) during July to October. The present work on six liverworts is a comparative study of their terpenoid compositions. *Wiesnerella denudata* (Schiffn.), *Cryptomitrium himalayanse* (Kash.) and *Conocephalum conicum* (L. Dum.) are rich in monoterpenoids (hydrocarbons, alcohols and esters) which are repsonsible for their pleasant fragrance. *Plagiochasma appendiculatum* (L. et L.), *Asterella wallichiana* (Lehm. et Lindb.) and *Targionia hyphophylla* (L.) have pleasant smelling sesquiterpenoids, sesquiterpene alcohols in particular. *Asterella wallichiana* has sesquiterpene alcohols as most exclusive constituents. *Wiesnerella denudata* and *Targionia hypophylla* possess sesquiterpene lactones. the wide occurrence of terpenoids offers considerable scope for their use.

The Kumaun region with diversified microclimate has favoured the growth of rich and varied bryoflora. Bryophytes are a crucial component of the mountainous ecosystem and are spread practically over all the habitat from the foot halls to the Alpine region. They are small rather inconspicuous green plants that would be noticed with difficulty. They usually grow in tufts and cushions contributing much as a whole to the green colour of the mountainous forests and moors especially in the rainy season[1].

Some liverworts produce bis-(bi-benzyls) group, known to possess anticancer, antitumour activity[2]. Some liverworts also display antimicrobial activity, both fungal and antibacterial activity, possibly because of terpenoids. This prompted us to screen these species for their terpenoid constituents. In addition, these possess antifeedant, molluscicidal and pesticidal activity[3,4]. The liverworts containing pungent substances also possess strong hemolytic activity. A few liverworts also exhibit vasopressin antagonist and cardiotonic activity[5]. Some liverworts produce allelo-chemicals which exhibit plant growth regulatory activity[6].

Six thalloid liverworts belonging to the Order Marcantiales taken for their

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chemical analysis are: (i) *Plagiochasma appendiculatum* (L. et L.), (ii) *Asterella wallichiana* (Lehm. et Lindb.) Grolle, (iii) *Wiesnerella denudata* (Schiffn.), (iv) *Targionia hypophylla* (L.), (v) *Cryptomitrium himalayanse* (Kash.) and (vi) *Conocephalum conicum* (L. Dum.).

The thalloid liverwort plant materials were collected from Nainital area (north-western Himalaya), height approx. 2000 m, during the period of July to October 1998. Identification of plant materials was confirmed from Botanical Survey of India, Dehradun. The plant materials were first freed from other mixings and washed with distilled water. The fresh plant materials were subjected to steam distillation separately using copper electric still. The distillates were saturated from NaCl and the oil was extracted with n-hexane and dichloromethane. The organic phases were dried over Na_2SO_4 and the solvent removed using rota vap. at 25°C. The GC and GC/MS of the oil samples were done using fused silica capillary column DB-5 (50 m × 0.25 mm) in a Hewlett Packard make GC and GC/MS using Flame Ionisation Detector. The column temperature was progammed at 3° per minute from 60 to 240°C. The mass spectra corresponding to GC peaks were scanned at 70 eV under EI conditions.

The comparative study on terpenoid compositions of six liverworts collected from Nainital and adjoining areas was done by their GC and GC/MS data. The comparative study of terpenoids composition of the essential oils of these thalloid liverworts is given in Table-1.

TABLE-1
COMPARATIVE TERPENOID COMPOSITIONS OF SIX HIMALAYAN THALLOID LIVERWORTS

Name of the plant species	% Monoterpenes				% Sesquiterpenes			
	hydro-carbons	alco-hols	esters	carbonyl compounds	hydro-carbons	alco-hols	carbonyl compounds	lactones
Plagiochasma appendiculatum (L. et L.)	1.3	4.4	6.7	–	19.0	31.2	38.4	–
Asterella wallichiana (Lehm. et Lindb.)	2.6	7.4	6.5	–	4.3	75.9	4.3	–
Wiesnerella denudata (schiffn.)	12.7	9.4	42.1	–	7.6	6.7	–	21.5
Targionia hypophylla (L.)	5.2	4.3	21.6	3.9	13.4	24.5	–	27.8
Cryptomitrium himalayanse (Kash.)	10.3	46.0	22.4	5.2	9.8	6.9	–	–
Conocephalum concum (L. Dum)	24.3	3.1	66.0		2.8	4.2	–	–

Wiesnerella denudata (Schiffn.), *Cryptomitrium himalayanse* (Kash.), and *Conocephalum conicum* (L. Dum.) are rich in monoterpenoids (hydrocarbons, alcohols and esters) which are responsible for their pleasant fragrance.

Plagiochasma appendiculatum (L. et L.), *Asterella wallichiana* (Lehm. et Lindb.) and *Targionia hypyophylla* (L.) have pleasant smelling sesquiterpenoids, sesquiterpene alcohols in particular. *Asterella wallichiana* has sesquiterpene alcohols as most exclusive constituents. *Wiesnerella denudata* and *Targionia hypophylla* possess sesquiterpene lactones. The wide variety of terpenoids offer considerable scope for the use of these plants as chemosystematic markers and biosynthetic studies.

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