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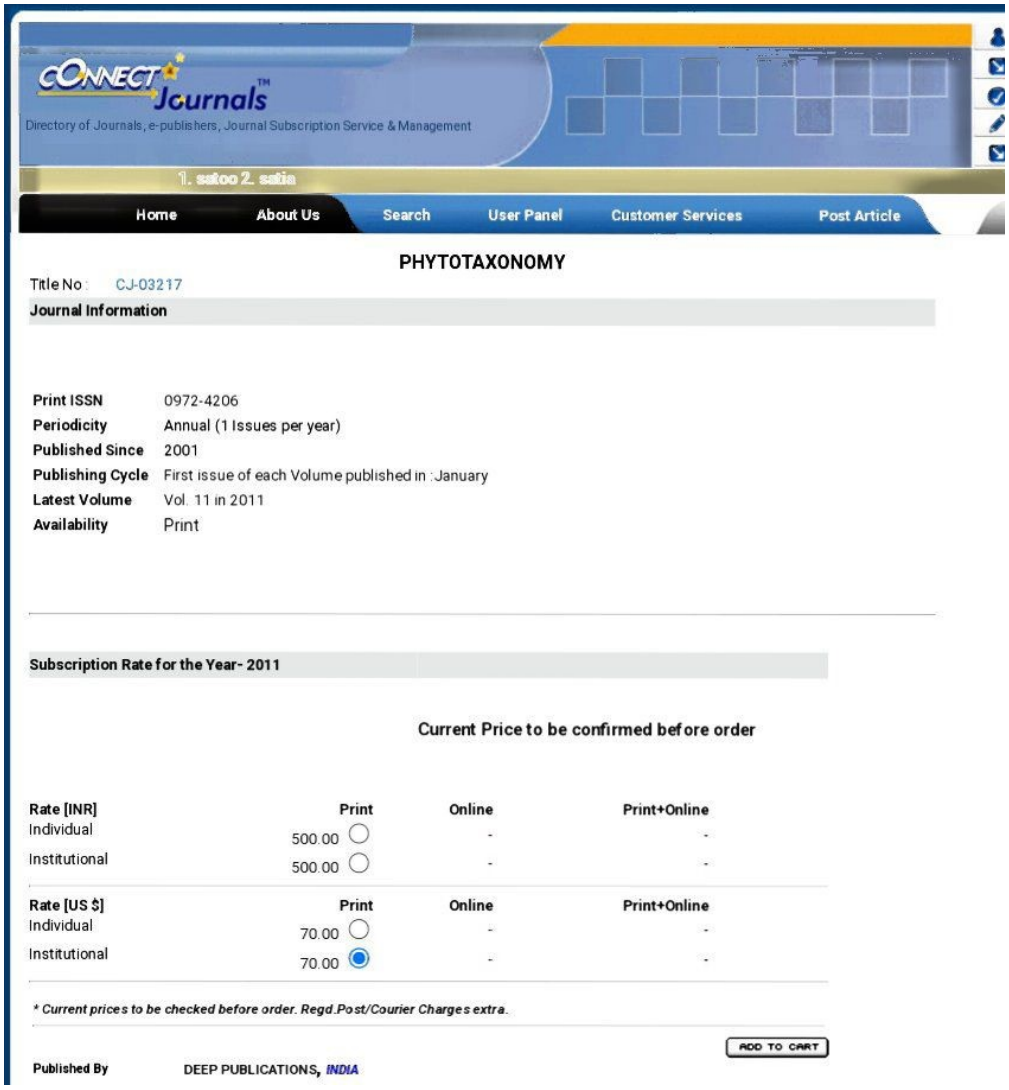

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PHYTOTAXONOMY

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PHYTOTAXONOMY
Vol. 17, 2017. pp. 74-80 Date of Pu

Checklist of Bryophytes of Pantnagar, Uttarakhand, I

**Preeti Chaturvedi[1*], Divyansh Panthri[1], Sheetal Rana[1], Vidisha Kandp
Geetanjali Mehra[1], D. S. Rawat[1] and S. D. Tewari[3]**

[1]Department of Biological Sciences, G.B. Pant University of Agriculture & Techn
Pantnagar-263145, Uttarakhand (India) *E-mail: an_priti@yahoo.co.in
[2]Forest Research Institute, Dehradun, Uttarakhand
[3]Department of Botany, Mahila Mahavidyalaya, Haldwani (Nainital), Uttarakha

The present study provides an enumeration of the bryoflora of Pantnagar region locat
of Uttarakhand state. In the investigation a total of 34 species have been reported belongi
classes, four subclasses, eight orders, 14 families and 22 genera. Out of these, liverworts are
by six species, hornworts by one species and mosses by 27 species. In mosses, two f
Pottiaceae and Bryaceae are reported dominant in the area with 10 and seven species r
whereas liverworts are dominated by Ricciaceae. *Riccia, Gemmabryum, Hydrogonium, Fi
Physcomitrium* are some dominant genera in the area.

Key Words: Bryophytes; mosses; liverworts; hornworts; Pantnagar; Utt

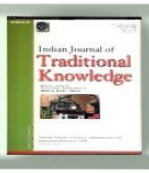
Introduction

Bryophytes are the small, gametophytically dominant, non- vascular plants not exceeding 75 cm in length. Plants are moisture loving found mostly at the sites where water is readily available. Bryophytes are classified into three phyla *viz.* Marchantiophyta (liverworts), Anthocerotophyta (hornworts) and Bryophyta (mosses). According to The Plant List (2013), bryophytes are the second largest group of plant kingdom consisting of 34,556 accepted species in 177 families and 1822 genera. According to Christenhusz and Byng (2016), bryophytes are represented by ca 9,000 liverworts, ca 225 hornworts and 12,700 mosses. Soderstrom *et al.* (2016) reported 7486 species in 398 genera representing 92 families from liverwort and hornwort group of bryophytes in the world. According to 'Plant Discoveries 2016' published by BSI (Singh & Dash, 2017) the bryophytes in India comprise of 2748 species, including 1818 species of mosses, 891 species of liverworts and 39 species of hornworts. Recently, Singh *et al.* (2016) reported 56 families,

Udham Singh Nagar of Uttarakl
town famous for its Agricultur
spread over 40.54 km² of area. In
integrated industrial area has be
the campus. Geographically, Pant
the Longitudes E 79° 28' 33" -
Latitudes N 28° 59' 36" - 29° 2'
ranges between 213 – 238 m ab
The climate of the region is hum
nearby places like famous hill st
other hilly areas of Kumaun re
surrounded by Tanda forest rang
submontane seasonal broad leaf
in Pantnagar, there are no natura
as maximum area is under cultiv
seasonal rivulets, *viz.*, Chakfe
through Pantnagar. Overall, clim
subtropical and rainfall is mai
monsoon currents with maximum
June to September as ob
meteorological observatory of th
soil type of the region is silty clay

2018

Dr. S. D. Tewari



Indian Journal of Traditional Know

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Indian Journal of Traditional Knowledge (IJTK)

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Indian Journal of Traditional Knowledge
Vol. 17 (4), October 2018, pp 763-769

Antibacterial activity of *Marchantia papillata* Raddi subsp. *grossibarba* (Steph.) Bischl. against *Staphylococcus aureus*

Kavita Negi[a]*, SD Tewari[b] & Preeti Chaturvedi[c]

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Staphylococcus aureus is a universally identified gram positive bacteria causing boils, carbuncles, skin infections or abscess, involving muscle or bone, and can easily disseminate even to the lungs or affect heart valves. The prolonged use of synthetic drugs like methicillin and cephalosporin have led to development of resistance in *S. aureus*. The present study aims to search for a natural and potent antimicrobial agent by validating the use of some traditionally used Bryophytes applying standard antimicrobial assays along with chemical characterization of important antibacterial compounds. Crude methanol/ethanol and acetone extracts of six Bryophyte species; collected from different regions of Kumaon hills (belonging to five different families), viz. *Conocephalum conicum* (L.) Underw, *Marchantia papillata* Raddi subsp. *grossibarba* (Steph.) Bischl. (syn. *Marchantia palmata* Reinw., Nees & Blume), *Reboulia hemispherica* L. Raddi, *Asterella wallichiana* (Lehm.) Grolle, *Anaectangium thomsonii* Mitt. and *Funaria hygrometrica* Hedw; were prepared and screened for antibacterial activities by determining minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC). The experiment showed that the six Bryophyte species had significant antibacterial activities against *S. aureus* with MIC and MBC ranging from 0.97 to 31.25 µg/mL and 1.95 to 125 µg/mL, respectively. Ethanol extract of *M. papillata* showed highest zone of inhibition (ZI=31±0.57 mm) with 0.97 µg/mL MIC and 1.95 µg/mL MBC and the ZI of its ethanol extract was found superior over the ZI of used antibiotics, viz. streptomycin and choloramphenicol. GC-MS data obtained from its ethanol extract showed a high percentage of sesquiterpenes/diterpenes (8.18 %), steroids (11.52 %), fatty acids (31.77 %) and alcohol derivatives (1.46 %) attributing to its antibacterial potential. Besides, a specific marker compound of liverwort-riccardin C (2.46 %), was also detected in *M. papillata*.

Keywords: Antibacterial, *Staphylococcus aureus*, *Marchantia papillata*, *M. palmata*, Riccardin C, *Bhotia*, *Raji*, *Tharus*, *Boxas*, *Khamti* tribes

IPC Int. Cl.[8]: A61K 36/00, A61K 36/10, A61K 39/40, A61K 39/02, A61K 39/116, C12R 1/445

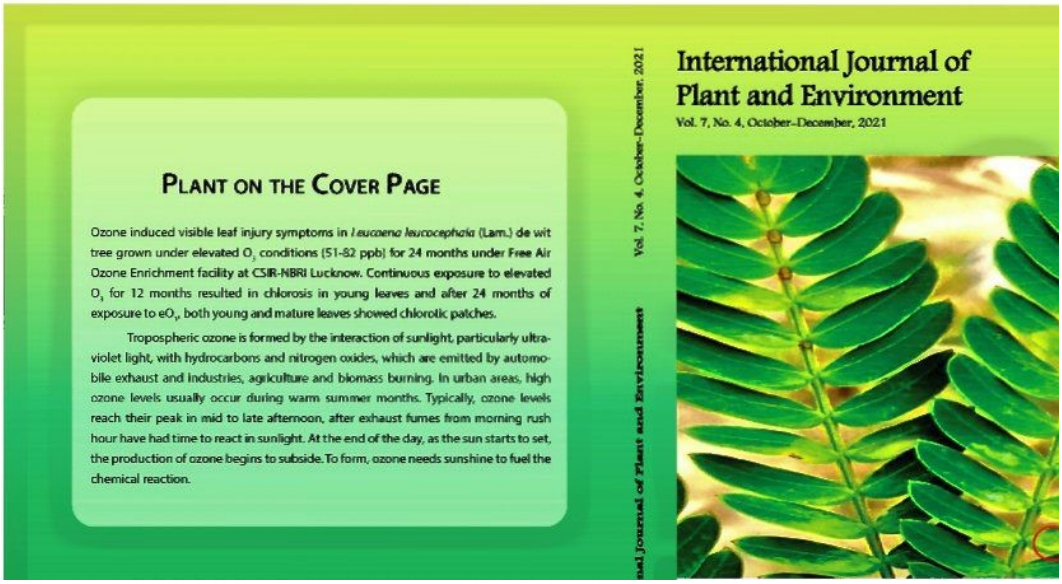
Methicillin resistant *Staphylococcus aureus* (MRSA) is endemic in India and is a dangerous pathogen of hospital acquired infections[1,2]. *S. aureus* infections initially begin as minor boils or abscesses leading to severe infections of the soft tissues, bones, joints and even heart valves[3]. Antibiotics (Teicoplanin, linezolid, arbekacin, daptomycin)[4] and amikacin[5] are typically used to treat MRSA infections. Several first and second line antibiotics, viz. methicilin, penicillin, vancomycin and tetracycline are rapidly becoming ineffective for treatment of *S. aureus* infections due to emergence of resistance[6]. To overcome the problem of rising resistance as well as controlling the side effects of drugs, demand for safer and cheaper plant based therapeutics is rising. Traditional medicine continues to provide health coverage for over 80 % of the world's population, especially in the developing world[7]. Most of the natural plant products that are in use worldwide are obtained from seed bearing plants. Spore bearing plants like bryophytes are relatively unexplored and underutilized.

Interestingly, this group is the first land inhabiting group of non-vascular plants showing predominance of gametophytic phase in the life cycle. The plants are highly desiccation tolerant owing to its unique structure and chemistry. There are reports of Bryophytes being used as traditional medicine for treatment of boils or abscesses by some Indian tribes who are acquainted with the superior antibiotic property of the Bryophytes by word of mouth from

*Corresponding author

2018

Dr. S. D. Tewari



International Journal of Plant and Environment
Vol. 4, No. 2 (July, 2018), 81-87

In vitro conservation strategy for endemic and endangered Hima *Stephensoniella brevipedunculata* Kashyap (Marchantiophyta)

A.K. Asthana[1]*, S.D. Tewari[2], Vishwa Jyotsna Singh[1], Isha Pathak[1] and Vinay Sahu[1]

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Marchantiophyta
Stephensoniella brevipedunculata

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E-mail:drakasthana@rediffmail.com

Abstract

During the present study an effort has been made t endangered and endemic Himalayan liverwort *Stephe* Kashyap using different culture media under controll Axenic cultures of the taxon have been established usin combinations of media with Full Strength Knop's mac Knop's macronutrients; Half-strength Knop's macror strength Knop's macronutrients + 0.2 mg L^{-1} IBA + 0.1 Knop's macronutrients + 0.1 mg L^{-1} Kinetin + 0.1 mg L^{-1} macronutrients + 0.1 mg L^{-1} IBA + 0.2 mg L^{-1} BAP and mixture were used for culture. The best growth was ob 2 basal salt mixture medium, in which dichotomously b successfully formed. Subsequently healthy population been raised on soil in pots for the first time.

1. Introduction

Stephensoniella brevipedunculata Kashyap was instituted by Kashyap nearly a Century ago as a monotypic and endemic species from the western Himalayas in India, however in a recent phylogenetic study of the complex thalloid liverworts by Villarreal *et al.* (2015) and Long *et al.* (2016), the genus *Stephensoniella* Kashyap has been transferred under genus *Exormotheca* Mitten in the family Exormothecaceae. But the morphological data are so strong and valid to maintain the genus *Stephensoniella* as such and is being treated as it is. Since its inception it was known only from western and North western Himalaya (Himachal Pradesh, Jammu and Kashmir and Uttarakhand) in some restricted pockets only (Kahyap, 1914; Mehra and Mehra, 1939; Udar *et al.*, 1983, Pant *et al.*, 1994; Singh, 1997; Sharma *et al.*, 2011; Awasthi and Pande, through tubers in nature imposes s dispersal and expanse to wider area. which are responsible for endangere collection, pollution due to urbaniz movement and also some natural dist grazing etc. Various workers from t detailed study on endangered bryo Kachroo, 1952; Udar *et al.*, 1983; Aw The spore germination study on thi done by Mehra and Kachroo (1952). organs and show more compact arr rhizoids (Udar *et al.*, 1983). During th has been made to propagate the plan culture media under controlled Labor study, semidried plants of *S. brevipe*

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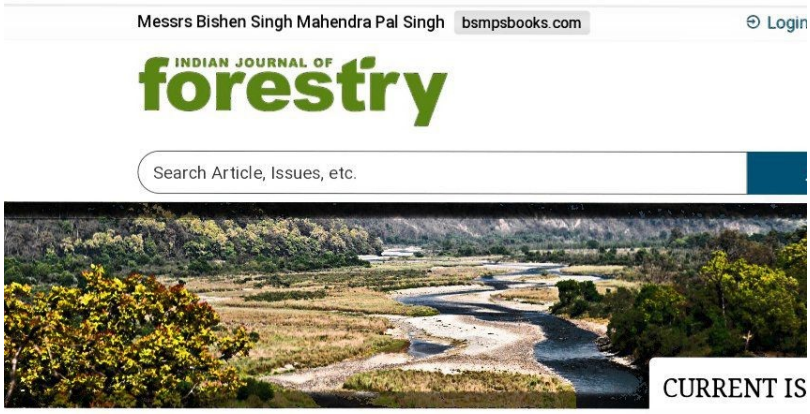
Dr. Prachi Joshi



Indian Journal of Forestry

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Indian Journal of Forestry 41(4) 397-402, 2018

Assessment of Biomass and Carbon Stock of planted teak Terai region of Kumaun Himalaya, India

Tanuja Gahlot, Prachi Joshi and Y.S. Rawat

ABSTRACT: The ability of forests in atmospheric carbon sequestration is increasingly gaining attention. Present st the estimation of biomass and carbon stock of the teak plantation in the terai central forest division in Kumaun, Utt of India. Very few scientific studies were done regarding the teak plantation and the estimation of its biomass in Kum this study was carried out in this region to assess the role played by teak plantation in climate change. The informa the changes in pattern of carbon storage is vital and important because it can be used by government and policyma the deposit pattern for changing climate. Three sites i.e., Kamola block (Site I), Kamola beat (Site II) and East Gada III) were selected for the study. Large scale variations in biomass and carbon stock were noted among all three sites Gadappu) showed the maximum biomass and carbon stock (297.03 tha^{-1} and 143.18 tha^{-1}) followed by site I (Kamola tha^{-1}and 117.27 t ha^{-1}) and site II (Kamola beat) (175.76 t ha^{-1}and 85.79 t ha^{-1}). Although stand density and total ba forest showed almost similar value on all three sites. still the differences in biomass and carbon stock at all sites indicat contribution of biodiversity as shown in the results and negative implications of human disturbance to the forest.

KEYWORDS: Density. Total basal area, Biodiversity, Carbon dioxide, Ecosystem and Conservation, Kumaun Himalaya.

INTRODUCTION

Biomass studies are important for studying the productivity, nutrient cycling and their potential in effective management of forest plantation. Biomass is a major source of energy for nearly 50% of world's population (Karekezi & Kithyoma, 2006). According to Turner and Cole (1973), estimates of forest biomass and its distribution is essential for understanding many aspects of forest ecology and ecosystem dynamics as they provide basis for determination of productivity, energy flow and chemical composition in mineral cycling studies. The value of biomass of trees gives the direct idea of the productivity of forests. Total biomass productivity and percentage contribution of each tree component vary with forest type, species, density, age, site condition and management practices (Ola-Adams 1993). Forest biomass assessment (Brown & Lugo 1984), its spatial distribution (Brown et al. 1999), its changes over time (Richards & Flint 1994), and strategies to increase the production and conservation of biomass (Schlamadinger & Marland, 1996; Marland, 1997) have therefore initiated

timber yielding species. It covers 75% o quality tropical hardwood plantations (terms of plantation area established wor third among tropical hardwood species, co hectare (Krishnapillay, 2000). It also h carbon in its biomass for long lived pool. equations for quantification of tree's vol carbon stock is really vital to understand that tree on climate change mitigation eff fast-growing tree species and is commonly programme. According to findings of a st Ecological Education and Research (GEE species which has the highest contribution atmospheric carbon in India and it absorbs CO_2 from the atmosphere. The potential of accumulating carbon and storing it in its bi most recommended species for afforestatio releases the pressure of deforestation for impose on natural forest. Information

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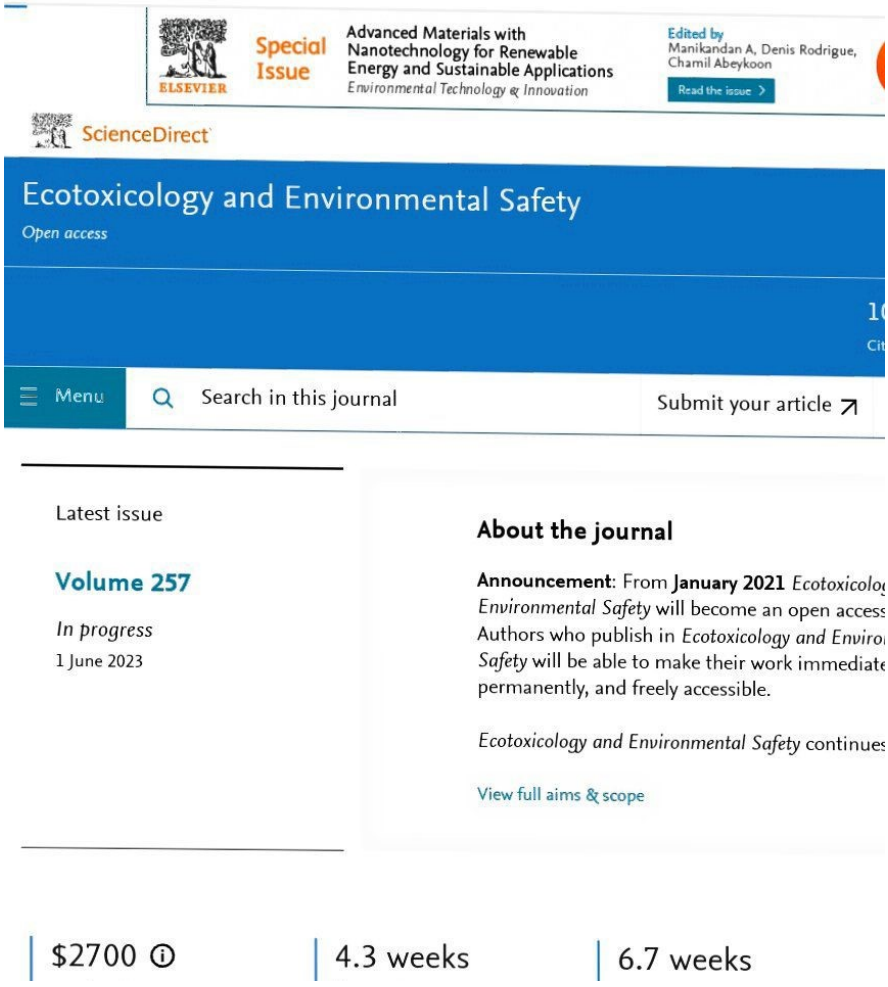
Dr. Saraswati Bisht



Ecotoxicology and Environmental Safety 195 (2020) 110480

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Yeast strain *Debaryomyces hansenii* for amelioration of arsenic stress in rice

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*ars*R gene
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Plant growth promotion

ABSTRACT

Arsenic (As) is a serious threat for environment and human health. Rice, the main staple crop is more prone to As uptake. Bioremediation strategies with heavy metal tolerant rhizobacteria are well known. The main objective of the study was to characterize arsenic-resistant yeast strains, capable of mitigating arsenic stress in rice. Three yeast strains identified as *Debaryomyces hansenii* (NBRI-Sh2.11), *Candida tropicalis* (NBRI-B3.4) and *Candida dubliniensis* (NBRI-3.5) were found to have As reductase activity. *D. hansenii* with higher As tolerance has As expulsion ability as compared to other two strains. Inoculation of *D. hansenii* showed improved detoxification through scavenging of reactive oxygen species (ROS) by the modulation of SOD and APX activity under As stress condition in rice. Modulation of defense responsive gene (NADPH, GST, GR) along with *ars*R and metal cation transporter are the probable mechanism of As detoxification as evident with improved membrane (electrolyte leakage) stability. Reduced grain As (−40% reduction) due to interaction with *D. hansenii* (NBRI-Sh2.11) further validated it's As mitigation property in rice. To the best of our knowledge *D. hansenii* has been reported for the first time for arsenic stress mitigation in rice with improved growth and nutrient status of the plant.

1. Introduction

Arsenic (As), a group I carcinogen is toxic to all forms of life. It has been considered as one of the major global environmental pollutant due to its predominant occurrence in the form of arsenite (As III) and arsenate (As V). The metalloid enters the farming system through natural geochemical processes, use of As-based pesticides, combustion of fossil fuels and irrigation with As-contaminated groundwater (Smedley and Kinniburgh, 2002; Meharg and Hartley-Whitaker, 2002; Wang and Mulligan, 2006).

Rice is the main staple food for about half of the world's population. However, millions of people are at risk of As poisoning due to consumption of rice and rice based products (Meharg and Rahman, 2003; Awasthi et al., 2017). Rice accumulates arsenic more efficiently than other crops due to its requirement for excess water, which facilitates the conversion of stable and bound forms of arsenic into more mobile arsenate (As V) and arsenite (As III) forms (Williams et al., 2009; Su et al., 2010; Xu et al., 2008; Stroud et al., 2011). Different strategies involving development of As tolerant varieties, transgenic, bioremediation and nutrient supplementation are being used for reduced arsenic uptake in rice (Zhao et al., 2009; Wu et al., 2011; Matsumoto et al., 2015; Shaibur et al., 2013). Roots, which act as interface for plant and soil, are the primary organ for acquisition of both metals and mineral nutrients. Different mineral nutrients (Fe, S, P, Si and Zn) are known to play an important role in decreasing As accumulation in edible plant parts either due to competition with their analogues or complexation with other metal ion (Dahlawi et al., 2018). Similarly, microbes present at rhizosphere are known to improve plant growth and development in heavy metal contaminated soils in various crops (Tripathi et al., 2013; Srivastava et al., 2011; Lampis et al., 2015; Ahmad et al., 2012; Dixit et al., 2015).

Several microorganisms belonging to different genera *viz. Aeromonas, Exiguobacterium, Acinetobacter, Bacillus, Pseudomonas, Acidithiobacillus, Deinococcus* and *Desulfitobacterium* are capable of

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Dr. Prachi Joshi

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On the behalf of **Tropical Plant Research**, I would like extend my regard to the all fellow researchers and scholars and wish prosperity in their field of research

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Research article

Stand structure and regeneration status of tree species in four major forest types along an altitudinal gradient in Kumaun Himalaya, Uttarakhand

Tanuja Gahlot[1]*, Prachi Joshi[1] and Y. S. Rawat[2]

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[Accepted: 10 April 2020]

Abstract: The present study was undertaken in four major forests (Teak forest, Sal forest, Pine forest and Oak forest) along an altitudinal gradient between altitude 300 m – 2080 m of Kumaun Himalaya. The total density and basal area of trees ranged between 470 ind. ha^{-1} and 916.67 ind. ha^{-1} and from 37.82 $m^2 ha^{-1}$ to 67.41 $m^2 ha^{-1}$ respectively. Maximum species richness for trees was reported at site KD (17) and minimum at site MG (7). The maximum beta diversity index was recorded for KD forest (5.46) and the minimum was reported for BP forest site (3.12). Regeneration status of forest sites varied from good regeneration to poor or no regeneration. Site MG was found very poor in regeneration. Proportionate distribution of trees, seedlings and saplings showed that site KD contained maximum density of seedlings in comparison with other sites. The minimum density of seedlings was recorded at site MG. This is due to heavy livestock grazing pressure at this site. The results of the study provide baseline data to conserve and recover different forests along the altitudinal gradient and will also help to formulate conservation strategies of forests in Himalaya.

Keywords: Altitudinal gradient - Beta diversity - Equitability indices - Species richness - Regeneration status.

[Cite as: Gahlot T, Joshi P & Rawat YS (2020) Stand structure and regeneration status of tree species in four major forest types along an altitudinal gradient in Kumaun Himalaya, Uttarakhand. *Tropical Plant Research* 7(1): 176–189]

INTRODUCTION

The ecosystems of Himalaya are rich in forest cover and biodiversity. Himalayan forests are crucial not only for the people living in Himalaya but also for many more living in the adjoining plains (Singh *et al.* 2014). Himalayan forests play an important role in tempering the inclemencies of the climate, cooling and purifying the atmosphere, protecting the soil, holding the hill-slopes in position, sequestering carbon, building up huge reserves of soil nutrients and providing numerous ecosystem services to mankind (Gairola *et al.* 2011). A great variety of forest types inhabit the Himalaya, ranging from dry deciduous forests in the subtropical foothills to evergreen coniferous forests in the subalpine zone (Vetaas & Chaudhary 1998). In the foothills of Kumaun Himalaya planted teak *Tectona grandis* L.f. and naturally occurring sal (*Shorea robusta* C.F. Gaertn.) forests are best-surviving forest communities. As we go high in the middle belt of Uttarakhand state in Kumaun western Himalaya, Pine (*Pinus roxburghii* Sarg.) and Oak (*Quercus* spp.) form the dominant forest vegetation and provide a range of ecosystem goods and services to the inhabitants (Joshi & Negi 2011). Understanding of the forest structure is a pre-requisite to describe various ecological processes and also to model the functioning and dynamics of forests (Elouard *et al.* 1997).

The regeneration pattern of any forest gives an idea of its future existence. The potential regeneration status of tree species often depicts the future composition of forests within a stand in space and time (Henle *et al.* 2004). Halle *et al.* (1978) described regeneration as the process of Sylvigenesis (forest building) by which trees and forest survives over time. Natural regeneration of the plant is a fundamental element for tropical forest ecosystem dynamics (Getachew *et al.* 2010, Sharma *et al.* 2014). An understanding of the processes that affect

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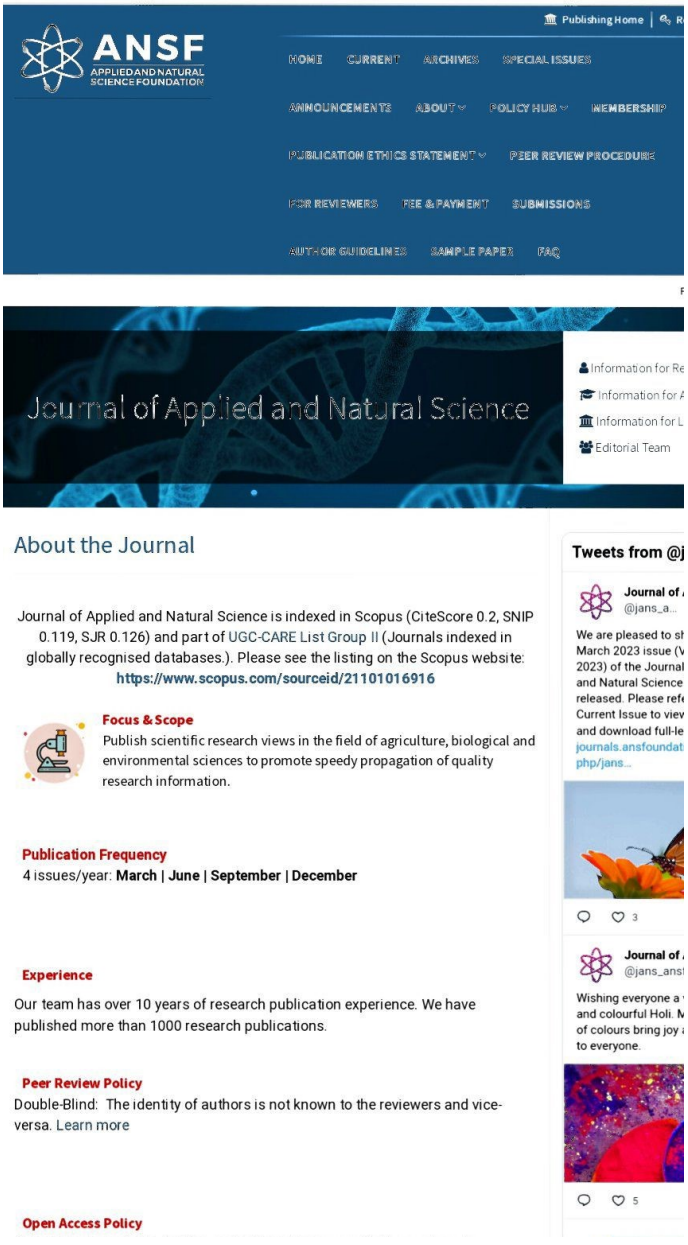
Dr. Saraswati Bisht



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Research Article

Diversity of water-borne conidial fungi in some freshwater bodies of Kumaun Himalaya in district Nainital (Uttarakhand), India

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Abstract
The aquatic ecosystem harbours a variety of micro-organisms, among which water-borne conidial fungi occupy an important place. Their occurrence in freshwater habitat has great significance in the decomposition of submerged plant materials, nutrient release and productivity. Their occurrence and frequency to extreme temperatures and pH may have a profound effect on fungal community composition and metabolic activities. The present paper deals with the diversity of conidial aquatic fungi from different unexplored freshwater bodies flowing through different elevations (1000-1500 m) in district Nainital, Kumaun Himalaya. Comparative study of species composition in different seasons, sporulation temperatures and pH conditions was also carried out. In all, 18 species of conidial fungi belonging to 14 genera were recorded, out of which maximum species (11 species) were recorded in both rainy (July to September) and winter seasons (November to December). *Anguillospora crassa, Beltrania rhombica, Campylospora chaetocladia, Cylindrocarpon aquaticum, Helicomyces roseus* and *Tetracladium setigerum* were isolated only during rainy season; *Alatospora acuminata, Clavariopsis aquatica, Clavatospora tentacula, Lemonniera pseudofloscula, L. terrestris* and *Tetrachaetum elegans* were isolated only during winter season while *Lunulospora curvula, L. cymbiformis, Setosynnema isthmosporum, Tetracladium marchalianum* and *Triscelophorus acuminatus* were isolated in both rainy and winter seasons. The preferred pH and the sporulation temperature ranged from 6-7 and 15-20 °C respectively. The results of the present study are clearly indicating fungal species composition variations along pH, temperature, seasonal and altitudinal gradients and the sites selected for this exploratory investigation are being undertaken for the first time.

Keywords: Aquatic ecosystems, Bio-monitors, Conidial fungi, Decomposition, Species composition

INTRODUCTION

Fungi inhabiting the submerged decomposed leaf litters in stream and river waters are referred to as aquatic hyphomycetes, freshwater hyphomycetes, amphibious hyphomycetes, Ingoldian fungi, water-borne conidial fungi etc. The pioneer studies of Professor C.T. Ingold (1942) were the most significant contributions to advert to these fungi. Water-borne conidial fungi are deutromycetous fungi characterized by producing distinctive shapes of conidia colonizing deciduous leaves, decaying in freshwater bodies (Ingold, 1975). The shapes of conidia and their attachment with conidiophores help in identification and characterization of these conidial fungi (Barlocher and Marvanova, 2010). The altitudinal and seasonal differences in diversity of these fungi may be due to physico-chemical properties of water, nutrient and substrate availability (Pant *et al.*, 2019). Environmental variables such as temperature and pH are also the dominant factors that affect the growth of these fungi (Duarte *et al.*, 2013; Bai et al., 2018). Their occurrence and frequency to extreme temperatures and pH may have a profound effect on fungal community composition and metabolic activities. For example, temperate species are found to survive at freezing temperatures and tropical species may survive at higher temperatures

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Dr. Tanuja Bisht

CHEMISTRY
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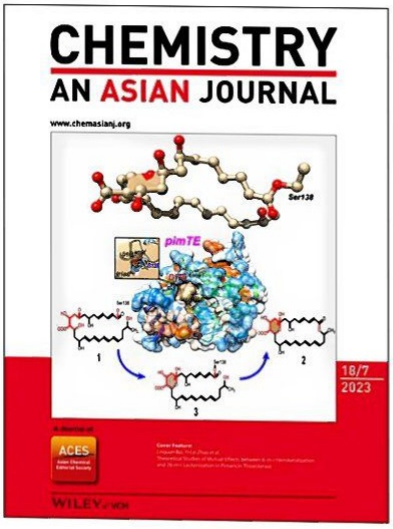

Cooperation between 6-m- hemiketalization and 26-m-r macrolactonization is report thioesterase (pimTE) in type- synthase. Intriguingly, the R- intermediate is not only cata D179 residue, but also twist substrate hairpin structure t lactonizing pre-reaction stat pimTE is believed to be a bif enzyme, which can synergist catalyze tandem 6-m-r and 2 formations during the main- of pimaricin biosynthesis. M information on this study ca the Research Article by Linq Lei Zhao et al.

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CHEMISTRY AN ASIAN JOURNAL Communication

A Hydrosilylation Approach to Silicon-Bridged Functional Dipyrromethanes: Introducing Silicon to A New Arena

Bhaskar Garg,*[a] Tanuja Bisht,[b] and Yong-Chien Ling[c]

Dedicated to Prof. S. M. S. Chauhan

Abstract: Two silylene-spaced ((*E*)-vinylsilyl)anthracene-dipyrromethane dyads have been designed and synthesized by $RhCl(PPh_3)_3$-catalyzed hydrosilylation reactions of 5-methyl-5′-(ethynylaryl)dipyrromethanes with (9-Anthryl)-dimethylsilane. The complexation studies of dyads toward different anions have also been performed, which reveal that dyads exhibit a highly selective response towards fluoride anion attributable to both hydrogen-bonding and pentacoordination phenomena. This dual-mode fluoride recognition event is unprecedented and may pave the way for future developments in the areas of porphyrinoids, organosilicon, polymer, and supramolecular chemistry.

Since the pioneer synthesis of first compound, tetraethyl silane, unarguably, the organosilicon chemistry has come a long way with all ups and downs, and currently, making a profound impact on both industrial and academic settings at the interface of synthetic organic chemistry, polymer chemistry, medicinal chemistry, materials science, and in the development of fluorescent sensors with improved biological attributes.[1,2] Fascinating this "aura" of organosilicon compounds and appreciable as this scientific progress are, studies pertaining synthetic pyrrolic systems within silicon domain are still very limited. Consequently, there remains an urgent need to develop new organosilicon compounds so that the ability of silicon to bridge the gap between different disciplines could be truly realized. In this context, the pyrrolic receptors such as dipyrromethanes (DPMs) are particularly appealing.

DPMs are of utmost importance in organic synthesis, namely, porphyrinogens and related macrocycles. Owing to the presence of two pyrrolic NHs as hydrogen bond donor sites, DPMs have emerged as versatile anion receptors either on their own or as building blocks within more complex settings such as calix[4]pyrroles (CPs).[3] Highly efficient organic reactions or diverse strategies have been extensively applied for many years as a powerful tool for structure modifications, and modulation of anion-binding properties of DPMs and CPs.[3–5] Undoubtedly, these intellectual efforts have transformed one's ability to better understand the chemistry of these pyrrolic systems as well as the concepts in supramolecular chemistry. Nevertheless, within this "tool box" of chemical functionalization of DPMs or CPs, an efficient reaction which has never received any attention as we think it merits is catalytic hydrosilylation reaction.[6] This scientific apathy has left the literature limited to only some elegant silicon complexes of DPMs and CP bearing N–Si bond.[7]

We initially envisioned that *meso*-substituted "two-wall" aryl extended CP with alkyne groups at aromatic walls[8] might serve as an embryonic system to incorporate silylene spacer between CP and an appropriate signaling motif, following hydrosilylation reaction. At this juncture, however, it would be worthwhile to emphasize that controlling the regiochemistry of alkyne hydrosilylation is especially challenging due to the formation of several isomers (Upper Panel, Scheme 1).[6b] Aside from that, the formation of stereoisomers of aryl-extended CPs in significantly low yields is another penalty essentially encountered in their synthesis.[5d,f,9] With such considerations in mind, 5,5′-alkylaryl DPMs, "better half" of aryl-extended CPs appeared quite attractive to us in order to develop a new class of silicon-containing synthetic pyrrolic receptors as well as to investigate the role of silicon atom on the anion-induced coordination events.

Herein, we report the synthesis, characterization, and anion-complexation properties of two novel Si-bridged anthracene-DPM dyads, **5a** and **5b**, that are to the best of our knowledge without precedent in the literature.

The structures and synthesis of target compounds **5** are outlined in Scheme 1. *Meso*-substituted DPMs **1** were prepared by minor modifications of known procedures.[8,10] **1**, in turn, could be carried on to the key-protected alkynyl derivatives **2** by exposure to an excess of alkynyl alcohol in TEA-toluene at 60 °C in the presence of $Pd(PPh_3)_2Cl_2$-CuI.[11] The deprotection of **2** with NaOH afforded moderately sensitive alkyne precursors **3a** and **3b** in 72% and 64% yields, respectively. **3a** and **3b** were kept at low temperature prior to use further. The synthesis of (*9-Anthryl*)-dimethylsilane precursor **4** was accomplished in two steps. Specifically, the lithiation of 9-bromoanthracene with *n*-BuLi at −78 °C followed by treatment with Me_2SiHCl in THF af-

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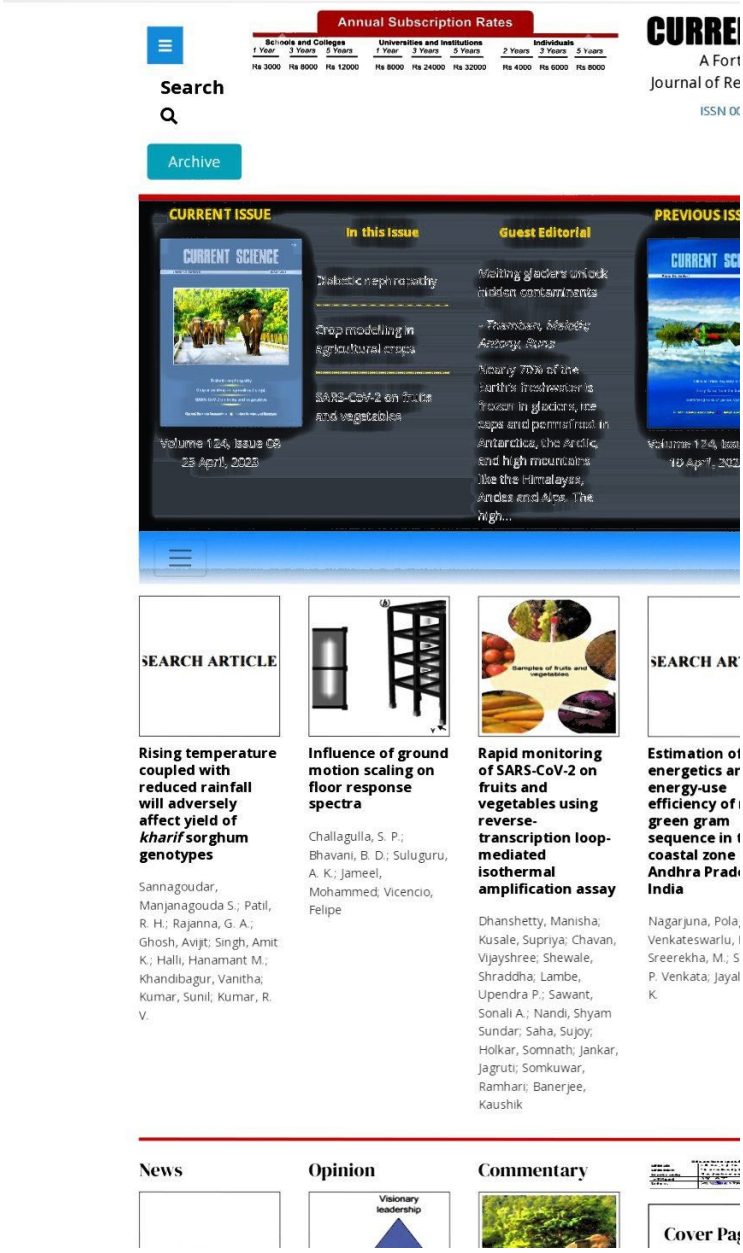
Dr. S. D. Tewari and Dr. Prachi Joshi



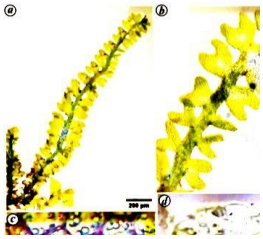
Gymnocolea (Dumort.) Dumort. (Anastrophyllaceae, Marchantiophyta) – a genus new to India

While studying the bryophytic vegetation of different forest types along an altitudinal gradient ranging from 500 to 2100 m in Nainital district, Uttarakhand, Western Himalaya, India, we came across an unique leafy liverwort *Gymnocolea* (Dumort.) Dumort. The name 'Gymnocolea' refers to the exposed position of the perianth exserted well above the two spreading bracts[1]. The presently reported leafy liverwort was found colonizing the shaded, mesic, basal side of *Shorea robusta* tree trunks in a west-facing sal forest area (29°19′1″N, 79°31′3″E; 691 m) along the Kathgodam–Ranibagh Road. Based on a survey of the literature regarding the occurrence and distribution of this Anastrophyllaceous leafy liverwort from 1932 till the present[2–6], it was concluded that this species has never been documented earlier from any part of the country. Here we report its occurrence in India from the Kumaun region of Western Himalaya.

Distinct dark green to blackish patches of the leafy liverwort were conspicuous on the wetter basal part of the sal tree trunks. On further examination, the species was identified as *Gymnocolea inflata*, commonly known as 'inflated notchwort'. It is noteworthy that copiously fruiting population of *G. inflata* was found in constant association with other leafy liverworts, namely *Lopholejeunea sikkemensis* Steph. and *Cololejeunea latilobula* (Herzog) Tixier. Amongst mosses, *Octoblepharum albidum* Hedw., *Fissidens laxitextus* Broth. ex Gangulee and *Herpetineuron toccoae* (Sull. & Lesq.) Cardot were predominantly observed as its close associates. The pH of the underlying substrate of *G. inflata* ranged from 5.0 to 6.5, and hence acidic.

Gymnocolea inflata (Huds.) Dumort., Recueil Observ. Jungerm. 17. 1835. *Jungermannia inflata* Huds., Fl. Angl. ed. 2: 511 1778.

two lateral rows, obliquely inserted especially near the bases of the shoots, where they become widely spaced, 0.18–0.24 × 0.17–0.18 mm, bilobed with a V-shaped sinus, lobes with obtuse apex, margin entire; apical leaf cells 16–24 × 13–20 µm; median leaf cells 23–29 × 16–20 µm, basal leaf cells 20–26 × 19–22 µm, trigones inconspicuous; oil-bodies 4–9 per cell (Figure 1 *c*). Underleaves absent. Gammae not seen. Dioicous. Male bracts in 4–6 pairs; antheridia brown, globose to subglobose with uniseriate stalk. Gynoecia terminal on the main shoot; bracts spreading; bracteole absent. Perianth cylindrical, 0.42 mm long, 0.28 mm wide, smooth, slightly plicate apically. Seta 0.9 mm long and 0.08 mm wide, several vertical cell rows thick with large outer cells encircling smaller inner cells; capsule ovoid to shortly cylindrical, 0.33 × 0.25 mm, wall two-layered; cells of outer capsule wall with nodular thickenings; those of inner layer of capsule wall with sinuate–nodulose thickenings on radial walls occasionally extending on the tangential walls as transverse bands. Spores yellowish-green, 13–16 µm in diameter,



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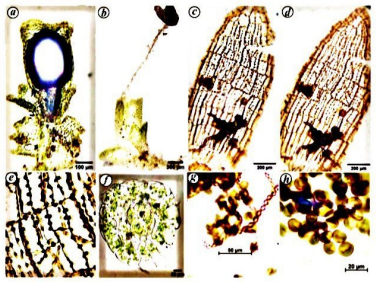

Figure 2. *G. inflata* (Huds.) Dumort. ***a***, A fertile shoot bearing gynoecium. ***b***, A mature sporophyte with elongated seta and dehisced capsule. ***c***, Outer capsule wall with nodular thickenings. ***d***, Inner capsule wall showing nodular and transverse thickenings. ***e***, Close-up of inner wall showing sinuate–nodulose thickenings. ***f***, Cross-section of seta. ***g***, Spores and elaters. ***h***, Spores.

Kathgodam–Ranibagh sal forest area, 640–800 m, 25/12/18: R.W1.23, R.W1.41, R.W1.42, R.W1.52; 26/1/19: R.W2.13, R.W2.17, R.W2.22; 12/8/2019: R.R.7, R.R.8, R.R.9, R.R.11, R.R.13, R.R.14, leg. S.D. Tewari & Richa Arya (Herbarium Department of Botany, Indira Priyadarshani Govt. P.G. Girl's College of Commerce, Haldwani; LWG).

Distribution: India (present study), Antarctica, Czech Republic, Denmark, Finland, Italy, Japan, Norway, Poland, Portugal, Russia, Sweden, Switzerland, Turkey and USA[7].

The present occurrence of *Gymnocolea* in India indicates the major range extension of this interesting leafy liverwort.

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Reproductive features of ornamental caridean shrimps und condition

Caridean shrimps are a large and diverse ing peculiar behaviour with other organ- reaches the zoe

2021

Dr. S. D. Tewari

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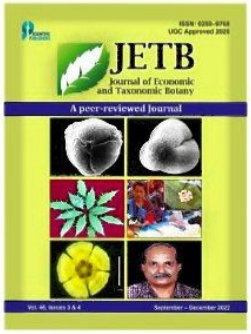

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APTYCHELLA PLANULA (BRYOPSIDA: PYLAISIADELPHACEAE) – AN TO THE WESTERN HIMALAYAN BRYOFLORA

Sapana Pant*, Manisha Bhandari, S.D. Tewari, Prachi Joshi, Neha Kohli and Nel

Department of Botany, Indira Priyadarshini Government Girls Post Graduate College of Commer
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*Email: *sapanapant2017@gmail.com*

Introduction

The Himalayas are the home of bryophytic wealth. Scanty information is available about the bryodiversity of the Western Himalayan region. Bahuguna *et al.* (2016) reported 113 species of 65 moss genera from the Kedarnath wildlife sanctuary in Garhwal Himalaya. The Tungnath forest area which endows enormous diversity of both liverworts and mosses has not been surveyed thoroughly though it was part of their study area. The bryophyte wealth of a ravishing natural beauty of the Tungnath area (2100–3800 m), Rudraprayag district, Garhwal region in Uttarakhand, was explored in collaboration with Govind Ballab Pant National Institute of Himalayan Environment and Development (GBPNIHESD), Kosi Katarmal, Almora. The specimens were collected from the flourishing bryophytic layer on the trunks and branches of trees and the thick, green carpet on the forest floor in different location. Among the collections, there was an interesting gemmiferous pleurocarpous moss, a species of *Clastobryopsis* M.Fleisch. (Musci Buitenzorg 4: 1179. 1923) which is now considered a synonym of *Aptychella* (Broth.) Herzog (Biblioth. Bot. 87: 157. 1916) of Pylaisiadelphaceae (Bryidae, Hypnales). The Asiatic epiphytic genus *Clastobryopsis* is treated as a synonym of *Aptychella* based on phylogenetic analyses of plastid (rpl16, rps4, and trnL-F) and mitochondrial (nad5) gene sequences as East Asiatic-Oceanic species, *A. p* Fleisch., is being reported here for the Western Himalayan region.

Material and methods

Bryophyte collection was made of August and September from differe way to Tungnath (30.4887° N, 79.217 altitude) and brought to the laboratory The pH of underlying substrate was meter. Temporary slides of leaves a prepared in 30% glycerine. Perma prepared using gum chloral as n (Watson, 1955). Different plant parts v and camera lucida drawings drawn. done with the help of the recent litera floras, and confirmed by experts. The (Ts 125-R) is deposited in the herb Department, I.P.G.G.P.G. College of Co (Nainital).

Taxonomic treatment

Aptychella planula (Mitt.) M. Fleisch. 4: 1671. 1923. *Stereodon planulus* Soc., Bot., Suppl. 1(2): 111. 18 *planula* (Mitt.) M. Fleisch., Mu

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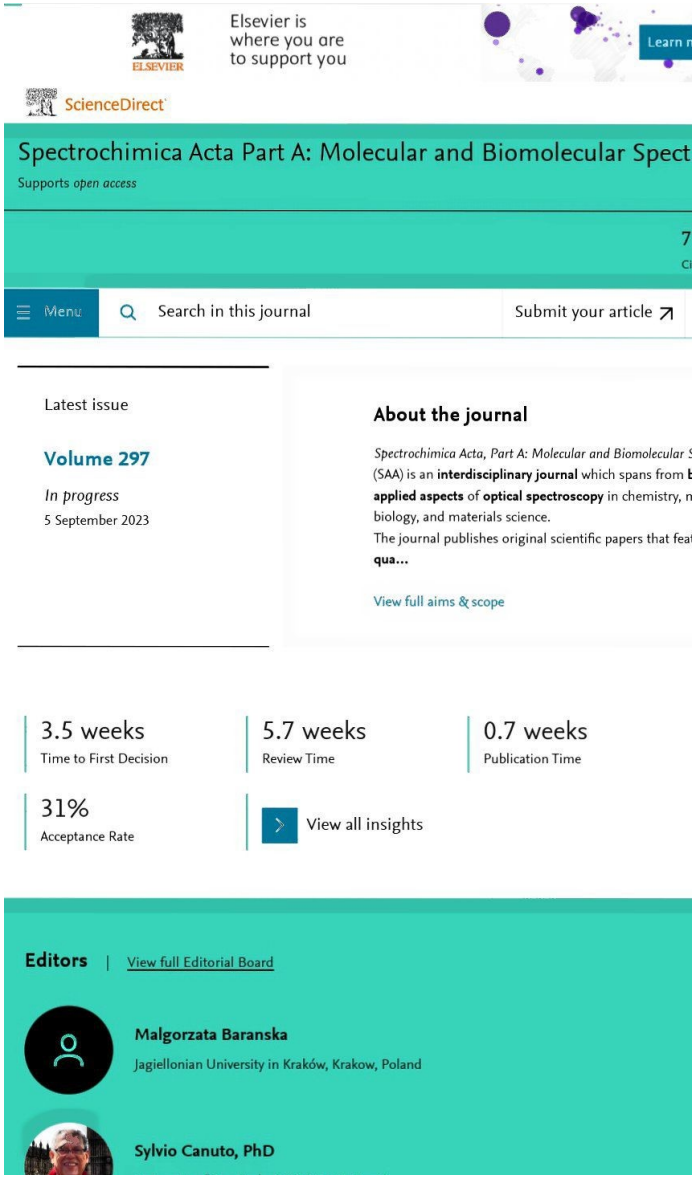
Dr. Tanuja Bisht



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Colorimetric recognition of hydrazine in aqueous solution by a bromophenol blue-tethered ion-pair-like ratiometric probe ☆

Bhaskar Garg [a], Tanuja Bisht [b], Yong-Chien Ling [a]

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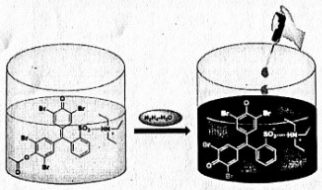
[b] Department of Chemistry, IPGGPG College of Commerce, Haldwani 263139, Uttarakhand, India

HIGHLIGHTS

- A novel design concept in chemodosimeters, an ion-pair-like, is introduced.
- The BPB-based ion-pair-like probe can function in a very high percentage of water.
- Probe can sense hydrazine in a colorimetric and ratiometric manner effectively.
- Probe offers a spectacular colour discrimination between N_2H_4 and NH_2OH.
- Probe can detect N_2H_4 in real samples with sufficient reliability and accuracy.

GRAPHICAL ABSTRACT



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Ratiometric probe

ABSTRACT

Hydrazine or hydrazine hydrate ($N_2H_4{\cdot}H_2O$) is a potential neurotoxin and has several mutagenic effects in physiological systems. Therefore, the development of synthetic organic probes that are sensitive and selective to hydrazine is of tremendous importance. Unfortunately, however, the hydrazine-selective sensing probes that rely upon minimum usage of the organic solvents (≤5%, v/v) are still rarer. In this work, an ion-pair-like mono acetate derivative of bromophenol blue has been developed as a fairly selective ratiometric probe for the naked-eye recognition of hydrazine in a solution of tris buffer and EtOH (19:1, v/v) at physiological pH. The chromogenic signalling relies upon hydrazine-induced cleavage of an ester moiety of the probe to its resonance stabilized quinonoid form, resulting in momentous variations in its spectrophotometric profile. Meanwhile, the colour of the probe solution changed from mustard yellow to blue within few minutes. This sensing assay could be successfully applied in the recognition of hydrazine in real environmental and pharmaceutical samples with satisfactory recoveries. Given the cost-effectiveness, simplicity and versatility, for instance, direct analysis of colorimetric probes, it is reasonable to propose that the present method can serve as a complementary method for prompt inspection of hydrazine in boiler feed water.

1. Introduction

Since its first use as rocket fuel with code name B-Stoff during the World War II, hydrazine or hydrazine hydrate† ($N_2H_4{\cdot}H_2O$)

* **Notes and Abbreviations:** Hydrazine hydrate†; For most uses, hydrazine is produced as hydrazine hydrate in a formulation with water. In this work, hydrazine hydrate represents a 64% solution of anhydrous hydrazine in water, which is often sold under the common trade names including Livoxin, SCAV-OX, and/or Zerox; BPB, Bromophenol blue.

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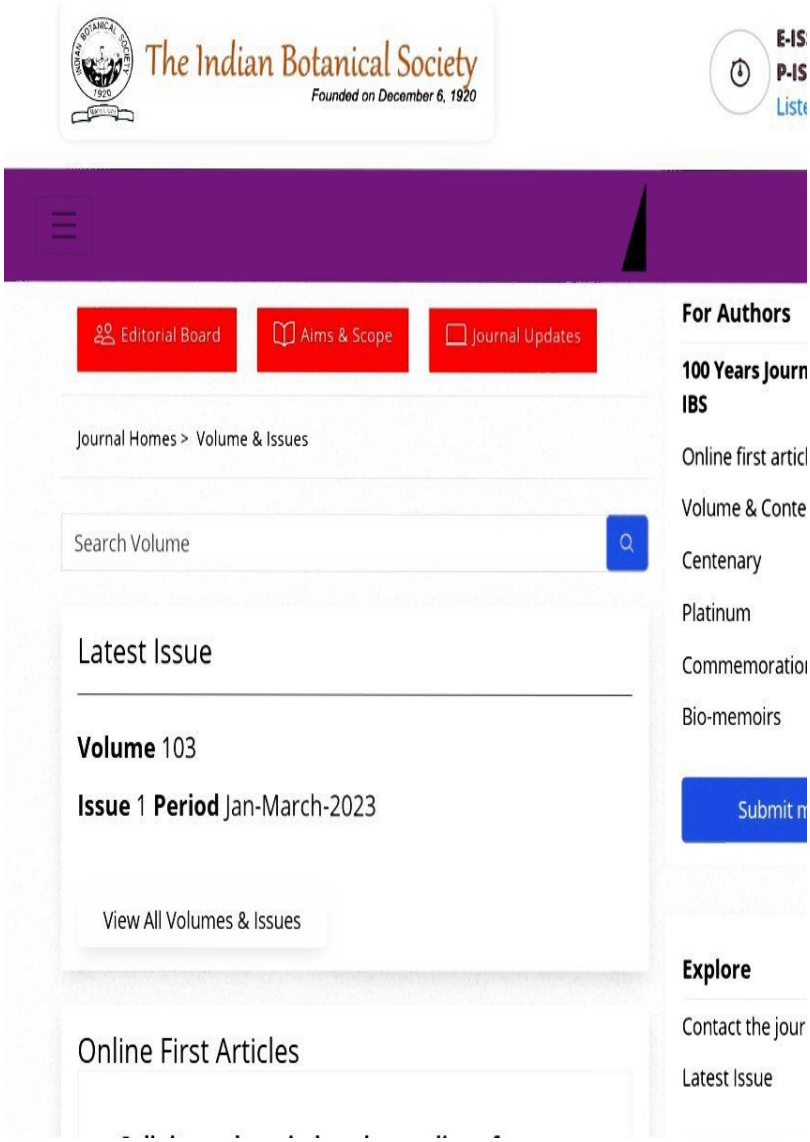
2022

Dr. Prachi Joshi, Dr. S. D. Tewari



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RESEARCH ARTICLE

Pleurocarpus moss, Symphyodon echinatus (Mitt.) (Symphyodontaceae) new to Western Himalayas, India

S. D. Tewari, Neha Binwal, Prachi Joshi, Manisha Bhandari, Sapana Pant

Abstract: *Symphyodon echinatus* (Mitt.) A. Jaeger a pleurocarpus moss of the family Symphyodontacea Western Himalayas. The species is characterized by abundant multicellular brood bodies developing from lea *S. echinatus* was listed as endemic to Eastern Himalayas. The present occurrence, therefore, puts a record o range of this epiphytic species in the Garhwal region of Western Himalayas.

Keywords- Bryophyte, Epiphyte, Gemmae, Pleurocarpus moss, Western Himalayas

Introduction

The sematophyllaceous genus *Symphyodon* was first instituted for a single species by Montagne (1841). On worldwide basis, Brotherus (1925) made the first assessment on the genus *Symphyodon* recognizing 14 out of the 17 species. Occasionally some of the *Symphyodon* taxa have been treated in regional floras (Bartram 1939, Gangulee 1976, Horikawa and Ando 1964). He and Snider (2000) in their taxonomic revision of *Symphyodon* included and described 15 species. From India, Gangulee (1976) reported nine species and one variety. Since then, *S. echinatus* species has shown extended distribution and expanded significantly in China, Nepal, India, Sri Lanka, and Thailand (He and Snider 2000). Scrutiny of previous literature indicates that this species has not been reported so far from the Western Himalayas (Lal 2005, Manju *et al.* 2009, Dandotiya *et al.* 2011, Bahuguna *et al.* 2015, Sahu and Asthana 2016, plant list WFO). However, Sahu and Asthana (2014) reported another species of *Symphyodon* as *S.* district in the Garhwal reg Himalayas.

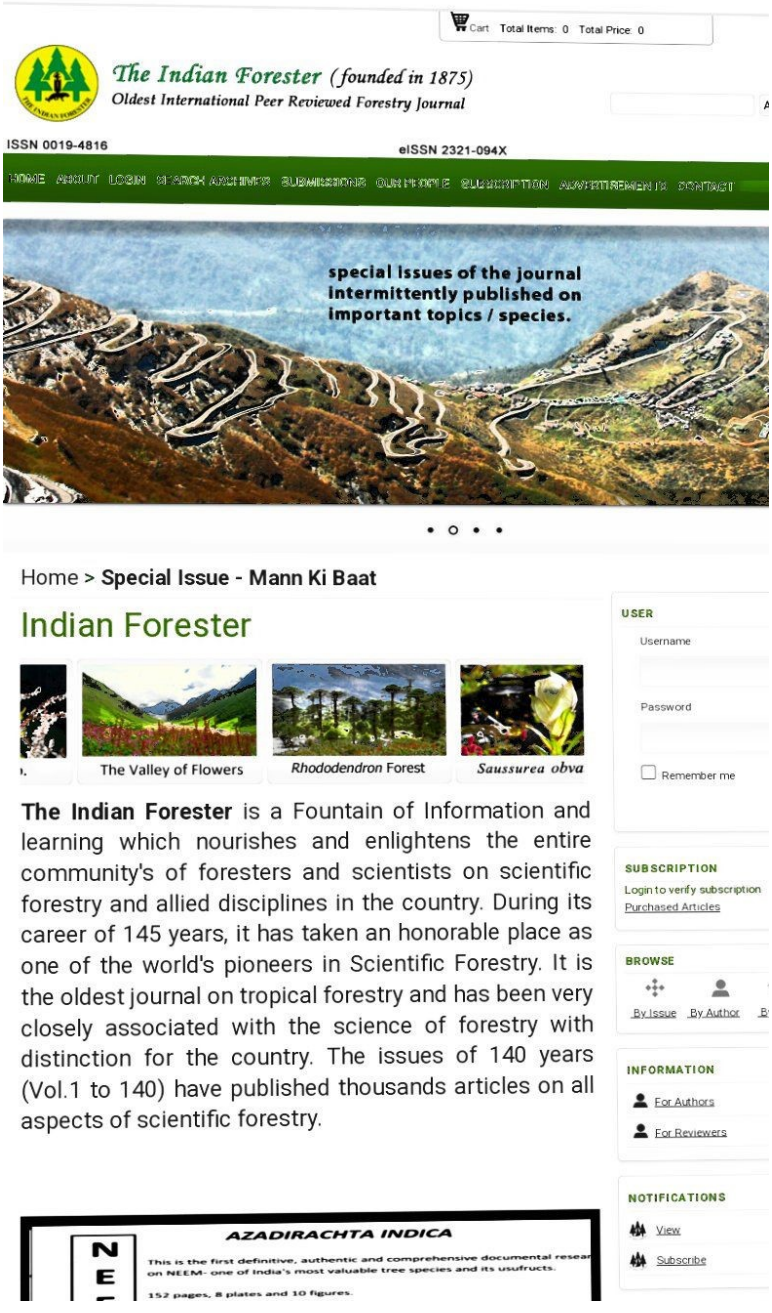
Material and methods

While studying th bryophytes made on way to (30.4887°N, 79.2170°E; 2100- Rudraprayag, Garhwal Hima came across an interestir pleurocarpus moss belongir Symphyodontaceae. Temporar and gemmae were prepared in permanent slides in gum chlora (Watson 1955). Photographs of were taken. Identification was of available literature and fur experts of the related group.

Observations

2022

Dr. Prachi Joshi, Dr. S. D. Tewari



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RESEARCH NOTES
(I)
Rediscovery of a Rare Indian Liverwort, *Delavayella serrata* Steph. (Marchantiophyta) from Western Himalayas

From Western region of North- West Himalaya, the rare monotypic liverwort *Delavayella serrata* was reported from the Girgaon area of Almora district, Uttarakhand by Pande and Srivastava (Udar, 1976). Since then, no collection of this foliose liverwort is known from Western Himalayan sector. Recently, during the field collection trip to Tungnath area of Garhwal Himalaya, we came across the meager intermixed population of an uncommon fascinating foliose liverwort. Deo and Singh (2013) reported this species as poorly known liverworts from Arunachal Pradesh (Eastern Himalaya), India.

Taxonomic Description

Delavayella serrata Steph. in Mem. Soc. Sci. Nat. Cherbourg 29: 211. 1894; in Hedwigia 33: 4. 1894. Deo and Singh in Indian Journal of Forestry, **36** (1): 101-105. 2013. *Nowellia orientalis* Chopra in Proc. Indian Acad. Sci. 8B: 427-439, 1938; *Nowellia indica* Pande & Srivastava, Proc. Indian Acad. Sci. 16B: 175-179, 1942. *Nowellia orientalis* R.S. Chopra in J. Indian Bot. Soc. 22: 245. 1943; *D. serrata* var. *purpurea*. Chen. Bryophyta nova sinica (Hepaticae), Feddes Rep. 58: 36-52, 1955; Long in J. Hattori Bot. Lab. 68: 381-440. 2005.

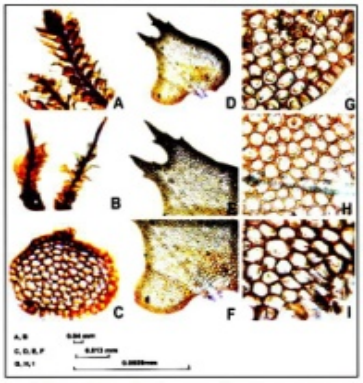

Fig.1: ***Delavayella serrata*** Steph. **A-** Vegetative shoots **B-** Portion of flagelliferous branches **C-** Stem cross-section **D-** Lateral lobe **E-** Stickeri lateral leaf with serrate apex **F-** Saccate lobule like structure of lateral lobe **G-** Marginal cells of lateral lobe **H-** Median leaf cells showing nodulose trigones **I-** Basal hexagonal leaf cells with prominent trigones.

Plants dark brown, robust. Shoot 1.2-2.5cm long and 2.2-2.7mm wide. Rhizoids numerous scattered in the lower portion of shoots. Flagelliform branches usually present. Stem dorsiventral, oval to elliptical in cross-section, 0.28 X 0.24 mm with 8-13 cells across the diameter. Cortical cells 1-2 layered, small, quadrate - sub quadrate, 33.5 X 22.5 µm, moderately thick walled, medullary cells larger, sub quadrate to polygonal, 32.3 X 23.5 µm, thin walled. Leaves succubous, imbricate, transverse and narrowly inserted; postical margin inflexed. Dorsal lobe ovate-triangulate forming characteristic saccate lobule like structure, 0.99-1.5 mm long, 0.9-1.2 mm wide; apex bifid, acute, and dentate at tip. Leaf apical cells quadrate to sub quadrate, small, thin walled, 23.5 X 20.58 µm, with minute trigones; marginal cells quadrate - sub quadrate, 17.6 X 14.7µm; median cells quadrate-polygonal, 32.3 X 23.5 µm; basal cells oblong, hexagonal, with distinct trigones 44.1 X 29.4µm (Fig. 1: A-I). Underleaves absent. Sporophyte not seen.

Characteristics of the species

The unique characteristic features of *D. serrata* are: flagelliferous branches, succubously arranged leaf lobes, with saccate lobule like structure, moderately thick-walled isodiametric cortical cells with thin-walled medullary cells, lateral lobe cells thin-walled with distinct nodulose-confluent trigones, underleaves absent.

Specimen examined: INDIA. West district Rudraprayag, Bhujg 31.08.2019, Tn39-d (Bryology lab I.P.C

The voucher specimens (Tn the herbarium of Botany Dep College of Commerce, Haldwani, Bryology herbarium NBRI Lucknc

Ecology- *D. serrata* plants were f 3000-3100m as epiphytes, re portion of the tree trunk. Its poor was recorded in association with *viz.*, *Bazzania*, *Chiloscyphus*, and mosses like *Dicranum*, *Leucodon* and *Plagiothecium*. Th pH was estimated as slightly acid

Conclusion

The present paper highlight rare taxon (*D. serrata*) fron Rudraprayag district in Garhwa Himalayas. Such bryo elemer explored and future attempts sl conserve the rare Himalayan mo

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S.D. TEWARI, NEHA BI
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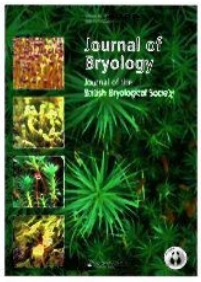

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Bryological Monograph

JOURNAL OF BRYOLOGY
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BRYOLOGICAL NOTE

Revisiting the identity of *Pylaisiadelpha capillacea* (Griff.) B.C.Tan (Pylaisiadelphaceae, Musci)

Sapana Pant [a], Neha Kohli [a], Hiroyuki Akiyama [b], Shiv Datt Tewari [a], Prachi Josh
Manisha Bhandari [a]

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ARTICLE HISTORY First Published Online 19 October 2022

In the course of a survey of the bryophyte flora in mixed oak–coniferous forest areas at elevations ranging from 1680 m to 2100 m in the Uttarakhand, Garhwal and Kumaun regions of the Western Himalayas, an interesting gemmiferous moss was found growing on the bark of *Pinus roxburghii* Sarg. Judging from the alar formation and filamentous propagules arising in the leaf axils, as well as the smooth, thin-walled linear laminal cells and straight capsules with hypnoid peristomes (Figure 1), it was identified as *Pylaisiadelpha capillacea* (Griff.) B.C.Tan & Y.Jia.

This species was originally reported from India as *Neckera capillacea* Griff., which was subsequently moved to *Clastobryum capillaceum* (Griff.) Broth. (Fleischer 1923). Later, Tan and Jia (1999) proposed classifying it in the genus *Pylaisiadelpha* Cardot, based mainly on its weak collenchymatous exothecial cells. They also suggested a close relationship to *P. drepanioides* Cardot & Dixon or *P. yokohamae* (Broth.) W.R.Buck. We know of no subsequent work on the phylogenetic relationships between *P. capillacea* and the other members of the Pylasiadelphaceae.

To confirm the systematic position of *Pylaisiadelpha capillacea*, we carried out a molecular analysis. A total of 22 species from 10 genera (29 samples) were used as the ingroup. *Heterophyllium nematosum* Broth. was selected as an outgroup based on the results presented by Akiyama (2019). One molecular marker was used (*rbc*L from the chloroplast genome), and the primers and PCR protocol were as detailed by Akiyama (2019). The newly acquired sequence of *P. capillacea* was registered in GenBank as LC662408. Other accessions are as shown in Figure 2.

Maximum likelihood (ML) and maximum parsimony

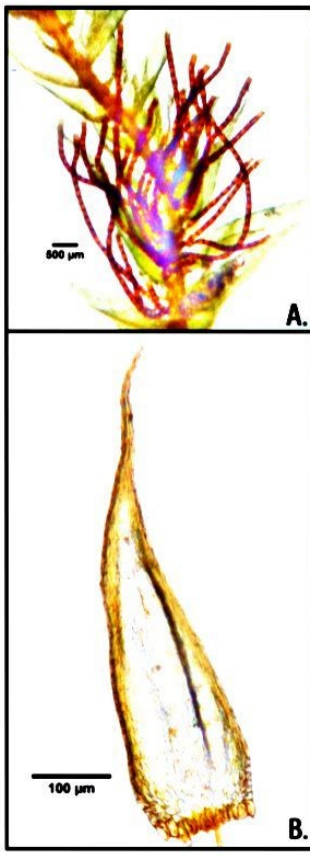
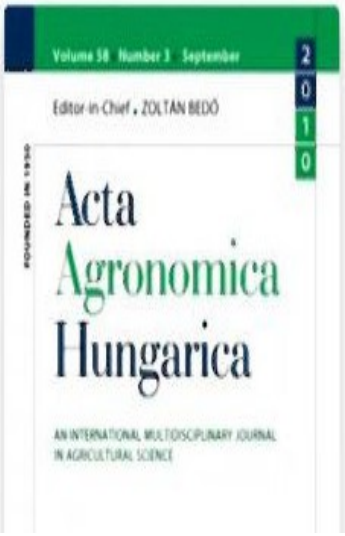


Figure 1. *Pylaisiadelpha capillacea* (Griff
& Pant s.n. N 32, SP65). (A) A shoot wi
gules born in leaf axils. (B) Stem leaf.
alar region of a stem leaf. (D) Str



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BRYOCRUMIA VIVICOLOR, A RHEOPHYTIC, HYPNACEC MOSS, NEW TO THE WESTERN HIMALAYAS, INDIA

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The Indian Himalayan sector is well known to support the diversified bryophy and communities due to varied phytoclimatical conditions met within different topographical zones. Many potential wilderness areas are still waiting to be ex terms of their exuberant bryodiversity. During a bryoexploratory survey of an ur high-altitude area in the Garhwal Himalayan region, we came across an interest phytic moss *Bryocrumia* L. E. Anderson. The genus *Bryocrumia* is represented in two species, viz. *B. vivicolor* (Broth. et Dixon) W. R. Buck and *B. malabarica* Manju Prakashkumar et W. Z. Ma. Both of these pleurocarpous species are known t fined in the southern part of the country. From the Indian Himalayan sector, genus has never been documented earlier. Recently, *B. vivicolor* has been report first time from the Tungnath area (2,100–3,000 m above sea level) in the Garhw of Uttarakhand state as a new addition to the Western Himalayan moss flora, i its new distributional range. This hypnaceous moss was found colonising the sl submerged rock surfaces along small streams and seepages in mixed oak forests Tungnath. The key characteristics include its rheophilic habit, stem lacking centr variable leaf forms, indistinct double costa and round to obtuse leaf apex with p cells. The present paper provides taxonomic details of this rare moss, representin geographical distribution in India.

Key words: hypnaceous, moss flora, pleurocarpous, rheophyte, Western Himala

INTRODUCTION

The floristical study of Indian bryophytes particularly the Hi sector has received little attention in spite of the rich and diversified wealth. There are many potential, unexplored areas where thorough wise survey has not been given proper attention. While exploring t phyte vegetation en route to Tungnath area, a rare pleurocarpous m

2022

Dr. Saraswati Bisht

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Full Length Research Article

Diversity and Seasonal Variation of Aquatic Hyphomycetes in Nandhaur Wildlife Sanctuary, Uttarakhand, India

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ABSTRACT

Aquatic hyphomycetes, the main fungal decomposers of submerged dead organic matter are known to play an important role in unlocking the energy flow in aquatic ecosystems. These fungi are yet to be explored from different freshwater bodies for their multifarious benefits. The Nandhaur Wildlife Sanctuary, situated at the foothill of Kumaun Himalaya (Uttarakhand) is still untouched for its aquatic biota exploration especially hyphomycetes. Comparatively warm temperature and diverse substrate pool of the site may favour the occurrence and growth of varied forms of aquatic hyphomycetes and make it an interesting matter of investigation. Therefore, the present work was undertaken to reveal the diversity and seasonal variation of these fungi. The samples were collected monthly and taken to the laboratory for further processing and incubation for sporulation. Altogether 19 species belonging to 12 genera were isolated from leaf litter samples, among which only 4 species were recorded from water foam samples. Seasonal variation was noticed in the species composition with the maximum number of species in winter (18 species) followed by autumn (12 species), spring (7 species), rainy (7 species) and least in the summer season (1 species). The temperature range of 11-25°C was found to favour the maximum species diversity.

Key words: Aquatic hyphomycetes, Decomposers, Diversity, Seasonal variation, Nandhaur Wildlife Sanctuary

Aquatic hyphomycetes are the polyphyletic group of fungi that were first described by Ingold [1]. These are also named Ingoldian fungi, water-borne hyphomycetes or freshwater hyphomycetes. These fungi usually occur on submerged plant debris like leaf litter, petioles, bark etc. [2] and complete the entire or portion of their life cycle in clean, flowing and well-oxygenated water. They also reside as aquatic endophytes in the roots of riparian trees [3]. They reproduce asexually by the formation of conidia and are usually identified by their unique conidial shapes i.e., tetraradiate, triradiate, sigmoid, spherical, helical, lunate etc. Aquatic hyphomycetes cause the decomposition of leaf litter and help in unlocking the nutrients in freshwater streams. These play an essential role in the trophic chain and are considered as important intermediaries in the food webs of streams [4].

To date, several workers reported these fungi from different regions of the world [5-11]. In India, the least attention has been paid towards the study of these fungi [12-13]. Aquatic Hyphomycetes are being extensively explored in the Kumaun Himalayan region [14-16], while no such work has been reported from foothill regions. As the foothill region is having a comparatively warm temperature and diverse substrate pool than the Himalayan region, this may favour the occurrence and growth of diverse forms of aquatic hyphomycetes and make it an interesting matter of investigation. Therefore, the present work is undertaken to investigate the diversity and seasonal variation of water-borne conidial fungi from water bodies flowing through the Nandhaur Wildlife Sanctuary.

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MATERIALS AND METHODS

Nandhaur Wildlife Sanctuary is located at Kumaun Himalayan foothill of district Nainital (Uttarakhand), 32 km away from Haldwani city. It is present at the latitude of 29° 1' 25" (29.0236°) North, the longitude of 79° 48' 18.9" (79.8053°) East and an elevation of 221 meters (725 feet). The site is mostly surrounded by *Tectona grandis*, *Mallotus philippensis*, *Haldina cordifolia* and *Shorea robusta* vegetation.

Sample collection and processing

Samples of water foam and partially decomposed submerged leaves of different plant species, accumulated at barriers were collected monthly (5 samples per date) from November 2018 to October 2019. The samples were collected in pre-sterilized plastic vials (50 ml) and zip lock polyethene bags (10 × 14 inches) respectively. The foam samples were kept in 5% FAA (Formaldehyde Alcohol Acetic Acid) on the spot in order to arrest the germination of conidia and examined in the departmental laboratory under the microscope to check the

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Dr. Ritu Singh and Dr. Rajni Mehra

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Short communication

Physico-Chemical Characteristics of Water in River Gaula

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ABSTRACT
Present study was conducted with the qualitative estimation on seasonal fluctuation in physico-chemical pa on Gaula River at Haldwani, Nainital, Uttarakhand, India. Various physico-chemical parameters temperature, transparency, conductivity, TDS, pH, total alkalinity, chloride, free CO_2 and DO were ana various seasonal changes from the period of January 2019 to December 2019. Some parameters were the spot whereas some parameters were tested in the laboratory according to standard method. The pres indicates that assessments of physico-chemical parameters of river are necessary for its various beneficial

Key words: Gaula River, Physico-chemical parameter, assessment, seasonal change, Pollution

INTRODUCTION

The Gaula River is a Himalayan river which flows in India. It originates from southern slopes of Gajar range near Motia pather (Mohan 2004). The source of this river is Pharpani and the end point is Kichha. The length of this river is about 103 km. It flows through Kathgodam, Haldwani and shahi. Then it merges with Ramganga river, a tributary of Ganga, which is about 15 km northwest of Bareilly in Uttar Pradesh.

Water is essential to all forms of life. It is indispensable for agriculture, manufacturing, transportation and many other human activities. Despite its importance water is the most poorly managed resource in the world (Fakayode 2005), and contaminated by several sources due to various anthropogenic activities and some natural processes. The quality of water is decreasing continuously and is posing a great threat to all forms of life including pollution has several dimensions a monitoring and control of river pollu the expertise from various disciplines (Singh and Gupta 2004).

Pollution of river is a global p availability of good water quality is an feature for preventing disease and i quality of life (Mezgebe 2015). The phy properties will also help in the ide sources of pollution for initiating neces remedial action. In case of polluted therefore the nature of any aquatic co an expansion of quality of water (Ekw 2008, Singh and Singh 2008).

Due to use of contaminated w population suffers from water borne therefore to check the water quality at re of time (Zindal 2005), the present study to make an assessment of the change quality of water of river Gaula.