

Allelopathic effect of *Stichococcus bacillaris* Nageli (Green Alga) on the growth of two bryophytes

Vinay Sahu, Kiran Toppo, M. R. Suseela and A. K. Asthana*

CSIR-National Botanical Research Institute, Lucknow, Uttar Pradesh, India, 226001

*Corresponding author e-mail: drakasthana@rediffmail.com)

Abstract

Stichococcus bacillaris (Green Alga) growth was observed as a contaminant on two taxa of bryophytes, a thalloid liverwort *Lunularia cruciata* (L.) Dumort. ex. Lindb. and a hornwort *Folioceros physocladus* Bharad. ex Schiffn. et Pande, growing on soil in pots in acclimatization chamber of Moss House at National Botanical Research Institute, Lucknow, India. Due to this algal contamination, suppression of growth of these bryophytes has been observed. It was evident that succession of *Stichococcus bacillaris* and its interaction with bryophytes played a significant role of allelopathy.

Key Words: Allelopathy; bryophyte; Green Alga.

1. Introduction

Algae-bryophyte association is a natural phenomenon in the nature because both are moist and shade loving plants and they prefer same climatic conditions. Henriksson and Henriksson (1974) recorded nitrogen fixation by *Nostoc muscorum* and *Anabaena variabilis* in soils inhabited by mosses, including *Funaria*. Anderson and Rushforth (1977) reported algal association with bryophytes and it was usually with diatoms followed by blue green algae and green algae. Campbell and Meeks (1989) found that the association of *Nostoc* spp. with *Anthoceros* spp. enhances the formation of hormogonia in *Nostoc* spp. Mikter and Shukla (2006) found that unique microhabitat created by the bryophyte patches on the bark of tree provides a suitable environment for the growth of some rare species of Cyanobacteria. Toppo and Suseela (2007) observed 21 algal taxa association in the rhizoidal zones of three bryophytes. Alam *et al.* (2012) found that chlorophycean alga *Ulothrix zonata* (Weber & Mohr) Kützing grow as an epiphyte on moss *Macromitrium sulcatum* (Hook.) Brid. and that association is peculiar as the algal filaments form a close net over the surface of moss leaves and axis. All these reports reveal that algae-bryophyte association is prevalent in the nature and it is mutualistic beneficial association. But the present communication is an interesting observation of allelopathic effect of *Stichococcus bacillaris* (Green Alga) on cultured bryophytes at National Botanical Research Institute, Lucknow, India.

2. Materials and Methods

Bryophytes culture were carried out in laboratory under control temperature (20-23°C) and provided with continuous illumination of 4000-5500 lux as well as alternate light and dark period of 16 hours and 8 hours respectively with the help of a combination of fluorescent tubes. Hoagland and ½ KNOP'S media was used to grow all the plants.

Algal growth was observed and samples were collected from bryophyte culture lab and preserved in 4% formaline and deposited at Herbarium of National Botanical Research Institute, Lucknow, India. For detailed study the algal samples were examined using Leica DM 500 microscope and photomicrography was done with the help of attached camera Leica EC3.

3. Results

It has been observed that growth of the bryophytes was affected due to contamination by *Stichococcus bacillaris* green alga (Fig. 1). This green alga has been reported for the first time from India and cosmopolitan in nature with a wide ecological distribution, sub aerial from tree barks, greenhouses, and as a phycobiont in Lichens, terrestrial in alpine soils, cryobiontic from Antarctica causing greenish snow; aquatic in various freshwater habitats. This alga possesses an efficient transport system for the uptake of leucine, methionine and phenylalanine and rapidly incorporates these amino acids into proteins (Ahmed & Hellebust 1993). Absolutely there are no reports on the allelopathic or toxic effects of *Stichococcus bacillaris*. In the present communication, it was evident that this alga has fatal allelopathic effect on the *L. cruciata* and *F. physocladus*. Algal filaments were growing profusely on the surface of the thallus (Fig.1-3) and adjacent media surface and destroyed the plant which made antagonistic effect on the growth of the plants

4. Discussion

Allelopathic compounds play a role in the interactions between the emitter organisms and their direct competitors. The contamination of green alga could be probably caused through air. In the case of the *L. cruciata* and *F. physocladus* algae cover the surface of the thallus and check the photosynthetic activity of the plants that caused death of the plant. In order to check any cellular intervention anatomy of bryophyte thallus was studied by having a cross section of it which revealed that alga did not penetrate inside the thallus. As far as Bryophytes and algal (endophytic) association is concerned it is a well known phenomenon in ecosystem where algal component exists as endophyte in the gametophytes of thalloid and leafy liverworts. In hornworts such association is very common in the form of *Nostoc* chambers in the thallus of these plants. Paired *Nostoc* chambers are also a characteristic feature of a liverwort *Blasia* that fix atmospheric Nitrogen (Rodgers 1978). It is a form of symbiotic relationship between the two organisms. Allelopathic compounds have various modes of action, from inhibition of photosynthesis to oxidative stress or cellular paralysis (Leflaive et al. 2007). Our observations revealed that bryophytic taxa were contaminated with green alga and this pattern of growth needs further study to establish the specificity of association between the bryophyte and algal taxa.

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6. Literature

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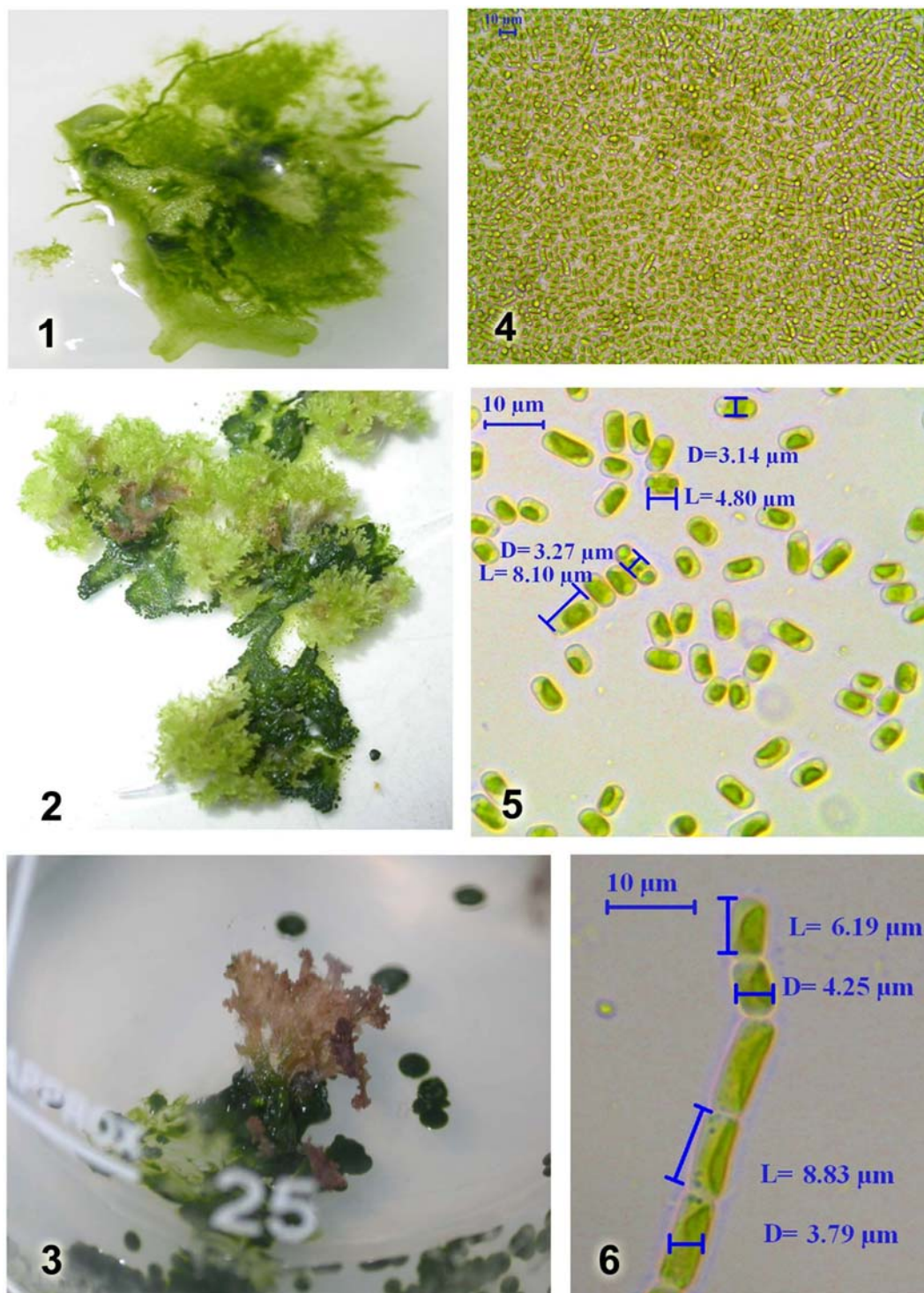


Figure 1: 1. *Lunularia cruciata*; 2-3. *Folioceros physocladus* 4-5. Unicellular form of *Stichococcus bacillaris*; 6. Filamentous form of *Stichococcus bacillaris* .