

Crust forming Blue Green Algae *Scytonema* Ag. from North Maharashtra Soils

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ABSTRACT

Blue green algae are ecologically important due to their potential ability to thrive on adverse conditions. They occur in diverse habitat and establish themselves successfully on it. Members of blue green algae have mucilage sheathing which protect them from desiccation, also play important role in soil conservation indirectly. Many filamentous taxa of blue green algae forms crust over moist soils. *Scytonema* Ag. is one of the heterocystous filamentous blue green algae. It forms deep olive green to blackish brown coloured crust on moist soils. Naturally growing total sixteen species of *Scytonema* Ag. were observed and enumerated taxonomically in present communication from North Maharashtra soils. Heterocystous blue green algal crust helps in enriching soil content by adding combined nitrogen in it.

Key words: Blue green Algae, Crust, *Scytonema* Ag., North Maharashtra soil.

INTRODUCTION

Algal crust can be observed to grow on barren lands, moist shaded surfaces, plain as well as on hilly regions, cultivated as well as non cultivated soils. Crust forming algal component are ecologically important being primary green producers on barren lands. Earlier few reports were made in this direction are Marathe 1972, Marathe and Anantani 1972, Marathe and Khushaldas 1975, Mahajan and Mahajan 1994, Sarma *et al* 1991, Eldridge and Leys 2003. Algae help to promote ecological succession of other plant community. *Scytonema* Ag. being filamentous mucilaginous form can retain water in crust and keeps soil surface moist for longer periods. It is important to avoid desiccation of soil and ultimate erosion of soil particles. *Scytonema* Ag. can multiply by various ways like hormogones, hormocyst and fragmentation. It colonizes easily and has perennation assets for unfavorable conditions.

MATERIAL AND METHOD

Various habitats of North Maharashtra like barren lands, hilly regions, cultivated and uncultivated soils, damp surfaces, shady place soils was

explored for study of algal crust. Surface growing algal crust samples were collected carefully by scrapping the soil surface and preserved in 4 per cent formalin. Direct observation of naturally inhabiting taxa was followed by microscopic observation and line drawings were made for taxonomical identification. Taxa were identified with the help of Standard monograph of Desikachary 1959 and relevant literature.

RESULTS

TAXONOMICAL OBSERVATION:

1. *Scytonema bohneri* Schmidle (Figure 1)

Thallus blackish green, filament 9-13.5 μ broad, false branched, branches mostly single, narrower at apex, sheath colourless, 1.5 μ thick, homogenous, trichome bluish green, 6-7 μ broad, cells rectangular, sometimes shorter than broad, 4.5-6 μ long, heterocyst compressed rectangular, 6-7.5 μ broad up to 6-7.5 μ long.

2. *Scytonema burmanicum* Skuja (Figure 2)

Thallus crustaceous, attached to substratum, prostrate, olivaceous, filaments 15-16.5 μ broad, false branched, false branches geminate or solitary, sheath simple with parallel lamellation 2.25-3 μ thick, yellow, trichome 10.2-12 μ broad, attenuated, more or less constricted, cells 8.5-10.2 μ long or 5.25-6 μ long, apical cell rounded, content homogeneous, heterocyst cylindrical or discoid 10.2-13.6 μ broad, upto 10.2 μ long or 6 μ broad when depressed, hormogone formed at apices of erect branches.

3. *Scytonema fre'myii* Desikachary (Figure 3)

Filament long, about 10.5 μ broad, sheath thick 4.6 μ broad or more, yellow not lamellate, false branches geminate, free at base, trichome, constricted at cross wall, cells 3-3.75 μ broad, twice long, shorter than long at apices, heterocyst rectangular 3.75 μ broad 7.5-11.5 μ long.

4. *Scytonema geitleri* Bharadwaja (Figure 4)

Thallus mucilaginous crust, green, filament upto 22.5 μ broad, irregularly curved, densely entangled, false branched, short branches club shaped, sheath firm about 6 μ thick, outer surface wavy and uneven, in old filaments inner surface following the contour of the swollen cells, with divergent stratification, 6-9 μ broad with constriction at joints, when old, usually narrowed down at the point of branching, cells quadratic or barrel shaped in old trichomes, heterocyst intercalary and terminal, single or in pairs, 10.5-13.5 μ broad, 7.5-9 μ long, depressed at ends, broader than trichome.

5. *Scytonema hansgirgi* Schmidle (Figure 5)

Filament curved or bent, short, fragile, false branched, false branch single, 13.6-18.7 μ broad, apex not attenuated, broadly rounded, sheath thin, yellow, doubling with age, closed to trichome, trichome 10.2-13.6 μ broad not constricted, cells rectangular shorter than broad 4.5-6 μ long, cell content blue-green, heterocyst as broad as trichome, quadrate or depressed.

6. *Scytonema hofmanni* Ag. ex Born. et Flah. (Figure 6)

Filament 10.5-15 μ broad, aggregated in vertical fascicles, false branches aggregated, sheath firm, trichome 6-7.5 μ broad cells are unequal in length, at apices flattened depressed, in rest of trichome longer than broad or quadratic, heterocyst oblong rectangular 6-7.5 μ broad, 10.5 μ long.

7. *Scytonema javanicum* (Kuetz.) Bornet ex Born. et Flah. (Figure 7)

Filament 13.6-15.3 μ broad, aggregation in erect fascicles, false branches long flexuous, aggregated, sheath firm, thin becoming yellowish, trichome 10.2-13.6 μ broad, cells compressed to quadrate, heterocyst sub quadrate, 10.2-13.6 μ broad, 8.5-10.2 μ long.

8. *Scytonema julianum* (Kuetz.) Menegh. (Figure 8)

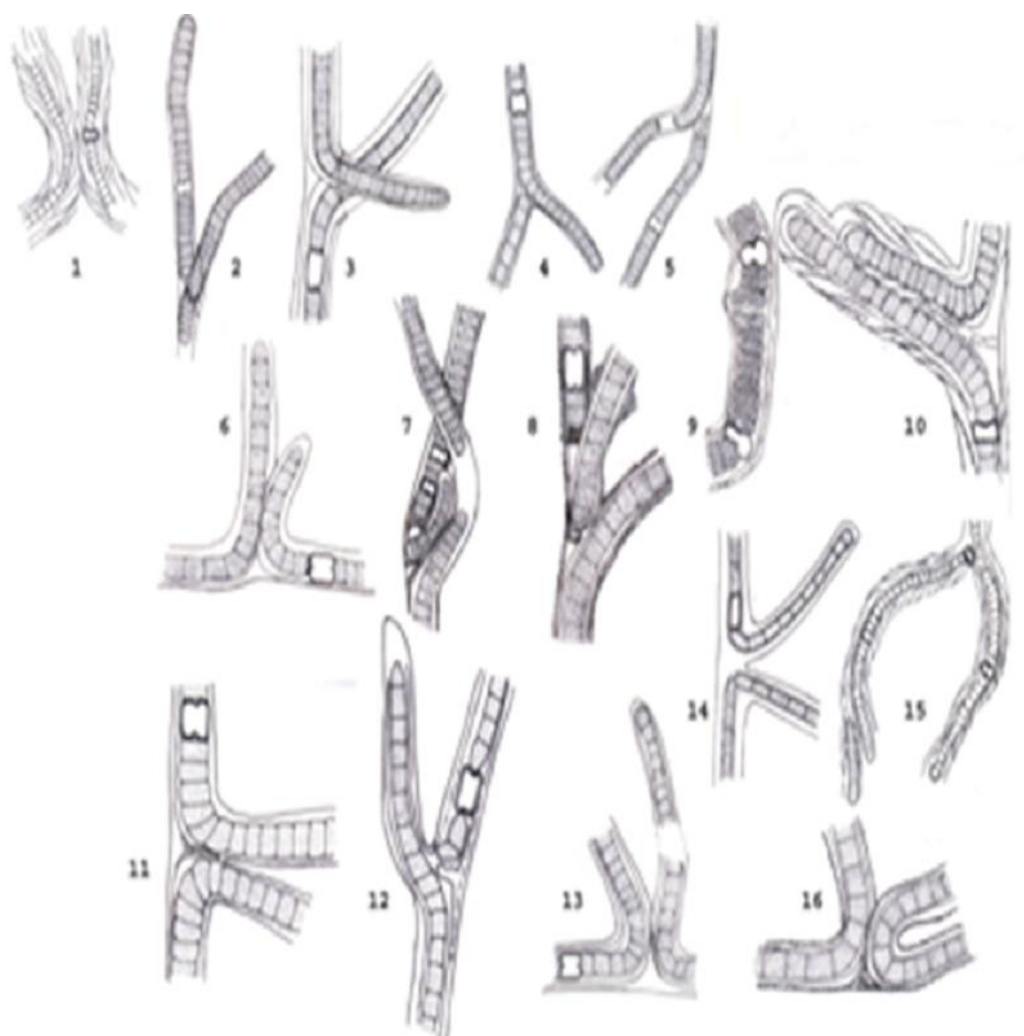
Thallus impregnated with calcium, filament in more or less distinct erect bundles, up to 9-10.5 μ broad, false branches sparse, sheath thin, firm not lamellated yellowish, in older parts densely covered by calcium, trichome 6-6.75 μ broad, cells 4.5-6 μ long, blue-green, heterocyst rounded, quadrate or cylindrical 6-6.75 μ broad, 4.5-12 μ long.

9. *Scytonema malaviyaensis* Bharadwaja (Figure 9)

Filament flexuous, interwoven, young up to 7.5-10.5 μ broad or more when matures, trichome 6-7.5 μ broad, cells constricted at joints slightly 6-9 μ long, heterocyst median quadratic or longer than broad, 7.5-8.25 μ broad, up to 9 μ long, false branches geminate, hormogones short, few celled commonly produced by formation of biconcave intercellular disc, perennate stays dormant inside the parent sheath, but secreting new hyaline sheath when germinate on recurrence of favorable condition.

10. *Scytonema millei* Bornet ex Born. et Flah. (Fig. 10)

Filament 18-22.5 μ broad, interwoven, false branched, sheath firm brownish, when old with parallel lamellation, cells 9-13.5 μ broad, discoid, when old becoming elongate up to as long as broad, heterocyst mostly discoid, broader than trichome, 13.5-14.25 μ broad, 6.8 μ long, heterocyst shows variation in length with in same trichome.



Scale -10 μ

Figure : 1

1. *Scytonema bohneri* Schmidle
2. *Scytonema burmanicum* Skuja
3. *Scytonema fre'myii* Desikachary
4. *Scytonema geitleri*
5. *Scytonema hansgirgi* Bharadwaja
6. *Scytonema hofmanni* Ag. ex Born.et Flah.
7. *Scytonema javanicum* (Kuetz.) Bornet ex Born.et Flah.
8. *Scytonema julianum* (Kuetz.) Menegh.
9. *Scytonema malaviyaensis* Bharadwaja
10. *Scytonema millei* Bornet ex Born.et Flah.
11. *Scytonema mirabile* (Dillw.)Born.
12. *Scytonema myochrous* (Dillw.)Ag. ex Born. et Flah.
13. *Scytonema ocellatum* Lyngbye ex Born.et Flah.
14. *Scytonema pseudohofmanni* Bharadwaja
15. *Scytonema pseudopunctatum* Skuja
16. *Scytonema stuposum* (Kuetz.) Born ex Bornet Flah.

11. *Scytonema mirabile* (Dillw.)Born. (Figure 11)
 Filament intricate, 12-21 μ broad, mostly false branched, sheath lamellated with divergent lamellation, yellowish brown, trichome 8-12 μ broad, cells at the ends discoid, more or less barrel shaped 8.25 μ -12 μ broad, 4.5-6 μ long, in older filaments cell narrowed down and elongates, sheath becomes more thick and stratified, heterocyst nearly quadratic 9-10.5 μ broad, 6-7.5 μ long.

12. *Scytonema myochrous* (Dillw.) Ag. ex Born. et Flah. (Figure 12)
 Filament 22.5-24 μ broad, sheath 4.5-9 μ thick, sheath lamellated, yellowish brown, lamellae divergent, trichome 7.5-9 μ broad, cells 6-7.5 μ long, constricted at cross walls, generally broader than long, discoid above, heterocyst sub quadrate 10.5-12 μ broad, 7.5-9 μ long,

pseudo branches are free at base, only sheath of upper median region slightly united.

13. *Scytonema ocellatum* Lyngbye ex Born.et Flah. (Figure 13)

Filament 9-18 μ broad, sheath yellow, lamellated, false branched, trichome 6-7.5 μ broad, cells quadrate or shorter than broad, 4.5-6 μ long, heterocyst sub quadrate or longer than broad, 6-6.75 μ broad, 6-9 μ long, sometimes up to 12 μ long.

14. *Scytonema pseudohofmanni* Bharadwaja (Fig. 14)

Thallus with short tufted growth, filament up to 13.5 μ broad, irregularly entangled curved, false branches single and geminate, sheath firm, up to 3.75 μ broad, with indistinct parallel stratification, trichome 4.5-5.25 μ broad, cells cylindrical to quadratic 4.5-7.5 μ long, heterocyst broader than trichome, 6-6.75 μ broad, 7.5-8.25 μ long.

15. *Scytonema pseudopunctatum* Skuja f.*minor* f.nov. (Figure 15)

Filament 12-15 μ broad, false branched, geminate, sheath 2.25-3 μ thick, with parallel lamellation, yellowish brown, anterior portion smooth, posterior portion finely and densely granulated, trichomes 7.5-9 μ broad, constricted at cross walls, cells isodiametric as long as broad up to 10.5-12 μ long, cell content homogeneous, heterocyst rounded quadrate or discoid 12 μ broad, 6 μ long, propagation by hormogones and hormocyst.

16. *Scytonema stuposum* (Kuetz.) Born ex Bornet Flah. (Figure 16)

Filament 10.5-15 μ broad, false branched, false branch as broad as main filament, single or geminate sheath thick gelatinous, trichome olive violet, 7.5-9 μ broad, cells shorter than broad, 3.75-4 μ long, heterocyst 6-9 μ broad, 3.75-6 μ long, sheath 2.25 μ thick.

DISCUSSION

Algal crusts are first colonizing green plants on moist soils. Many Blue green algae members are observed to form crust on soil surface. *Scytonema* Ag. is nitrogen fixing filamentous heterocystous taxa showing false branching. It forms intricate velvety olive green deep brown stratum like growths, at maturity it becomes black. Due to thick crustate growth, indirectly it binds soil particles. It also help to hold moisture in its mucilage sheathing, help to add nitrogen and organic matter in soil after death. Algal crusts on soil are ecologically important.

CONCLUSION

Scytonema Ag. is blue green algal member occurs commonly on moist exposed soil surface. Sixteen taxa of Genus *Scytonema* Ag. were enumerated with taxonomical description. It has various ways for propagation. It withstands unfavorable conditions, also overcome desiccation and establishes successfully on soils forming crusts. Among them *Scytonema geitleri* Bharadwaja, *S. hofmanni* Ag. ex Born.et Flah. and *S. mirabile* (Dillw.) Born. found distributed very commonly. *Scytonema pseudopunctatum* Skuja f. *minor* is newly described forma having minor dimensions of its trichome, heterocyst and cell.

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