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RESEARCH ARTICLE

EFFECT OF SUCROSE ON PROTONEMAL GROWTH AND BUD FORMATION IN SOME INDIAN MOSSES

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ABSTRACT

Present study was conducted to study the effect of different concentrations of sucrose on protonemal growth and bud formation of *Hydrogonium arcuatum* and *Anoectangium clarum.* Addition of sucrose have no effect on bud formation in *Anoectangium clarum* and 1% sucrose shows maximum protonemal growth in both moss species.

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INTRODUCTION

Bryophytes are pioneer land plants and shows similar physiological responses as in higher plants. Bryophytes have attracted several researchers for morphogenetic studies due to presence of significant properties such as high regeneration ability and simple nutritional requirements. The purpose of the present investigation was to study the effect of sucrose on the spore germination of *in vitro* culture for *Hydrogonium arcuatum* and *Anoectangim clarum*. *In vitro* studies on two Indian moss taxa have been carried out on NB medium by inoculating their spores and their growth and development were studied. Different concentrations of sucrose were used and lower concentration of sucrose is served as the best carbohydrate source for spore germination. Hoffman (1964**)** observed that sucrose is most effective in *Funaria hygrometrica* and in *Physcomitrium japonicum* and *Semibarbula orientalis* (Khuntaila, 1991).

MATERIALS AND METHODS

Fully developed plant bearing capsules were collected from North Western parts of India. Sporophytes were washed thoroughly in running tap water and then surface sterilized with chlorine water then, rinsed them 3 times in cold, sterile distilled water for an hour. Spores were used as starting plant material for *in vitro* multiplication of mosses. Capsules were opened with a sterile needle and transferred onto semi-solid medium aseptically under the Laminar hood. Cultures were maintained at 25°C (±2) illuminated by fluorescent tube lights. Moss plants were sub cultured after one month interval. The spores were inoculated on slanting medium supplemented with various concentrations of sucrose Different concentrations of sucrose were prepared and pure NB medium was treated as control. Each experiment was comprised of ten replicates and repeated once.

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RESULTS AND DISCUSSION

Germination of spores of *Hydrogonium* and *Anoectangium* was done in different concentrations of sucrose. A number of significant effects of sucrose on culture development were observed.

Effect of sucrose on *Hydrogonium arcuatum*

Effect of sucrose was studied at four levels: 0.5, 1.0, 2.0 and 4.0 %. Cultures raised on medium without sucrose served as controls. On medium without sucrose, inoculum took more time to regenerate and only a few, pale and sparingly branched protonemal filaments were produced (Plate 1). On sucrose containing media, 1.0% sucrose supported maximum growth of

protonema. At this concentration protonema was dark-green. At 0.5% sucrose protonemal patch was light-green and protonema was poorly branched. At higher levels of sucrose (2.0 and 4.0%) protonema appeared brownish-green and growth of lateral branches decreased. Bud formation occurred at all concentrations of sucrose including control and number of buds was maximum at 1.0% sucrose (Fig.1). Further increase in concentration of sucrose in the media resulted in reduction in number of buds. Buds appeared after 38, 35, 33 and 43 days at 0.5, 1.0, 2.0 and 4.0% sucrose, respectively. At 0.5 and 1.0% sucrose containing media normal gametophores were produced, whereas at higher levels buds developed into stunted gametophores with abundant rhizoids.

Effect of sucrose on *Anoectangium clarum*

Effect of four concentrations of sucrose (0.5,1.0, 2.0 & 4.0%) was studied on protonemal growth and bud formation. Cultures raised on medium without sucrose served as control. In control cultures, inoculum failed to grow. With the addition of sucrose, growth of protonema increased and maximum protonemal growth was recorded at 1.0% sucrose (Fig.2, Table 2). At this concentration, both the systems (prostrate as well as aerial) were equally well developed. With increase in concentration, protonemal patch became more compact and extent of aerial system decreased. At 0.5% sucrose, protonema was light-green, at 1.0% sucrose, protonema was dark- green and further at higher concentrations it turned brownish-green.

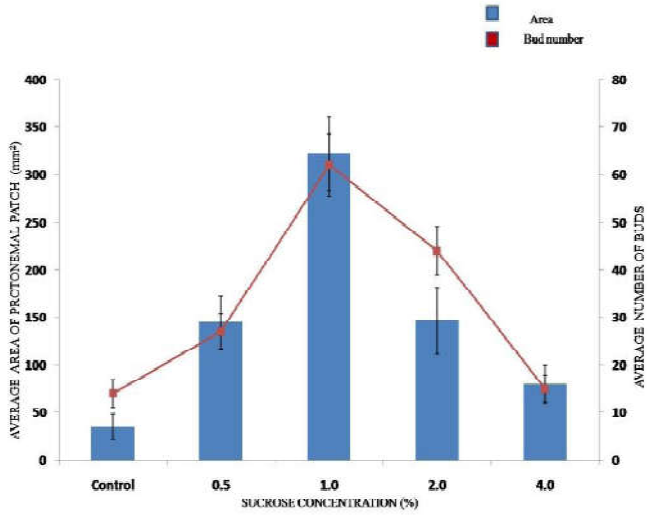

Fig. 1. Effect of Sucrose on *Hydrogonium arcuatum*

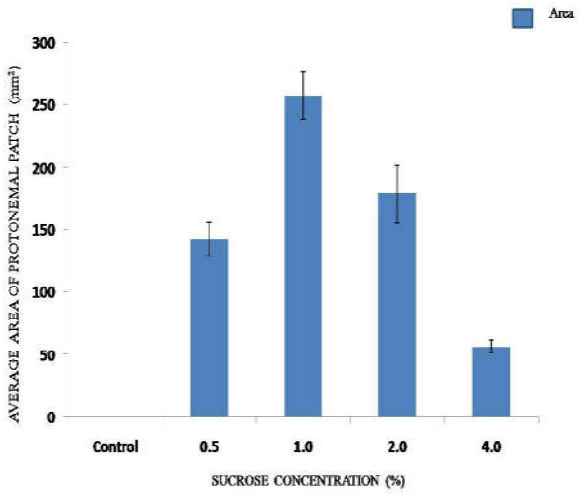

Fig. 2. Effect of Sucrose on *Anoectangium clarum.*

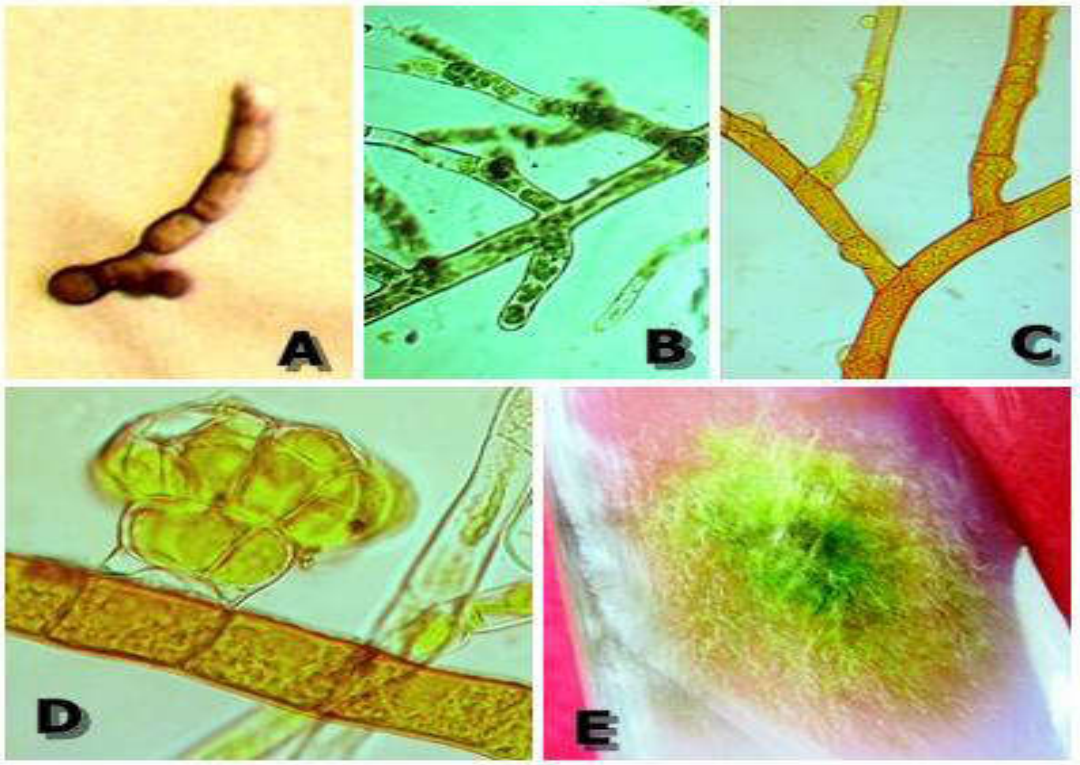

Plate 1. *Hydrogonium arcuatum,* A.Spore germination showing emergence of tube; B. Chloronema; C. Caulonema; D. Bud on protonema; E. Control culture

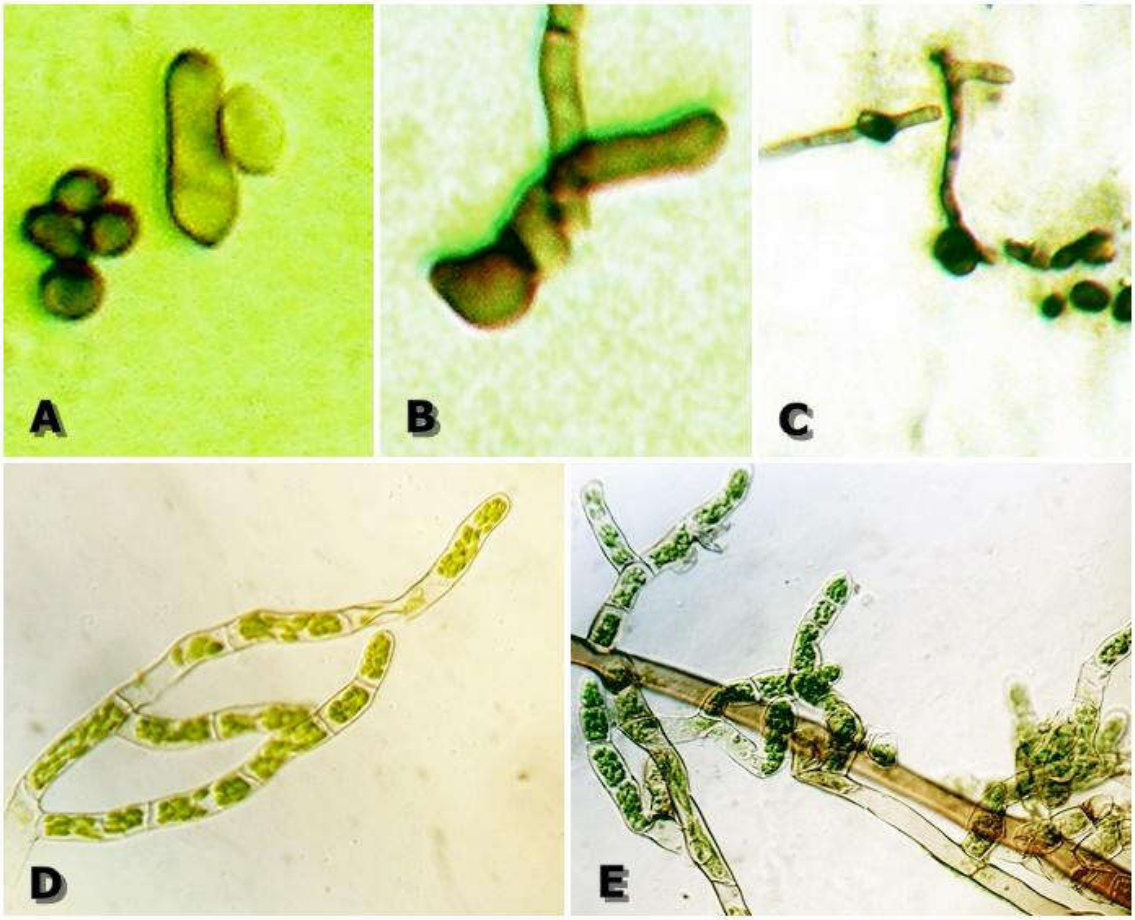

Plate 2. ***Anoectangium clarum,*** **Spore germination and protonema formation: A-C. Various stages of spore germination showing uni- and bipolar germination; D. Chloronema showing transverse walls and dense chloroplasts; E. Heterotrichous caulonemal filament**

Dispite the importance of the basal medium, absence of sucrose inhibits spore germination in *Anoectangium clarum*. Different concentrations of sucrose plays important role, higher concentration shows negative effect towards the growth of mosses. Chaudhary *et al*. (2011) observed that darkness shows negative effect in selected bryophyte. In the present investigation also spores of *Anoectangiium clarum* did not germinate in darkness irrespective of presence of sucrose. According to Richards (1932) darkness does not affect the growth of some bryophytes. Similar observations were studied in *Hydrogonium arcuatum*. Sucrose at 1% has been reported to induce maximum number of buds in *Anisothecium molliculum* (Kumra and Chopra, 1985), *Garckea phascoides* (Sarla, 1987), *Microdus brasiliensis* (Mehta and Chopra, 1991), *Anisothecium spirale*, *Pohlia elongata* (Vashistha and Chopra, 1987), *Barbula horricomis* (Saini, 1994), *Bryum capillare*, *Brachymenium bryoides* (Chaturvedi, 2001) and *Funaria hygrometrica* (Awasthi *et al*., 2009) and at higher concentration number of buds decreased. Similar observations were found in *Hydrogonium arcuatum,* 1% sucrose proved optimum for bud number and higher conc. Proved inhibitory.

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