CHAPTER I

INTRODUCTION

The paramount importance of blue-green algae (cyanobacteria) has long been recognized for crop production in tropical rice fields. The immediate need for using BGA is the outcome of a back drop due to food shortage, petroleum based energy deficit, high cost of nitrogenous fertilizers and concern of the environment. The production and processing of these nitrogen-fixing organisms for crop cultivation are striking apparent at a practical level.

These microorganisms are endowed with enzymatic equipment, nitrogenase. With the help of this enzyme, the microorganisms bring elemental nitrogen from the atmosphere into a combined form, namely ammonia under ambient conditions and the term "fixation" is applied. The chemical energy required for this fixation in photosynthetic organisms is driven by solar radiation. The unlimited reservoir of atmospheric nitrogen and abundant sunshine offer opportunities for supplementing the energy dependent synthetic fertilizers.
Generally, rice crop is grown in the fields with shallow standing water. In the tropical paddy fields, the nitrogen-fixing organisms like heterotrophic, autotrophic bacteria and BGA generally occur. Out of these BGA contribute substantial quantity of nitrogen to the total nitrogen fixed (Watanabe and Lee, 1977). The nitrogen fixed by BGA range from a few kg to as high as 80 kg/ha/crop (Trarore et al., 1978). Moreover, the abundant growth of blue-green algae in presence of the paddy has been well established (De and Sulaiman, 1950; Watanabe et al., 1951; Watanabe and Lee, 1977). Thus, the tropical rice fields are congruent for the congenial growth of BGA. The standing crop of BGA is recorded from few kg to 24 t/ha (Roger and Reynaud, 1979).

BGA are highly adaptable and are very tolerant to extremes of conditions. They grow very fast which provide unique opportunity for maximum biomass production and ultimately nitrogen fixation. They multiply rapidly in the flood water in neutral to alkaline soils. However, the proliferation of these organisms in acid soils is also known. The transport of algal inoculum is simple as it is easily preserved in a viable state for future use by simple methods. Further, BGA release nitrogen slowly for meeting the nutrient
requirement by rice. They provide a gradual fertility build up in the soil and check over harvest of nitrogen from the soil reserve.

These are also known to increase the nitrogen status of the soil, add organic matter to the soil and increase the nitrogen and phosphorus availability of the soil. Thus, they are vital in increasing the soil fertility in paddy fields.

Attribution of rice yield increase due to BGA inoculation is established (Singh, 1961; Watanabe, 1962; Venkataraman, 1972). Further, these organisms stabilise for consistent good yield of rice (Watanabe, 1962).

Under Indian conditions, rice being one of the principal crops, covers about 40 million hectares of land accounting for the largest share of artificial fertilizer consumption. If the current average cereal yield at 1.5 ton/ha is to be raised to at least 2.4 ton/ha for meeting the food requirement, an amount of 75 kg nitrogen per hectare will be required as against the present consumption of around 25 kg N/ha (Venkataraman, 1981). Thus, it seems that blue-green algae are indispensable for rice cultivation.
If the use of blue-green algae is to be extended to millions of hectares paddy field, the inoculum requirement will be tremendous. In order to meet the demand, blue-green algae are to be produced at a low cost avoiding sophisticated technology so as to be economically feasible for the farmers. Thus, cultivation in production units and its establishment in the inoculated paddy field for better utilization by rice need special emphasis.

Unfortunately most of the information available about different aspects of BGA is from laboratory or pot culture studies which might over estimate the actual algal contribution. Moreover, the same species which performed better in the laboratory may not prove worthy in the field. Knowledge is limited on the factors influencing the BGA production, BGA growth with paddy and realization of possible yield increase by algalization trials. Grain yield was being used as a convincing testimony of algalization, overlooking the primary input blue-green algal growth and nitrogen fixation quantitatively during the paddy cultivation cycle.

In the light of above facts and with the realization of the attractive potentiality of the
blue-green algal technology for rice cultivation the present study is thus initiated with the following objectives:

- to evaluate the factors affecting the production of inoculated and indigenous BGA,
- to assess the BGA inoculum growth during rice cultivation cycle, and
- to find out algalization effect by inoculated and indigenous BGA.