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Blue Green Algae (BGA) are considered to be one of the remarkable group of photosynthetic simple plant forms. The cellular organization of BGA is prokaryotic, characterized by the lack of membrane bound organelles including nucleus, chloroplast or mitochondria. Thus, they are very much identical to photosynthetic bacteria and represent a link between bacteria and green plants. BGA are often called as Cyanobacteria or Cyanophycean algae. Mucilage is secreted by all members of BGA. Some members of Chroococcales are surrounded by their individual mucilaginous sheath, whereas others are surrounded by a common mucilaginous envelope. A firm sheath is present in many filamentous members. The mucilaginous envelope may be yellowish, brownish, reddish violet or bluish (Desikachary 1959). Branching is observed and is of two types- true branching and false branching. Complete absence of flagella and sexual reproduction is characteristics of BGA. They reproduce only by formation of hormogones, pseudohormogonia, endospores, exospores, nannocysts, akinetes and planococci. BGA are oxygen evolving and nitrogen (N₂) fixing prokaryotes using sun light as the sole energy source for the fixation of nitrogen (Stewart 1980). The heterocysts are the main sites of-nitrogen fixation under aerobic condition (Fleming and Haselkorn 1973; Bradlay and Carr 1976). Heterocysts are the thick walled distinctive and specialized cells of unusual structure found in the members of Nostocaceae, Scytonemataceae, Stigonemataceae and Rivulariaceae (Lazaroff 1973). They can be easily distinguished from the remaining cells by their thick walls and pale-yellow homogeneous contents. They have conspicuous pores on both the ends and are either intercalary or terminal.
The agronomic potential of BGA was first recognized in India by De (1939) who attributed the inherent fertility of the tropical rice field soils to fix nitrogen and sustain the fertility of the rice field. Man-made waterlogged soil habitat of rice field is particularly rich in nitrogen fixing BGA (De 1939; Watanabe 1959; Materassi and Balloni 1965). Since rice field provide an ideal ecosystem for the growth and development of BGA, a number of BGA has been isolated from rice habitat and the practice of algalization has been advocated and adopted (Singh 1961; Venkataraman 1981; Kannaiyan 1985).

The study of BGA became “fashionable” in the last two decades for many academic and practical reasons. The role of nitrogen fixing BGA in the maintenance of the fertility of the rice fields has been well substantiated and documented (Ramani and Pillai 1992; Suri and Puri 1994; Gopalaswami et al. 1997). Studies conducted in the country have shown that BGA applied @ 10 kg/ha a week after transplanting of rice contributed 20-30 kg nitrogen (N) ha\(^{-1}\) season\(^{-1}\) (Singh 1985) and the grain yield increase by 4–14%. Those benefits are due to the contribution by BGA on combined nitrogen (Venkataraman and Kaushik 1980) and growth promoting substances like vitamin B12, auxin and ascorbic acid (Mishra and Kaushik 1989). However, nitrogen fixation by BGA varied considerably depending on locations and strains. Venkataraman (1975) quoted the fixation rate up to 80 kg N ha\(^{-1}\) season\(^{-1}\) and the yield improvement from 5-25% in presence of 100-150 kg N ha\(^{-1}\) by some efficient strains. Further, inoculated BGA on establishment and under good condition of growth add organic matter up to 50 t/ha, which is good indicative of residual effect of BGA on the subsequent crop (Verma and Martin 1976; Suri et al. 1995).

Besides fixing atmospheric nitrogen and liberating growth promoting substances, BGA can influence soil property and nutrition of rice plants in many other ways. BGA
liberate a large number of organic compounds, which have chelating properties to retain micronutrients like Fe, Mn, Cu and Zn in available form (Mandal 1988).

BGA have tremendous potential in environmental management in view of their importance as soil conditioners, biofertilizers, biomonitors of soil fertility, water quality ameliorator aiding in the reclamation of saline and user lands and rehabilitation of degraded ecosystems through biosorption of metals, feed for animals and protein supplements (Singh 1950, 61; Rai et al. 1998; Rai et al. 2000; Whitton and Potts 2000; Singh et al. 2001)

Another important reason for the rapidly growing popularity of BGA is that they provide a relatively simple and useful model system for the study of fundamental cellular process such as macromolecular synthesis, regulation of gene expression, cell differentiation and orderly developmental pattern formation (Fogg et al. 1973; Carr and Whitton 1973, 82).

The other benefit of BGA is that it can withstand high temperature and variable moisture regimes better than Azolla and hence has better adaptability. However, soil and climatic condition of a region must be primary criteria for selection of BGA biofertilizer for rice crop.

Morigaon is a district of Assam, India and it is located between 26.15° N and 26.5° N Latitude and between 92° E and 95.5° E Longitude. The district covers an area of 143150 ha. The geographical boundary comprises Nagaon district in the East, Darrang district in the North, Karbi -Anglong and a part of Nagaon and Kamrup district in the South and Kamrup district in the West.

On the basis of agro-climatic parameters particularly soil physiography and rainfall, the district is divided into six broad agro-climatic zones.

1) Humid alluvial non-flooded area.
2) Sub-humid alluvial non-flooded area.
Location map of the study area Morigaon District
3) Humid alluvial flooded area.
4) Humid char area.
5) Humid piedmont and high land.
6) Sub- Humid piedmont and high land.

Morigaon district has 161642 ha. gross cropped area and 81092 ha. net-sown area (Status Report of Agriculture Department, Morigaon district).

Rice is the principal cereal grown in Morigaon district. The farmers grow rice under waterlogged condition in this region. Although rice cultivation has been practiced in Assam since time immemorial by the farmers, the production and the yield of the crop is quite low as compared to national average. This may be ascribed to improper management practices, less extent use of high yielding varieties and lesser amount of fertilizers used by the farmers.

Fertilizers mainly NPK (Nitrogen, Phosphorous and Potassium) play a significant role in soil fertility. Among these, nitrogen content in soil is the major determinant for plant growth. Nitrogen can be made available by either crop rotation in soil or addition of farmyard manure and chemical fertilizer. But there are several limitations in adopting the above methods. Crop rotation is not possible in all places and all seasons and farmyard manure is not available in sufficient quantities to meet the increasing demand. Moreover, inadequate use of chemical fertilizer by poor farmers has emphasized the need for alternative nitrogen source. The fertilizer statistics show that consumption of fertilizers in Assam is around 16 kg/ha against the national average (1998-99). The use of high yielding varieties also demand increased use of fertilizers. However, due to socio-economic constrains, the farmers cannot afford the costly fertilizers particularly nitrogen. Moreover, there is every possibility of loss of added nitrogen fertilizer through various means particularly leaching loss that is prone to this part because of high rainfall in this region.
Therefore, need arises to search for an alternative source of nitrogen fertilizer that should be easily adapted and cost effective for the farmers and which should have the following advantages:

1) Production of a regular supply of nitrogen available over a longer period.
2) Less loss from volatilization and leaching.
3) Reduced concern about use of chemicals.
4) Increased soil organic matter.
5) Available in areas where nitrogen fertilizer may be difficult to obtain or apply.

The answer to the alternative of chemical nitrogenous fertilizer is biological nitrogen fixation (BNF). Under the existing socio-economic condition of the farmers of Assam, the use of biofertilizer shall partly fulfill the nitrogen demand of crop. At the same time, any saving in the consumption of mineral nitrogen without affecting the productivity of the crop shall, therefore, be not only an economic advantage but also an urgent necessity considering the global energy crisis. The indigenous BGA microflora has so far not been exploited in all the areas of Assam for the increase of rice production. Due to lack of proper survey work and the information about the potential BGA, the algal technology is not becoming so popular in Assam in comparison to other states of India. Attempts are necessary to isolate the potential nitrogen fixing BGA and for mass production of these indigenous isolates under natural condition to be used easily by the farmers as biofertilizers.

Since Morigaon district is traditionally rice growing area, BGA are particularly important for fixation of atmospheric nitrogen under rice field condition. This is relevant to the fact that Boro rice is largely grown in low lands under waterlogged condition occupying an area of 19820 ha. (Status Report of Agriculture Department, Morigaon district).
Cultivation of Boro rice in Morigaon District has been practiced extensively as 'early ahu'. This crop is sown primarily during pre-flooded season where the temperature remains ideal and there are sufficient irrigation facilities through deep tube wells. On the other hand, the Kharif crop (June to Oct) is subjected to frequent floods and water is unmanageable. Moreover, the average production of Boro rice is more than Sali and Ahu rice. Since there is sufficient water during cropping season, Boro rice plantation may be an ideal ecosystem for flourishment of BGA. No systematic approach has so far been made on the occurrence of diverse communities of BGA under such situations. The present investigation has been emphasized on the isolation of native efficient BGA from Boro paddy field and their future use as biofertilizers. The research thrust has utmost importance and concerned with environmental hazards caused by chemical fertilizers and future energy crisis. It will also help in accelerating the BGA technology in this region.

The present investigation has been taken with the following objectives:

1) Isolation of different species of BGA from different rice fields of Morigaon district.

2) Characterization and identification of isolated BGA.

3) Screening of efficient BGA.

4) Mass production of selected BGA.

5) Field application study.

6) Biofertilizer production (Preparation of immobilized inoculum).

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