*Research Journal of Agriculture and Forestry Sciences* _____ ISSN 2320-6063
Vol. **5(5),** 14-16, May **(2017)** *Res. J. Agriculture and Forestry Sci.*

***Short Communication***

# Studies on influence of blue green algae as biofertilizers on *Lycopersicon esculentum* (Tomato) plants

**Preeti Dobhal*** **and Parul Singhal**
Department of Botany, Alpine Institute of Management and Technology, Nanda Ki Chowki, Prem Nagar Dehradun, 248007, Uttarakhnad, India
dobhalpreeti@ymail.com

**Available online at: www.isca.in, www.isca.me**
Received 3rd April 2017, revised 20th April 2017, accepted 2nd May 2017

## Abstract

*Since the upcoming green revolution technologies, modern agriculture has been getting much more dependence on fertilizer. The green revolution brought impressive gains in food grains production for ever growing population in the country, but due to their adverse effect on environment and soil, Long Term Fertilizer Experiment (LTFE) has established that complete dependence on these chemical based fertilizers will not be useful in the future. Combination of inorganic fertilizers, green manures and biofertilizers can only retain the production of crop, preserve fitness and biodiversity of soil. In present study it is analysed that blue green algae is promoting the growth of tomato plants in soil. This study shows a positive influence of blue green algae as biofertilizer on various growth parameters taken during the experiment performed.*

**Keywords:** Biofertilizer, Blue green algae, Crop production, Nitrogen Fixation, Soil.

## Introduction

Man started cultivating land in a proper way for cereals around 8000 B.C. Very soon he learned that the same land cannot support the growth of plants endlessly and this led him to think about way to improve the fertility of soil. The earliest records indicate that the Romans and Aryans had many manuals for farmers to improve the cultivation of crops.

Man made fertilizers as we know them today, those containing Nitrogen, Diphosphate Pentaoxide and Potassium, increase the output of agricultural products and meet the ever increasing demands of the human population, which have been further accentuated by the limited availability of additional fertile land. The world's population, food production and fertilizer's consumption have increased gradually. To guarantee enough food for all, either the population growth has to be stemmed or more fertilizer has to be found to fulfill an ever increasing requirement for protein. Thus, an increase in world's fertilizer requirement by 2025 would be approximately three times the rate of current consumption.

Nitrogen is a very common limiting factor for proper and quick growth of all plants. Thus, sufficient supply of Nitrogen is very important. Nitrogen fixation is one the most important biological processes and though, the atmosphere contains 79% Nitrogen, most of the plants cannot utilize it. They can only utilize combined Nitrogen like Ammonium, Nitrate, Nitrite etc. Nitrogen is a constituent of proteins, nucleic acids, chlorophylls, enzymes and other physiological substances in green plants. Nitrogen is the macronutrient that is requires in high amounts by plants, and its availability in the soil may change substantially in relatively short time intervals[1]. The demand for chemically fixed Nitrogen is bound to be on the increase and the Nitrogen gap gets enlarged. Such a gap would be difficult to bridge in the rise of the energy crisis. Furthermore, in an area of chemical fixation, no major breakthrough is yet visible to minimize the energy requirements of the conventional Haber process, for the production of ammonia. In developing countries, the construction of new Nitrogen fertilizer plant is not only expensive but also time consuming. The combination of Nitrogen and Hydrogen could also be accomplished by Nitrogen fixing microorganisms in soil and within the nodular tissue of certain plants at ordinary pressures and temperature mediated by an enzyme known as 'Nitrogenase'.

Increased cost of the fertilizers is becoming an economic constrain for the farmers of the developing countries like Bangladesh and India. Still, the regular use of chemical fertilizers creates an imbalance in field, which affects it both economically and biochemically. It will help in protecting the health of soil and the quality of crop products. The beneficial effect of biofertilizers are addition of nitrogen, increased soil organic matter and soil aggregation[2]. Therefore, the strategy for improving agricultural production in developing countries should take into account inexpensive and realistic programmes to augent biological Nitrogen fixation. The concept of biofertilizer is nowadays being achieving momentum and is greatly practiced in rice fields in so many countries. The algalization technology has been reported to be successful to a great extent in India[3]. Blue green algae extracts excretes a great number of substances that influence plant growth and development[4]. Cyanobacteria attract the attention of scientists

due to their nitrogen fixing capacity and hence their role in the maintenance of soil fertility is well documented[5].

In the present study tomato was taken as the tester crop plant. Tomato is among the most important vegetable crops of India. It is a rich source of vitamins A, C, minerals, fibers and potassium. It has been suggested as a "functional food", a particular food which is providing not only basic nutrition but also preventing severe diseases and providing other health benefits, due to useful phytochemicals present in it such as lycopene and beta-carotene pigments.

## Materials and methods

Total Twenty seeds were sown in each pot of blocks A, B, and C under controlled and blue green algae treatment conditions. The soil used in the present study was 1-18cm deep and taken from garden located in Turner road, Clement Town region of Dehradun in polythene bags. Some mechanical, physical and chemical properties of soil were analysed before conducting the pot experiment. Nitrogen fixing blue green algae *Nostoc* was used for the present study. This blue green algae was choosed due to its easy availability, quick growth and good nitrogen fixing ability. Tomato (*Lycopersicon esculentum*) one of the most important vegetable crops grown in India was chosen to be the indicator plant in this study. Plants were raised in clay flower pots with a central drainage hole. The inner surface of the pots along with the top of outer rim was lined with acid washed polythene with a central hole superimposed on the drainaged hole of the pot. Normal tap water was used during experiment. Six pots were taken for the experiment and they were arranged in three blocks. i.e. block A, B and C. Sampling was generally started at 8:30 a.m. and completed in an hour. All samples were drawn at the same time and placed in shade.

The 3 blocks A, B and C were sampled at the same time. Soil was separately mixed with required amount of blue green algae. Thereafter it was dried thoroughly grounded and mixed. For thorough mixing required amount of blue green algae was mixed with bigger amount of soils, and finally these soils were mixed with bigger lots of calculated soil required for experiments. Soil mixing was done on separate clean sheet to avoid any contamination. Mixed soil was filled in pot.

## Results and discussion

Different growth parameters were studied. The height of the tops of the tomato plant was found to be 14cm under controlled condition and was 26.58cm after applying 250g bga/kg soil. Total fresh weight of 60 days old tops of the plant under controlled growth condition was found to be 4.0 g and 14.0g after applying blue green algae as biofertilizer. Dry weight of 60 days old tomato plants in controlled condition was 0.001g and 1.5g on applying 250g bga/kg soil. The number of leaves of tomato plant were found to be 8 in controlled conditions and 26 on applying blue green algae.

**Table-1:** Result of the experiment performed on the tomato plant is depicted.

| Growth parameter / Soil conditions | Height of the plant (cm) | Fresh matter yield(g) | Dry matter weight(g) | Number of leaves |
|---|---|---|---|---|
| Controlled conditions | 14.3 | 4 | 0.001 | 8 |
| 250 g bga/kg soil | 26.58 | 14 | 1.5 | 26 |

The application was effective in increasing the growth parameters of tomato plants. This shows the efficiency of blue green algae in increasing the growth of tomato plant in soil in low nitrogen fertility. In comparison to the plants which were grown in controlled conditions, the plants under blue green algae treatment show easily noticeable changes both qualititatively and quantitatively. Blue Green Algae proved to be very effective in increasing height of tomato plant by 85.8%. The data of present study shows that there is significant increase in dry matter and fresh matter of tomato plants. Similar information in positive influence of tomato plant due to Cyanobacteria has also been advanced by other investigators[6]. Blue green algal fertilizers in the soil were shown to exert a ever lasting effect. They were promising alternative for agrochemical fertilizers in avoiding soil pollution. These biofertilizers can also recover the nutrients long after harvest. So, further long term study on soil inoculated with microalgae is needed. The the results of the present investigation revealed the beneficial role of blue green algae.

## Conclusion

Blue green algal biofertilizers are recommended to be used as renewable nitrogen sources for different crop in agriculture. They are non hazardous, cost effective; utilize renewable resources in addition to solar energy, water and atmospheric nitrogen.

## References

**1.** Cameron K.C. and Haynes R.J. (1986). Retention and movement of nitrogen in soils. 166-241In: Haynes R.J. (ed.), Mineral Nitrogen in the plant soil system, Academic Press, Orlando.

**2.** Kulik M.M. (1995). The potential for using cyanobacteria and algae in the biological control of plant pathogenic bacteria and fungi. *European J. Plant Pathology,* 101(6), 585-599.

**3.** Venkataraman G.S. (1979). Algal inoculation of rice fields. *Nitrogen and Rice*, : International Rice Research Institute. Los Banos, Philippines, 311-321.

**4.** Ordog V. (1999). Beneficial effect of microalgae and cyanobacteria in plant/soil system with special regard to their auxin and cytokinin activity. International workshop

and training course on microalgal biology and biotechnology, Mosonmagyarovar, Hungary, 13-26.

**5.** Taha M.S. and El–Aggan W.H. (1981). Isolation, purification and culturing of physiologically two different nitrogen fixing strains of blue green algae Nostoc commune Vaucher from the soil of a rice field in Egypt. *Bull. Fac. Sci. Alex. Univ*. 21(4), 1-13.

**6.** Soad Humead Ali Al-Khiat and Ali H. (2006). Effect of cyanobacteria as a soil conditioner and biofertilizer on growth and some biochemical characteristics of Tomato (Lycopersicon esculentum L.) seedling. Thesis, submitted to King Saud University.