Estimation of Major and Minor elements from fresh water alga *Lyngbya martensiana* Meneghini ex Gomont

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ABSTRACT: : *Algal studies were carried out by many phocologists for human welfare. Many workers has pointed out that, the algae has potential as biofertilizer. Due to more use of of chemical fertilizers the quality of water and soil is decreasing day by day. These fertilizers are also costly. Therefore, it becomes very essential to substitute the chemical fertilizers. Algae can be used as biotertilizers as some have nitrogen fixing capacity. Some algae have potential of having different major and trace elements. The present studies were carried out on fresh water alga, Lyngbya martensiana Meneghini ex Gomont for its potential as a source of major and minor elements. The algal material is collected from Yesgaon canal from Kopargaon taluka during the period from March, 20012 to February, 2014. The alga was collected when canal does not flow and there is a formation of small water ditches in the canal. Screening of collected algal material for Major and Minor elements is carried out. It is concluded from the present investigations that, the fresh water alga Lyngbya martensiana contains significant quantity of major and minor elements. Among major elements, total nitrogen and phosphorus contents are moderate, while potassium values are lower than the reported values in marine algae. Ca and Mg contents are higher, while Fe content is low. Manganese values are in the range but fluctuating, while zinc and boron contents are higher than the marine algae. This alga may be used as important source of major and minor elements for the crop improvement.*

Key Words: *Lyngbya , Major, Minor elements, biofertilizer*

Introduction:

Different aspects of algae and their potential applications as feed, fodder, fertilizer are being revealed by many workers in all over the world. Biochemical constituents viz proteins, carbohydrates, lipids, major and minor elements etc. of algae were analyzed by several workers from different parts of the world.

Improvements in agricultural production, food and nutrition situation depend on land, water and energy resources. Research on the selection of new high yielding varieties started after the second world war and the selected new cultivars (varieties) were spread all over the world during 1960-70. The new plants produced by such techniques are supposed to be resistant to diseases, predators, drought and can be grown without fertilizers or pesticides.

In most of the developing countries, use of chemical fertilizers to increase the crop production is becoming highly essential. At the same time uncontrolled application of these fertilizers has created major problems in farming. Day by day production cost of these fertilizers is increasing and that's why biological methods of improving soil fertility now a days becoming important. Use of living organisms to increase soil fertility is a recent biotechnological process. Biologically fixed nitrogen is important source which can supply an adequate amount of nitrogen to the plants and other nutrients to some extent. It is a non hazardous way of increasing soil fertility. As these microbes or plants multitiplying rapidly, biofertilizers are required in less quantity. Now days, algae are commonly used as biofertilizers. Some are used as inoculants, while some are directly used as fertilizer as they are having different major and minor elements. The Cyanophycean alga Lyngbya is used as bioertilizer as it contains major and minor elements.

Materials and Methods:

Study area:

The present studies were carried out on fresh water algae, *Lyngbya martensiana* Meneghini ex Gomont. The algal material is collected from Yesgaon canal during the period from March, 20012 to February, 2014. The alga was collected when canal does not flow and there is formation of small water ponds in the canal.

About the alga- *Lyngbya martensiana* Meneghini ex Gomont is the fresh water alga. The thallus of the alga is filamentous, 6-18 cm in length, dark green and unbranched (Desikachary, T.V. 1959).

Taxonomic studies:
Division- Cyanophyta Smith
Class- Cyanophyceae Sachs
Order- Nostocales Geitler
Family- Oscillatoriaceae (S.F.Gray) Dumortier ex Kirchner
Lyngbya martensiana Meneghini ex Gomont
Biochemical constituents:

Estimation of some major and minor elements:
Major and minor elements were estimated according to Tandon (2005), *S*adasivan, S. and Manickam, A. (1996) etc.
a) Nitrogen- dry powdered algal sample was used. Total nitrogen was estimated by Kjeldahl distillation method.
b) Phosphorus- Dilute acid digested extract was used and phosphorus was estimated by using molybdate vanadate reagent.
c) Potassium- The acid digested extract of the alga was used for the estimation of potassium by flame photometric method.
d) Calcium and Magnesium- The di acid digested extract was used to estimate calcium and magnesium by using absorption spectrophotometer.
e) Iron, zinc, copper and manganese- Using di acid digested extracts of the alga, these trace elements were estimated by atomic absorption spectrophotometer.
e) Boron- boron estimation is based on the formation of colored rosacyanin, absorbance of an alcoholic solution of rosocyanin is proportional to that of boron concentration determined by spectrophotometer.

Preparation of algal powder:
In order to study the major and and minor elements of *Lyngbaya martensiana,* algal material was collected in large quantity from the collection sites. Collected algal material was washed in same water to remove epiphytes, impurities, soil particles etc. and carefully screened under binocular microscope. Washed algal material was dried under shade in the laboratory. Completely dried material was ground in a grinder to obtain fine powder. Fine powder of the alga was stored in air tight plastic containers for further use and for preparing extract in order to study their potential as a source of major and minor elements.

Results and Discussion:
Major elements:
The major and minor elements analysed during present investigation revealed the following composition and represented in table no.-1.
1. Nitrogen (N):
The total nitrogen values estimated during the year 2012 and 2014 were 4.2 and 5.3% of total dry weight respectively. The values showed marked fluctuation in nitrogen content. However the mean average value of nitrogen content was in the same range of nitrogen content estimated by Dhargalkar *et al* (1980) and Kesava rao and Indusekar (1987) from some marine seaweed.
2. Phosphorus (P):
The total phosphorus content in the algal sample collected during the year 2012 and 2014 were recorded as 0.02 and 0.05% respectively. A range of 0.003% to 0.62% phosphorus with an average of 0.16% in the Indian marine algae was reported by Kesavarao in 1992.
3. Potassium (K):
The potassium ranged between 0.42% to 0.68% in *Lyngbaya* species. Kesava Rao (1992) proposed a range of potassium in Indian marine algae from 0.15% to 6.45% with an average value of 3.51%. Potassium content of *Lyngbya martensiana* studied was within the range of those reported by Kesava Rao (1992) but found to be lower than the average value.
4. Calcium (Ca):
Calcium content in *Lyngbya martensiana* was found within the range of 3.5.% to 4.9% in both the years. Parekh *et al* (1977) reported 1.26% calcium in *Sargassum tennrimum.* Khemnar (2005) reported 4.93% of Ca in the Enteromorpha species. Kesava Rao (1992) reported Ca in the range of 0.2 to 1.9% in the Indian marine algae with an average of 0.9%.
5. Magnesium (M):
The estimated magnesium content in the alga *Lyngbya martensiana* was ranging between 3.2 % to 5.4% in two years time. Comparatively lower Mg content, 0.73% and 2.57% were reported earlier by Parekh *et al*

(1977) and Khemnar (2005) respectively from *S. tennerimum.* Kesava Rao *et al* (1992) reported an average of 1.45% of Mg in the Indian marine algae. The estimated values of Mg in *Lyngbya martensiana* are quite high than the marine seaweeds.

Minor elements:

6. Iron (Fe):

In *Lyngbya martensiana* exhibited 658.22 ppm iron content in the year 2012 and 849.25 ppm in the year 2014. Iron content showed fluctuating values in the same alga in two different seasons. There is no available information about iron content in fresh water algae so far. However, there are few reports of iron content from some seaweeds. Khemnar (2007) reported 0.4% iron from *S. tennerimum.* Kesava Rao *et al* (1992) reported an average of 1.33% iron in the Indian seaweeds. Sobha *et al* (1992) estimated a range of 498 to 16,435 ppm of Fe in some species of marine algae from Cape Comorine and Kovalam.

7. Zinc (Zn):

Zinc contents in *Lyngbya martensiana* was ranged between. 48.8. ppm and 86.2 ppm in two years. Zingde *et al* (1976) reported 20.4 ppm zinc content in *S.tennerimum.* Khemnar (2007) reported 14 ppm of zinc in the same species. Kesava Rao *et al* (1987) analyzed 29.66 ppm of zinc in the same species.

8. Copper (Cu):

Copper content were obtained in *Lyngbya martensiana* was 36.2 ppm in the year 2012 and 42.8 ppm in the year 2009. Zingde *et al* (1976), Kesava Rao *et al* (1986), Khemnar (2007) reported 7.3 to 11.2 and 10 ppm Cu content in marine algae *S.tennerimum.* Kesava Rao *et al* (1992) reported an average of 11.07 ppm in the Indian seaweeds.

9. Manganese (Mn):

In the present study manganese content in the year 2012 was 89.3 ppm and 303.5 ppm in the year 2014. Like iron and zinc, manganese content was also fluctuating.There are reports of Mn content from marine algae *S. tennerimum*. Zingde *et al* (1983) estimated 223 ppm, and Khemnar (2007) reported 200 ppm Mn in the aforesaid species. Kesava Rao *et al* (1992) estimated an average of 157 ppm of Mn in the Indian seaweeds.

10. Boron.(B):

Boron content of *Lyngbya martensiana* was 132.8 ppm in the year 2012-13 and 178.60 ppm in the year 2013-14. Kesava Rao *et al* (1992) reported an average of 90 ppm of boron content in Indian seaweeds. During present studies high values of Boron was recorded *Lyngbya martensiana.*

Conclusion:

Major elements:

During investigation period, total nitrogen content was ranged from 4.2% to 5.3%. Phosphorus content was recorded as 0.02% and 0.05%. In *Lyngbya martensiana* 0.42% to 0.68% potassium has been noted. Calcium content in the alga was found to be in the range 3.5% to 4.9%. during the period of investigation. Calcium is comparatively much higher in *Lyngbya martensiana* than the values reported earlier by all authors for marine algae. Magnesium content was ranged from 3.2 % to 5.4%, which is quite high than the marine algae.

Minor elements:

The analysis of iron content recorded was in the range of 658.22 to 849.25 ppm. The amount of iron was almost double in the second years observation. Zinc contents were also fluctuating between 48.8 to 86.2. As compared to Zn content of Indian seaweeds, it appears that Zn content is higher in *Lyngbya martensiana.* Fairly constant values, 36.2 and 42.8 ppm of copper content were obtained in the present alga. Like iron and zinc, manganese content in the present alga was also fluctuating and found in the range of 89.3 to 303.5 ppm. Boron content of *Lyngbya martensiana* ranged from 132.8 to 178.60 ppm.

Thus, during present investigations, considerable content of major and minor elements were recorded, This alga may be used as important source of major and minor elements for the crop in agriculture

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