Research Paper

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Comparative Study of Biofertilizerson the Growth and Biochemical Parameters of Mungbean Vigna Radiata (L ,Wilczek)

Environmental Science

KEYWORDS : Mungbean vigna radiata (L ,Wilczek), Rhizobium japonicum, Azotobacter spp Morphological parameters, Biochemical parameters.

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ABSTRACT

Biofertilizers are used for growing good quality produce. Biofertilizers are commonly called microbial inoculants which are capable of stopping important nutritional elements in the soil from non-usable to usable form by the crop plants through their biological processes. Agriculture is a most important sector of Indian economy. It contributes to growth, employment and overall economy of India. The Government of India has been trying to promote the use of Biofertilizer by providing incentives to the farmer. These inputs have a multiple beneficial impacts on the soil. Biofertilizers increases the soil fertility naturally and does not effect the soil like chemical fertilizers. Hence to increase the producity of the soil the use of biofertilizer is a must. The comparative effect of biofertilizers Rhizobium japonicum and Azotobacter sppon the growth and yield of Mungbean vigna radiata (L ,Wilczek) was studied. The seeds of mungbean were treated with biofertilizer and their result was recorded after 45 days.Results proves that plants treated with Rhizobium japonicum and Azotobacter spp showed excellent results in the morphological as well as biochemical parameters as compared to control(untreated) plants.

INTRODUCTION

Bio-fertilizers are microorganisms. The microorganism are like bacteria, fungi, algal strains. They differ from chemical fertilizer in their mode of action differs. Biofertilizers has an important role to play in improving soil fertility by fixing atmospheric nitrogen and improving the quality of nutrient available in the soil. Thus, enhancing crop yield by natural method. Chemical fertilizers also plays a similar role but they cause a great harm to the environment by significantly disturbing the soil. Agriculture is the most important sector of Indian economy. It contributes to growth, employment and overall economy of India .The Government of India has been trying to promote the use of Biofertilizer by providing incentives/subsidies to the farmer. These inputs have a multiple beneficial impacts on the soil. Biofertilizers increases the soil fertility naturally and does not effect the soil like chemical fertilizers.Hence to increase the producity of the soil the use of biofertilizer is a must. (Dixit,2013). Biofertilizer is one of the best and modern tools for agriculture. Use of Biofertilizer is of great importance because they are components of integrated nutrient management, and they are also cost effective and renewable source of energy forplants and to help in reducing the use of chemical fertilizers for sustainable agriculture(Rana et al,2013).Biofertilizer or microbial inoculants can be generallydefined as latent cells of efficient strains of a phosphate solubilizing and nitrogen fixing microorganism used for treatment of soil .They are composting the area with the objective of increasing the number of such microorganisms andaccelerate microbial process to augment to extent of the availability of the nutrient in a form which can easilyassimilated by plant (Subba-Rao1986). Microorganisms play an important role in soil processes that determine the plant productivity. There are many soil microorganisms like Rhizobium, Azotobacter, Azospirillum, Phosphatesolubilizers (Phosphobacteria), Blue green algae, Azolla and Mycorrhiza which can be used to increase the productivity of the plants. It includes mainly nitrogen fixing and, phosphate solubilizing microorganisms (Goel et al., 1999).Organic farming has emerged as an important priority area globally as well in our country India. Due to this there is a growing demand for safe and healthy food. Hence, there are concern for the long term sustainability as well as environmental pollution associated due to use of agrochemicals indiscriminately. Biofertilizers has an important role to play in improving soil fertility by fixing atmospheric nitrogen. Hence, the use of biofertilizer for harvesting of the naturally available, biological system of nutrient mobilization (Venkatashwarlu, 2008). The importance and role of bio-fertilizers in sustainable crop production has been studied by several authors. But their progress in the field of technology production always remained below satisfaction in Asia and Europe due to various constraints, either economically or politically and in some cases even ecologically(Mishra et a., 2013)Biofertilizers are small microbes which can be created by contain living cells of nitrogen fixing and phosphate solubalizing microorganism for treatment of seed or soil. Nitrogen is an essential nutrient for the growth of different crops; its application is beset with economic burdens and environmental risks. Biological nitrogen fixation not only improves plant growth but also helps to minimize the use of chemical nitrogen fertilizers, so that the cost of production and environmental risks are reduced. They are organic product which contain living cells of various types of microorganism, which are capable of converting important elements from unavailable to available from through biological processes (Vessey et al., 2003). Currently, a real challenge for the workers in the field of agricultural research is to stop the use of expensive agrochemicals/chemical fertilizers. Which negatively affect the environment as well as human health. Chemical fertilizers are used to replenish soil N, in Large quantities, they are highly costly and contaminate environment severely (Dai et al, 2004). Biofertilizers fix the atmospheric nitrogen in the available form for plants (Chen 2006). Biofertilizers are low cost, renewable sources of plant nutrients which supplement chemical fertilizers. Pulses play a vital role in Indian agricultural crop production. Pulses are important sources of food in rural as well as urban India. They are very rich in protein, particularly to the vegetarian who constitute the bulk of population in India. Green Gram is an annual food legume. It is very nutritious and is recommended for diabetics. Green Gram belong to Fabaceae Family of Plantae Kingdom. Its seeds are rich in protein. Mungbean is a short season crop, which is adaptive to a warmer and drier climate. Temperature of 20 -30 degree Celsius is optoum for plant germination. They are mostly grown in all over India. They are not expensive and rich source of protein. Thus, the aim of the experiment was to increase the productive of the crop with the help of Biofertilizers, which is ecofriendly.

MATERIALS AND METHODS

Seeds of Mungbeanvigna radiata (L ,Wilczek) were treated with Biofertilizers as follows

SEED TREATMENT WITH BIOFERTILIZERS

Two fertilizers were used to conduct the experiment they are Azotobacter spp and Rhizobium japonicum.

Rice starch was used for making the slurry of biofertilizer . The seeds were treated with the biofertilizers Azotobacter spp and Rhizobium japonicumslurry separately and were kept overnight for germination. 100 healthy seeds were selected. After selection, the seeds were sown in 10 plastic pots with garden soil. Ten control pots were also maintained by showing normal seeds. The plants were watered daily at regular intervals for 45 days. After 45 days morphological parameters such as number of leaves,length of leaves, breadth of leaves, length of plant, shoot length and root length were studied.The biochemical parameters such as total chlorophyll content, protein content and carbohydrates content were also studied by standard methods.

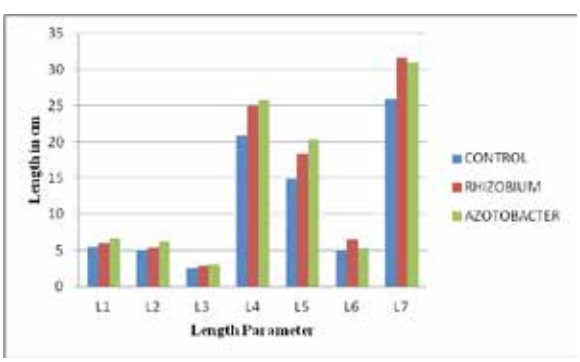
RESULTS AND DISCUSSION

When vigna radiata were treated with biofertilizer rhizobium japonicum and azotobacter showed excellent result as compared to control plants. In general, all plants treated with biofertilizers showed significant improvement in the growth like the number of leaves, length of leaves, breadth of leaves, length of plant, shoot length and root length .(Table1). This was agreed with previous findings of Gaur and Agarwal (1989) and Vasudevan et al. (2002).The total chlorophyll contents level of inoculated plants were significantly higher then the untreated plants. The similar results were observed in carbohydrates and protein content.(Table2) This was well correlated with earlier studies on Vignamungo L. (Mohan et al., 1994; Shukla andGupta, 1964).

Table 1: Effect of Biofertilizers on morphological parameters of (vigna radiata) plants

TREATMENT	(A) Number of leaves/plant (cm)	(B) Length of leaves (cm)	(C) Breadth of leaves (cm)	(D) Length of plant (cm) (above ground)	(E) Shoot length (cm)	(F) Root length' (cm) (below ground)	(D+F) Total length of plant (cm)
CONTROL	5.5	5.1	2.5	20.9	14.9	5.0	25.9
RHIZOBIUM	6	5.4	2.9	25	18.4	6.6	31.6
AZOTOBACTER	6.7	6.2	3.1	25.7	20.4	5.3	31

Figure1:Effect of Biofertilizers on morphological parameters of(vigna radiata) plants.

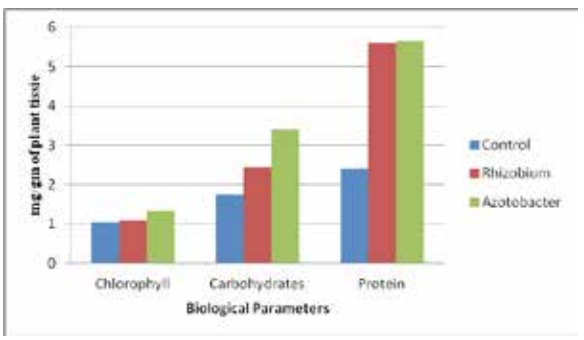


L1- Number of leaves/plant, L2- Length Of leaves, L3- Breadth of leaves,L4- Length of plant,L5- Shoot length, L6- Root length, L7- Total length of plant.

Table.2 Effect of Biofertilizers on bio-chemical parameters of (vigna radiata) plants.

Sample	Total Chlorophyll Content	Total Carbohydrate Content	Total Protein Content
Control	1.039	1.75	2.4
Rhizobium	1.077	2.45	5.6
Azotobacter	1.341	3.4	5.66

Figure.2.Effect of Biofertilizers on Bio-chemical parameters of(vigna radiata) plants.



CONCLUSION

When seeds were treated with biofertilizers they showed significant increase in growth parameter of plant Mungbean (Vigna radiata).Their morphological parameters such as Number of leaves, length of leaves, breath of leaves, length of plants, shoot length, root length and Total length of plant showed significant increase. The effect was also seen on the bio-chemical parameter such as carbohydrate content, protein content and chlorophyll content,the results proves that plants treated with experimental Azotobacter spp and rhizobium japonicum showed excellent growth in both the morphological as well as biochemical parameters. Hence , the use of biofertilizer should be encouraged by the government of Maharashtra & India because it is cost effective and Eco-friendly.

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REFERENCE

Chen J. The combined use of chemical and organic fertilizers for crop growth and soil fertility. Int. Workshop on Sustained Management of the Soil Rhizosphere System for Efficient Crop Production and Fertilizer Use., (2006) pp: 16-20 . | | Dai J, Becquer T, Rouiller JH, Reversat G, Bernhard-Reversat F, Lavelle P. Influence of heavy metals on C and N mineralization and microbial biomass in Zn-, Pb-, Cu-, and Cdcontaminated soils. Applied Soil Ecology, 2004; 25: 99-109. | | Dixit Supriya. Impact of Bio-fertilization on morphological parameters of Vigna mungo (L.) Hepper: International Journal of Research in Plant Science, 2013; 3(1): 10-13. | | Gaur, A.C., and Agarwal, A.R. 1989. In:Plant-Microbe interactions (Ed.Bilgrame, K.S), Focal Theme (Botany) ISCA symposium Narendra publication House, New Delhi, pp. 35-46. | | Goel AK, Laura RD, Pathak DV, Anuradha G and Goel A. Use of biofertilizers: potential, constraints and future strategies review. Inter. J. Trop. Agric., 1999; 17: 1-18. | Mishra DJ, Singh Rajvir, Mishra UK and Shahi Sudhir Kumar. Role of Bio-Fertilizer in Organic Agriculture: A Review; Research Journal of Recent Sciences, 2013; 2:239-41. | | Mohan, V.R., N. Kumar, G.S. Venkataraman, V. Murugaswari and Muthusamy, S.C. 1994. Effect of crude and commercial seaweed on seed germination and seedlings growth of | Cajanus cajan. Phykos.33: 47-51. | | Rana Rachna Ramesh and Kapoor Pooja Biofertilizers and Their Role in Agriculture;Popular Kheti , 2013; 1(1):56-61. | | Subba-Rao NS, Phosphate Solubilization by soil Micro organisms. In: Advances in Agricultural Microbiology, Subba-Rao, N.S. (Ed.). Oxford and IBH, New Delhi, (1986); pp: 295-303. | | Shukla, A.C., and Gupta, G.1964. Effect of algal hormones on stumetal and epidermal development in rice leaves. Hydrobiologia. 30:221-224. | | Vasudevan, P., M.S. Reddy, S. Kavitha, P.Vellusamy, K.S. David Paulraj, S.M. Purosothaman, V. Brindha Priyadarishini, S. Bharathkumar, J.W. Kloepper and Ganamanickam, S.S.2002. Role of biological preparations in enhancement of rice seedlings growth and yield. Curr. Sci. 83 (9): 1140-1143. | | Venkatashwarlu B. Role of bio-fertilizers in organic farming: Organic farming in rainfed agriculture: Central institute for dry land agriculture, Hyderabad, (2008); pp: 85-95 . | | Vessey JK. Plant growth promoting rhizobacteria as biofertilizers. Plant Soil., 2003; 255: 571-586. |