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Research Article

Effect of biofertilizer on the growth and biochemical parameters of Mungbean *Vigna radiata* (L ,Wilczek)

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Abstract

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 biofertilizer *Rhizobium* on 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. The proves that plants treated with *Rhizobium japonicum* showed excellent results in the morphological as well as biochemical parameters result as compared to controlled plants.

Keywords: Mungbean *vigna radiata* (L ,Wilczek), *rhizobium japonicum*, the morphological and biochemical parameter.

Introduction

Biofertilizers such as *Rhizobium japonicum* 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 .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. 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 for plants and to help in reducing the use of chemical fertilizers for sustainable agriculture(Rana *et al*,2013). For the last one-decade, biofertilizers are used in large quantity as an eco-friendly approach to reduce the use of chemical fertilizers, improve soil fertility status and for improvement of crop production by their biological activity in the *rhizosphere*. Biofertilizer like *Rhizobium, Azotobacter, Azospirillum* and *blue green algae (BGA)* are in use since long time ago. *Rhizobium* inoculants is used for leguminous crops. azotobactor is used on crops like wheat, maize, mustard, cotton, potato and other vegetable crops. *Azospirillum* inoculants are recommended mainly for sorghum, millets, maize, sugarcane and wheat. *Nostoc* genera represents blue

green algae, while the atmospheric nitrogen are fixed by *Anabaena, Tolypothrix and Aulosira* and these are used for the growth of paddy crop of both upland and lowland condition. Water fern *azolla* is associated with anabaena, it helps in contributing 60kg/ha/season ans its usefull in enriching soil with organic matter and bacteria which are usefull so-called phosphate solubilizing bacteria like Pantoea agglomerans strain P5 and Pseudomonas putida strain P13. These bacteria solubalize the insoluble phosphate source. Some phosphates are not mobile due to mineral ions such as Fe, Al and Ca or organic acids, the rate of available phosphate (Pi) in soil is well below plant needs .Vast researches were carried out on the use of bacteria, *(Azotobacter, Azospirillum, Rhizobium, phosphobacteria*) vam fungi as biofertilizers supply nitrogen and phosphorous improves the growth of several crop plants was observed (Marwaha, 1995). Dual inoculation of VAM and bacteria biofertilizers proved more effective in increasing the growth of different crop plants (Panwar, 1993). In recent years, biofertilizers have started on large scale as a promising component of integrating nutrient supply system in agriculture.). Most of the biofertilizers benefiting the crop production such as *azotobactor , azospirillum blue green algae (BGA) and rizhobium*(Hegde1999). Our whole system of agriculture depends in many important ways, on microbial activities and it appears to be a tremendous potential for making use of microorganisms in increasing crop production. Some of the small or microbe fertilizers or biofertilizers are important part of our environment for sustainable agricultures practices (Bloemberg 2000).). 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). The findings of previous studies in the field show that the biofertilizers are widely used in several countries with proven results in all kinds of plants and trees. (Victor and Ruben, 2002).

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. 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).

Materials and Methods

Seeds of Mungbean were treated with as follows: Rice starch was used for making the biofertilizer slurry. The seeds were treated with the *Rhizobium* slurry and were kept overnight for germination. Nearly, 50 undamaged healthy seeds were selected. After selection, the seeds were sown in 10 pots with soil (clay soil, red soil and sandy soil with farmyard manure). Ten control pots were also maintained by showing untreated seeds. The plants were watered at regular intervals and the growth parameters were studied. After 45 days of sowing, the morphological and biochemical parameter of green gram were analyzed. The morphological parameters like number of leaves, length of leaves, breadth of leaves, length of plant, shoot length and root length were analyzed. The biological parameter such as Total chlorophyll content in the leaves of plant, Total Protein content in the leaves of plants and Total carbohydrate content in the leaves of plants were analyzed.

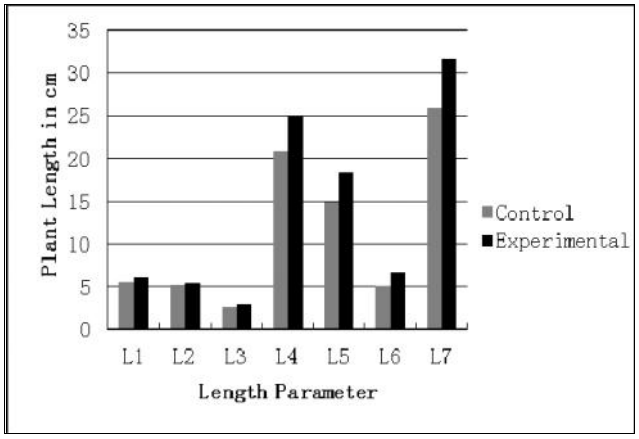
Results and Discussion

When *vigna radiata* plants were treated with biofertilizer *rhizobium japonicum* 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)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)

Table 1: Effect on morphological parameters of Mungbean plant treated with biofertilizer

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
EXPERIMENTAL	6	5.4	2.9	25	18.4	6.6	31.6

Figure 1: Effect on morphological parameters of green gram plant treated with Biofertilizer.

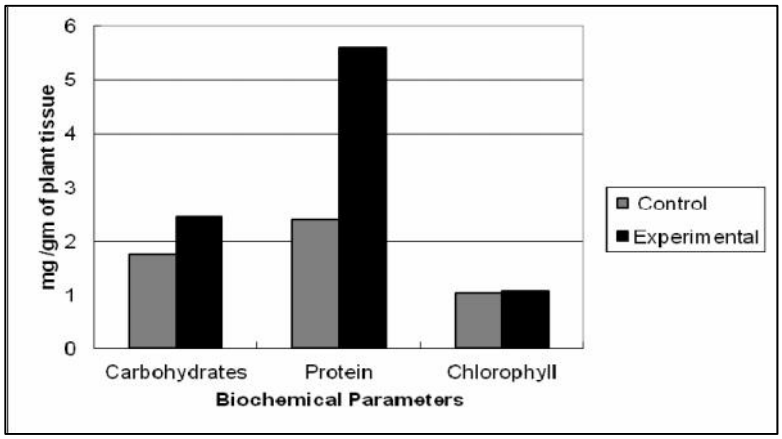


L1- Number of leaves/plant, L2- Length Of leaves, L3- Breadth of leaves,L4- Length of plant,L5- Shoot length, L6- Root length, L7- Total length of plant

Table.2 Effect on bio-chemical parameters of Mungbean plants treated with biofertilizer

Sample	Total Carbohydrate Content	Total Chlorophyll Content	Total Protein Content
Control	1.75	1.039	2.4
Experimental	2.45	1.077	5.6

Figure. 2. Effect on bio-chemical parameter of Mungbean plants inoculated with Biofertilizer.



Conclusion

The seeds treated with biofertilizer *rhizobium japonicum* showed an significant increase in the growth 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 improvements. The effect was also observed in the bio-chemical parameter such as carbohydrate content, protein content and chlorophyll content. Hence, results proves that plants treated with *rhizobium japonicum* showed better growth in both morphology as well as biochemical parameters.

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