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Research Article

Comparative account of Effect of Biofertilizers on the growth and biochemical parameters of *Vigna mungo* (L.Hepper*)*

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Abstract

Biofertilizers are commonly called microbial inoculants which are capable of mobilizing important nutritional elements in the soil from non-usable to usable form by the crop plants through their biological processes. . Biofertilizers increases the soil fertility naturally and does not affect the soil like chemical fertilizers. Hence to increase the productivity of the soil the use of biofertilizer is necessary. The comparative effect of biofertilizers *Rhizobium japonicum* and *Azotobacter spp* on the growth and yield of Black gram *vigna mungo* (L.hepper) was studied. The seeds of mungbean were treated with biofertilizer and their result was recorded after 45 days. This proves that plants treated with *Rhizobium japonicum* and *Azotobacter spp* showed excellent results in the morphological as well as biochemical parameters result as compared to controlled (untreated) plants. 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.

Keywords: V*igna mungo*(L.hepper), *Rhizobium japonicum*, *Azotobacter spp* Morphological and Biochemical parameters.

Introduction

Biofertilizer' is a substance which contains living microorganisms which, when applied to seed, plant surfaces, or soil, colonizes the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant. Biofertilizers add nutrients through the natural processes of Nitrogen fixation, solubilizing phosphorus, and stimulating plant growth, through the synthesis of growth promoting substances. Biofertilizer or microbial inoculants can be generally defined 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 and accelerate microbial process to augment to extent of the availability of the nutrient in a form which can easily assimilated by plant (Subba-Rao1986).

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 commonly called microbial inoculants which are capable of mobilizing important nutritional elements in the soil from non-usable to usable form by the crop plants through their biological processes. For the last one-decade, biofertilizers are used extensively as an eco-friendly approach to minimize the use of chemical fertilizers, improve soil fertility status and for enhancement of crop production by their biological activity in the rhizosphere. Extensive researches were carried out on the use of bacteria, (*Azotobacter, Azospirillum, Rhizobium, phosphobacteria) and VAM fungi* as biofertilizers to supplement nitrogen and phosphorus fertilizers and considerable improvement in the growth of several crop plants was observed [Marwaha *et al.* 1995]. Biofertilizers include mainly the nitrogen fixing, phosphate solubilizing and plant growth-promoting microorganisms [Goel *et al*. 1999]. Among, biofertilizers benefiting the crop production are *Azotobacter*, *Azospirillum*, blue green algae, *Azolla,* P-solubilizing microorganisms, mycorrhizae and sino rhizobium [Hegde *et al*.1999].Dual inoculation of VAM and bacteria biofertilizers proved more effective in increasing the growth of different crop plants [Panwar *et al.*1993]. In recent years, biofertilizers have emerged as a promising component of integrating nutrient supply system in agriculture. Our whole system of agriculture depends in many important ways, on microbial activities and there appears to be a tremendous potential for making use of microorganisms in increasing crop production. Microbiological fertilizers are an important part of environment friendly sustainable agricultures practices [Bloemberg *et al*.2000]. Many experiments were conducted to study the effect of biofertilizers alone or in combination with other chemical fertilizers [Patel *et al*. 1992].Pulses play a vital role in Indian agriculture. Pulses are important sources of food. They are very rich in protein, particularly to the vegetarian who constitute the bulk of population in India. Blackgram is an annual food legume. It is very nutritious and is recommended for diabetics. Biofertilizer or microbial inoculants can be generally defined as preparation containing live latent cells of efficient strains of nitrogen fixing and phosphate solubilizing microorganism for treatment of seed or soil. They are organic product containing living cells of different types of microorganism, which have the ability to convert nutritionally important elements from unavailable to available from through biological processes (Vessey, *et al*, 2003). They are composting the area with the objective of increasing such microorganisms and accelerate microbial process to augment to extend of the availability of the nutrient in a form which can easily assimilated by plant (Subba-Rao, *et al*, 1986The 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 Reuben, 2002). 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 (Bhattarai and Hess, 1988; Hewary *et al.*, 1998; Aly *et al.*, 1999). Microbial inoculants have attained special significance in modern agriculture. Responses of biofertilizers have been obtained in cereals, millets, pulses, legumes, oilseeds, sugarcane and cotton grown under different agro climatic conditions (Gupta, 1966)

.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). .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. In the present study, used microorganisms as biofertilizer was azotobacter,rhizobium and plant used was Black Gram *Vigna Mungo* (L , Hepper) Blackgram is also called Udat or black gram in India. It belong to Fabaceae.(Leguminosae). Its seeds are rich in protein. blackgram 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 *Vigna mungo* (L.Hepper) were treated with Biofertilizer as follows.

Seed treatment with biofertilizers

Two Biofertilizers namely (*Azotobacter* and *Rhizobium*) were used to conduct the experiment. Rice starch was used for making the slurry of biofertilizer . The seeds were treated with the biofertilizers *Azotobacter spp* and *Rhizobium japonicum* slurry separately and were kept overnight for germination. 100 undamaged 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 after 45 days of sowing. The morphological parameters such as number of leaves, length of leaves, breadth of leaves, length of plant, shoot length and root length were analyzed. The biochemical parameters such as total chlorophyll content, protein content and carbohydrates content were also analyzed by standard methods.

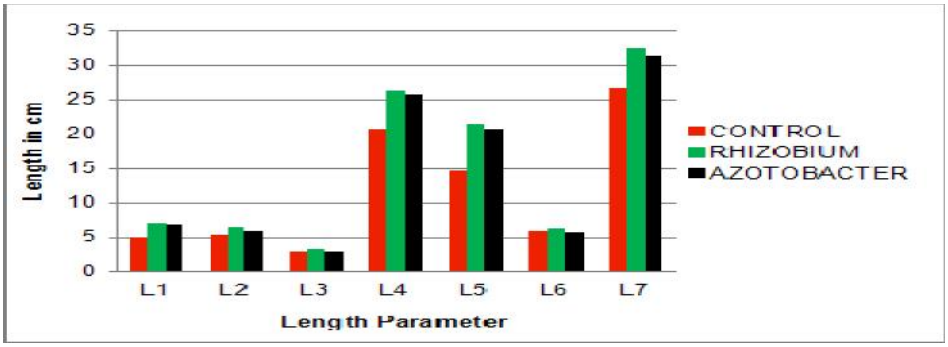
Results and Discussion

When *Vigna mungo* plants 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).These result was well agreed with previous finding of Gaur and Agarwal (1989), Tilak (1991) and Vasudevan et al. (2002). And this was well correlated with earlier studies on *Vigna mungo* L. (Mohan et al., 1994; Shukla and Gupta, 1964).The total chlorophyll contents level of inoculated plants were significantly higher than the untreated plants. The similar results were observed in carbohydrates and protein content.(Table2). After comparing the present result with the findings of other researchants, it was found that result was well agreed.

Table 1: Effect of bioferetilizer on morphological parameters of *Vigna mungo* plants 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	5.0	5.4	3.0	20.7	14.7	6.0	26.7
Rhizobium	7.2	6.5	3.4	26.2	21.4	6.3	32.5
Azotobacter	6.9	6.0	3.0	25.8	20.8	5.7	31.5

Figure1:Effect of biofertilizers morphological parameters of *Vigna Mungo* plant treated with Biofertilizer.

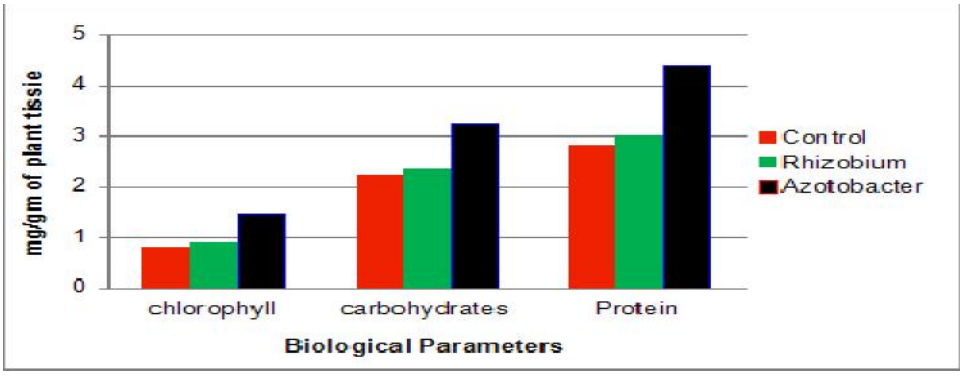


L1- Number of leaves/plant, L2- Length Of leaves, L3- Breadth of leaves,L4- Length of plant,L5- Shoot length, L6- Root length, L7- Total length of plant.

Table.2 Effect of biofertilizers bio-chemical parameters of Blackgram plants treated with biofertilizer.

Sample	Total Carbohydrate Content	Total Chlorophyll Content	Total Protein Content
Control	2.25	0.821	2.8
Rhizobium	2.35	0.885	3.0
Azotobacter	2.25	0.821	2.8

Figure. 2. Effect of biofertilizers on Bio-chemical parameters of *Vigna mungo* plants treated with Biofertilizer.



Conclusion

When seeds were treated with biofertilizers they showed significant increase in growth parameter of plant Blackgram (*Vigna mungo* (L.Hepper).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 biofertilizers *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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