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## Original Research Article

### Effect of Biofertilizer (*Azotobacter sp.*) on the Growth of Blackgram *Vigna mungo* (L.) Hepper

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Abstract	Keywords
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. The seeds of <i>Vigna mungo</i> (L.) Hepper were treated with bio-fertilizers for 45 days after which their result was recorded. It was observed that the plants treated with bio-fertilizer <i>Azotobacter sp.</i> showed excellent result in the morphological and bio-chemical parameters.	<i>Azotobacter sp.</i> Biofertilizers <i>Vigna mungo</i> (L.) Hepper

## Introduction

Today, global agriculture is at crossroads and this is the consequence of climatic change, increased population pressure and detrimental environmental impacts and new mechanism must be found to ensure food security through sustainable crop production system that will supply adequate nutrition without harming the agroecosystem. 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. Biofertilizers like *Azotobacter sp.* they are very rich in protein, particularly to the vegetarian who constitutes the bulk of population in India. Blackgram is an annual food legume. It is very nutritious and is recommended for diabetics. 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 and Pooja, 2013).

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. Biofertilizer are organic products of living cells containing different types of microorganisms, which have the ability to convert important elements from unavailable sources to available sources through ecological processes (Vessey, 2003). 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-Rao, 1986).

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 concerns 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 (Venkateshwarlu, 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 al., 2013) nodules with legumes whereas, phosphobacteria solubilize the insoluble phosphorous and converts it in soluble form to crop plants (Dixit, 2013).

Most of the biofertilizers benefiting the crop production such as *Azotobacter*, *Azospirillum* blue green algae (BGA) and *Rizhobium* (Hegde, 1999). Many experiments were conducted to study the effect

of biofertilizers alone or in combination with other chemical fertilizers (Patel et al., 1992).

## Materials and methods

Seeds of *Vigna mungo* (L.) Hepper were treated with *Azotobacter sp.* as follows.

### Treatment of biofertilizer (*Azotobacter sp.*) with seeds

Rice starch was used for making the biofertilizer as slurry. The seeds were treated with the *Azotobacter* slurry and were kept overnight for germination. Nearly hundreds of undamaged seeds and experimental *Azotobacter* were selected. After the selection process seeds were sow in 10 pots with soil in it (wet farm soil). Even 10 “control” pots were maintained in which no *Azotobacter sp.* was used or seeds were untreated. The plants were watered at regular intervals and growth rate was noted down time to time. After 45 days of sowing, the morphological and biochemical parameter of Black gram were analyzed. The morphological parameters such as number of leaves, length of leaves, and 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.

## Results and discussion

When *Vigna mungo* (L.) Hepper when treated with biofertilizer, *Azotobacter sp.*, showed better results compared to untreated control. In general, all plants treated with biofertilizers showed significant improvement in the results like the number of leaves, length of leaves, breadth of leaves, length of plant, shoot length and root length (Table 1). The total chlorophyll contents level of inoculated plants were significantly higher than the uninoculated plants. The same results were observed in carbohydrates and protein content (Table 2).

## Conclusion

When seeds treated with bacterial biofertilizer *Azotobacter sp.* showed significant increase in the growth of plant, black gram *Vigna mungo* (L.) Hepper. Their morphology parameters such as number of

leaves, length of leaves, breadth of leaves, length of plants, shoot length, root length and Total length of plant showed significant importance. The effect was also seen in the bio-chemical parameter such as carbohydrate content, protein content and chlorophyll content, the results proves that plants

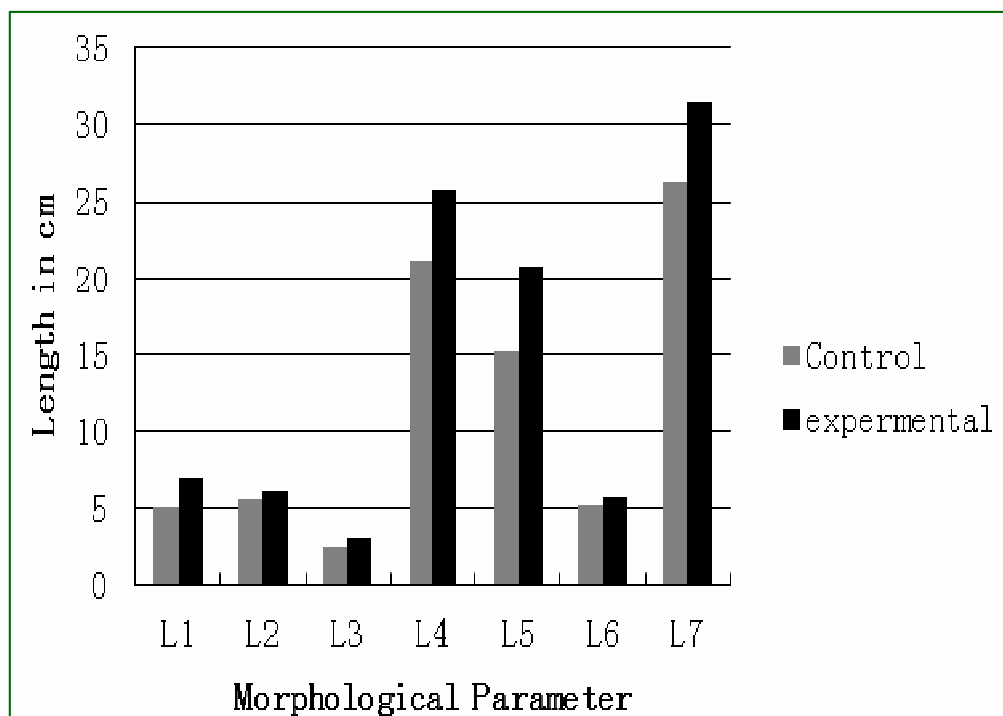
treated with experimental *Azotobacter sp.* showed excellent growth in both the morphological as well as biochemical parameters. Hence, the use of biofertilizer should be encouraged by the government of Maharashtra, India because it is cost effective and eco-friendly.

**Table 1. Effect on morphological parameters of black gram plant treated with biofertilizer, *Azotobacter sp.***

Treatment	(A)	(B)	(C)	(D)	(E)	(F)	(D+F)
	No. of leaves/plant (cm)	Length of leaves (cm)	Breadth of leaves (cm)	Length of plant (cm) (above ground)	Shoot length (cm)	Root length (cm) (below ground)	Total length of plant(cm)
Control	5.0	5.5	2.4	21.1	15.1	5.2	26.3
Experimental	6.9	6.0	3.0	25.8	20.8	5.7	31.5

**Fig. 1: Effect on morphological parameters of black gram plant treated with biofertilizer (*Azotobacter sp.*).**

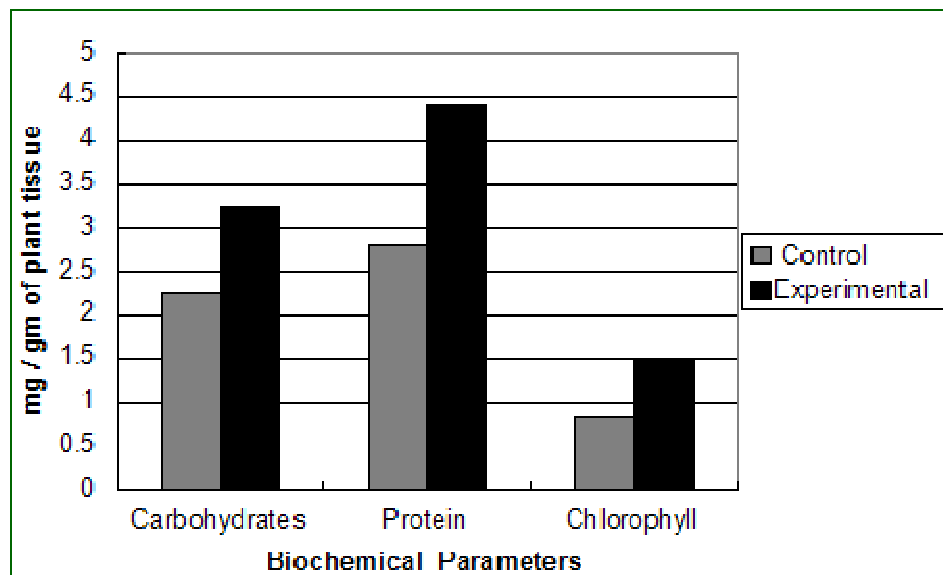
L1- Number of leaves/plant, L2- Length Of leaves, L3- Breadth of leaves, L4- Length of plant, L5- Shoot length, L6- Root length, L7- Total length of plant.



**Table 2: Effect on bio-chemical parameter on *Vigna mungo* (L.) Hepper plants treated with biofertilizer (*Azotobacter sp.*).**

Sample	Total Carbohydrate Content /100g	Total Chlorophyll Content /100g	Total Protein Content/100g
Control	2.25	0.821	2.8
Experimental	3.25	1.472	4.4

Fig. 2: Effect on biochemical parameters of *Vigna munga* (L.) Hepper plants treated with biofertilizer.



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