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# Microbial Inoculants effect an individual and combined on growth and plant height of soybean

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**ABSTRACT**
*Soybean [Glycine max (L.) Merrill] is popularly known as miracle crop, A field experiment was conducted to study the effect of "Interactive effect of beneficial microorganisms on growth and yield of soybean under microcosm conditions" during kharif 2012 at Zonal Agricultural Research Station, University of Agricultural Sciences, Ghandhi Krishi Vignana Kendra, Bengaluru. The experiment consisted of twelve treatments with three replications laid out in Randomized Complete Block Design. The results indicated that the growth parameters of soybean viz., plant height, number of trifoliate leaves plant$^{-1}$ were significantly influenced by the interactive effect of beneficial microorganisms under microcosm conditions.*

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## INTRODUCTION

Soybean [*Glycine max* (L.) Merrill] is popularly known as miracle crop, introduced to India during mid sixties. It is also called as 'Golden bean' and it is the second largest oilseed crop in India after groundnut and is being grown in varied agro-climatic conditions. In recent past it has emerged as one of the important commercial crops in many countries. Soybean accounts to more than 50 per cent of the world's oilseeds production. As per USDA report 2011, USA, Brazil and Argentina collectively accounts to more than 80 per cent of the global soybean production (Anon., 2011).

## MATERIAL AND METHODS

### Crop variety

MAUS2 variety was used for experimentation. It is a long duration variety matures in 100-110 days after sowing. This variety is mainly used for grain purpose.

### Sowing

The furrows were opened at a row spacing of 30 cm and the treated seeds were placed at 10 cm distance within the rows to a depth of 5 cm and later soil was covered.

### Plant height (cm)

Plant height of five randomly selected plants were measured from the base of the plant to base of the penultimate leaf of the main shoot and the mean plant height was worked out and expressed in centimeter.

### Number of trifoliate leaves per plant

The number of fully opened green leaves arising from the main stem were counted from five plants and the mean number of leaves per plant was worked out.

## RESULTS

### Plant height (cm)

The data on plant height recorded at 30, 60 DAS and at harvest as influenced by interactive effect of beneficial microorganisms on growth and yield of soybean under microcosm conditions are presented in Table 2.

At 30 DAS, application of 100 % NPK + *Bradyrhizobium* + *Aspergillus niger* + VAM ($T_{11}$) recorded taller plants (22.32 cm) followed by 100 % NPK + *Bradyrhizobium* + *Acinetobacter calcoaceticus* + VAM ($T_{12}$; 20.80 cm). The lowest plant height (15.49 cm) was recorded in the treatment of FYM alone ($T_1$).

At 60 DAS, application of 100 % NPK + *Bradyrhizobium* + *Aspergillus niger* + VAM ($T_{11}$) recorded significantly taller plants (38.15 cm) compared to all other treatments followed by 100 % NPK + *Bradyrhizobium* + *Acinetobacter calcoaceticus* + VAM ($T_{12}$) (36.77 cm). The lowest plant height (29.12 cm) was recorded in the treatment of FYM alone.

At harvest application of 100 % NPK + *Bradyrhizobium* + *Aspergillus niger* + VAM ($T_{11}$) recorded significantly taller plants (40.69 cm) followed by 100 % NPK + *Bradyrhizobium* + *Acinetobacter calcoaceticus* + VAM ($T_{12}$; 40.61 cm) while the lowest plant height (31.64 cm) was recorded in the treatment of FYM alone (Table 1).

**Number of trifoliate leaves per plant**

The data with respect to total number of leaves per plant at different growth stages as influenced by combined effect of beneficial microorganisms on growth and yield of soybean under microcosm conditions are presented in Table 3.

At 30 DAS, application of 100 % NPK + *Bradyrhizobium* + *Aspergillus niger* + VAM ($T_{11}$) recorded more number of leaves (5.42) followed by ($T_{12}$) 100% NPK + *Bradyrhizobium* + *Acinetobacter calcoaceticus* + VAM (5.37). Lowest number of leaves (3.61) were recorded in plants applied with FYM alone ($T_1$).

Significantly more number of leaves were recorded in $T_{11}$ having 100 % NPK + *Bradyrhizobium* + *Aspergillus niger* + VAM (19.53) followed by 100 % NPK + *Bradyrhizobium* + *Acinetobacter calcoaceticus* + VAM ($T_{12}$) (18.81). The lowest number of leaves (13.99) were recorded in FYM treatment ($T_1$).

Similarly at harvest, application of 100 % NPK + *Bradyrhizobium* + *Aspergillus niger* + VAM ($T_{11}$) recorded significantly higher number of leaves (20.55) which statistically it was on par with 100 % NPK + *Bradyrhizobium* + *Acinetobacter calcoaceticus* + VAM ($T_{12}$) (20.28). Lowest number of leaves (15.97) were recorded in the treatment of FYM alone ($T_1$) (Table 2).

**Table 1: Influence of beneficial microorganisms on plant height (cm) of soybean**

| Treatments | 30 DAS | 60 DAS | At harvest |
|---|---|---|---|
| $T_1$: FYM alone | 15.49 | 29.12 | 31.64 |
| $T_2$: *Bradyrhizobium* + 75% N + 100 % PK | 16.03 | 30.66 | 34.41 |
| $T_3$: *A. niger* + 100 % NK + 75 % P | 15.73 | 30.41 | 33.46 |
| $T_4$: *A. calcoaceticus* + 100 % NK + 75 % P | 15.57 | 29.33 | 32.87 |
| $T_5$: VAM + 100 % NK + 75 % P | 15.65 | 29.62 | 32.92 |
| $T_6$: 75 % NP + *Bradyrhizobium* + *A. calcoaceticus* | 16.49 | 31.14 | 33.98 |
| $T_7$: 75 % NP + *Bradyrhizobium* + *A. niger* | 17.72 | 32.67 | 36.08 |
| $T_8$: 75 % NP + *Bradyrhizobium* + VAM | 17.20 | 32.03 | 34.80 |
| $T_9$: 75% NP + *Bradyrhizobium* + *A. niger* + VAM | 20.54 | 35.78 | 37.88 |
| $T_{10}$: 75 % NP + *Bradyrhizobium* + *A. calcoaceticus* + VAM | 18.12 | 32.82 | 36.42 |
| $T_{11}$: 100 % NPK+ *Bradyrhizobium* + *A. niger* + VAM | 22.32 | 38.15 | 40.69 |
| $T_{12}$: 100 % NPK + *Bradyrhizobium* + *A. calcoaceticus* + VAM | 20.80 | 36.77 | 40.61 |
| **S. Em. ±** | 0.28 | 0.32 | 0.45 |
| **C. D. at 5 %** | 0.82 | 0.94 | 1.34 |

**Note:** 1.DAS = Days after sowing, 2.VAM = *Glomus fasciculatum*

**Table 2: Number of trifoliate leaves of soybean as influenced by beneficial microorganisms**

| Treatments | 30 DAS | 60 DAS | At harvest |
|---|---|---|---|
| $T_1$: FYM alone | 3.61 | 13.99 | 15.97 |
| $T_2$: *Bradyrhizobium* + 75% N + 100 % PK | 4.23 | 14.77 | 16.33 |
| $T_3$: *A. niger* + 100 % NK + 75 % P | 4.13 | 14.43 | 16.32 |
| $T_4$: *A. calcoaceticus* + 100 % NK + 75 % P | 3.77 | 14.06 | 16.11 |
| $T_5$: VAM + 100 % NK + 75 % P | 3.93 | 14.20 | 16.23 |

| | | | |
|---|---|---|---|
| $T_6$: 75 % NP + *Bradyrhizobium* + *A. calcoaceticus* | 4.43 | 15.21 | 16.43 |
| $T_7$: 75 % NP + *Bradyrhizobium* + *A. niger* | 5.02 | 16.12 | 17.11 |
| $T_8$: 75 % NP + *Bradyrhizobium* + VAM | 4.97 | 15.67 | 16.77 |
| $T_9$: 75% NP + *Bradyrhizobium* + *A. niger* + VAM | 5.10 | 16.91 | 18.79 |
| $T_{10}$: 75 % NP + *Bradyrhizobium* + *A. calcoaceticus* + VAM | 5.10 | 16.14 | 17.39 |
| $T_{11}$: 100 % NPK+ *Bradyrhizobium* + *A. niger* + VAM | 5.42 | 19.53 | 20.55 |
| $T_{12}$: 100 % NPK + *Bradyrhizobium* + *A. calcoaceticus* + VAM | 5.37 | 18.81 | 20.28 |
| **S. Em. ±** | 0.18 | 0.27 | 0.22 |
| **C. D. at 5 %** | 0.53 | 0.78 | 0.67 |

## DISCUSSION

### Growth and its attributes as influenced by interactive effect of beneficial microorganisms on soybean.

Rhizobium is a symbiotic N fixer in pulses and oilseed crops and is known to produce growth promoting substances like IAA, gibberellins and cytokinins etc., which help in enhancing the plant growth and yield. Many research studies have showed that dual or triple microbial inoculation is highly beneficial to crop growth in obtaining higher crop yield (Iraj *et al*. 2009). In this study combined application of *Bradyrhizobium, Aspergillus niger* and VAM with 100 % NPK to soybean has resulted in enhanced plant growth attributes as compared to individual inoculation.

Plant height was significantly increased due to microbial inoculation at all the stages of plant growth *viz*., 30, 60 DAS and at harvest (40.69) which can be attributed to efficient nutrient mobilization by introduced microbial inoculants. The bio-active substances produced by these microorganisms might have helped in better nutrient uptake for plant growth. These results are in conformity with the findings of many research workers who reported such increased plant height due to biofertilizers application in crops like chickpea (Almas *et al*. 2006) and soybean (Aruna and Narasa Reddy, 1999).

## REFERENCES


1. Allen, M.F., Moore, T.S. And Christensen, M., 1980, Phytohormone Changes In *Bouteloua Gracilis* Infected By Vesicular-Arbuscular Mycorrhizae. Cytokinin Increase In The Host Plant. *Can. J. Bot*., **58**: 371-374.
2. Almas, Z., Khan, M.S. And Zaidi, A., 2006, Interactive Effect Of Rhizosphere Microorganisms On Yield And Nutrient Uptake Of Chickpea (*Cicer Arietinum* L.). *European J.Agron*., **19**: 15-21.
3. Anonymous, 2011, *Project Director's Report*, Aicrp On Soybean, Dor, Indore.
4. Aruna, V. And Narasa Reddy, S., 1999, Influence Of Integrated Supply Of Nitrogen Through Organic And Inorganic Sources On Growth, Nutrient Uptake And Yield Of Soybean. *J. Oilseed Res*., **16**(2): 337-339.
5. Asgharali., Muhammad Ishtiaq And Noor Elahi Jan, 2003, Effect Of *Rhizobium Leguminosarum* Inoculum On The Growth And Yield Of Different Pea Cultivars. *Sarhad J. Agric.* **19**(1): 56-59.
6. Babhulkar, P.S., Wandile, R.M., Badole, W.P. And Balpande, S.S., 2000, Residual Effect Of Long Term Application Of Fym And Fertilizers On Soil Properties (Vertisols) And Yield Of Soybean. *J. Indian. Soc. Soil Sci*., **48**(1): 89-92.
7. Balyan, S.K., Chandra, R. And Pareek, R.P., 2002, Enhancing Nodulation In *Vigna Mungo* By Applying Higher Quantity Of *Rhizobium* And Phosphorus Solubilizing Bacteria In Planting Furrows. *Legume Res*., **25**(3): 160-164.
8. Barea, J.M., Navarru, E. And Montoya, E., 1976, Production Of Plant Growth Regulators By Rhizosphere Phosphate Solubilizing Bacteria, *J.Appl. Bacteriol*., **40**: 129-139.
9. Bharti, N., Murtuza, M., And Singh, A.P., 2002, Effect Of *Rhizobium* Fixed Nitrogen On Yield Of Chickpea (*Cicer Arietinum* L.). *J. Res., Birsa Agril. Univ.* **14**: 175-179.
10. Bhaskar, M, Solaimalai, A., Shivakumar, C., Sankaranarayana, K. And Sudhakar, G., 2000, Effect Of Phosphorus, Zinc And Phosphorus Bacteria On Soybean- A Review. *Agril. Reviews*., **21**(1):60-65.
11. Bhavian, S.K., Chandra, R. And Pareek, R.P., 2008, Enhancing Nodulation In *Vigna Mungo* By Applying Higher Quantity Of *Rhizobium* And Phosphorus Solubilizing Bacteria In Planting Furrows*. Legume Res*., **25**(3): 160-164.



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