

Regular Article

# Effects of Combined Inoculation of *Azospirillum* and AM Fungi on the Growth and Yield of Finger Millet (*Eleusine coracana* Gaertn) Var. Co 12

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**ABSTRACT:** An experiment was conducted to find out the effect of *Azospirillum* and AM (Arbuscular mycorrhizae) fungi on finger millet (*Eleusine coracana* Gaertn) var. Co 12. Both the inoculants were applied by seed, seedling and soil application method. These inoculants were tried at as a single and dual inoculation and comprised with nitrogen and phosphorus controls. Over all influences by these two beneficial microbes played a vital role in supplying N and P to the finger millet and found enhanced the growth and yield over the untreated control.

**Key words:** Finger millet, *Azospirillum*, AM fungi, Combined inoculation

## Introduction

Finger millet (*Eleusine coracana* Gaertn) is an important principal staple food crop grow in fields with marginal and submarginal fertility levels under dry land farming system in India. To achieve with sustainable crop productivity the use of certain beneficial microbes can be considered. Biofertilizer have recently gained with momentum for effecting the sustainable increase in crop yield under various agro climatic condition. Role of biofertilizer on the crop yield was documented by Ramakrishnan and Thamizhiniyan (2009) and Vijayakumar *et al.* (2000). The present investigation has been taken upto assess the significance of nitrogen fixer and phosphorus mobilizes on the improvement of growth and yield of finger millet.

## Materials and Methods

The field experiment was conducted to find out the effect of *Azospirillum brassilense* and AM (Arbuscular mycorrhizae) fungi on the growth and yield of finger millet. The field was prepared as per the recommended agronomic practices. Co-12 variety was utilized for this study. *Azospirillum* and AM fungi were inoculated alone and in combination. These inoculants were applied as seed, seedling (*Azospirillum*) and soil application (AM fungi) method. To compare the efficacy of these microbial inoculants N and P controls were also maintained. Each treatment was replicated four times. Seedlings

were transplanted at 20 × 10 cm spacing in 3 × 5 m<sup>2</sup> plots. During vegetative phase of the plant biomass, root and shoot growth at 30 and 45 days and tillers initiation at 45 days were recorded at harvest the yield attributes *viz.*, finger counts, earhead length, haulms and grain yield were recorded.

## Results and Discussion

The results on the effect of combined inoculation of *Azospirillum* and AM fungi on the growth and yield of finger millet var Co-12 is presented in Tables 1 and 2. Bioinoculation of *Azospirillum* and AM fungi as seed, seedling and soil broadcasting effected enhanced establishment and vigour indexes of finger millet. The various growth biometrics *viz.*, plant biomass, root and shoot growth at 30 and 60 days after transplanting in main field was found significantly increased over untreated control. The effect being registered with the dual inoculation of both the bioinoculants which might be due to the provision of nitrogen and growth promoting substances (IAA, GA) by *Azospirillum* and the possible mobilization of phosphorus by AM fungi created with sustainable growth of the crop. Appa Rao Podde (1995) reported seedling of *Bacillus subtilis* found to increases the yield of pigeonpea. Similar to the present investigation, Upadhyaya *et al.* evinced the role of nitrogen fixing microbes in the rhizosphere of finger millet found to record high nitrogenase activity and it was altered by the varieties, age and nature of the soil. Gopal (1991) critically reviewed the role of biofertilizers on the sustainable crop productivity.

At harvest the co-inoculation of *Azospirillum* and AM fungi significantly enhanced the straw yield and grain yield of Co 12 finger millet with reference to grain productivity bioinoculants cumulatively recorded 36.8 per cent increased yield over their respective control. Kundu and Gaur, (1982) reported the yield of wheat was increased due to the inoculation of *Azotobacter* and phosphobacteria. Saxena and Tilak (1994) critically analysed the role of biofertilizers on the crop productivity over all influences by these two microbes played a vital role in supplying nitrogen and phosphorus to the finger millet and found enhanced the growth and yield over the untreated control.

Table 1. Effect of combined inoculation of *Azospirillum* and AM fungi on growth attributes Co 12 finger millet

| Treatments                     | At 30 and 45 days after sowing |      |                           |      |                            |      | Tillers production<br>(number/plant) |
|--------------------------------|--------------------------------|------|---------------------------|------|----------------------------|------|--------------------------------------|
|                                | Plant biomass<br>(g/plant)     |      | Root length<br>(cm/plant) |      | Shoot length<br>(cm/plant) |      |                                      |
|                                | 30                             | 45   | 30                        | 45   | 30                         | 45   |                                      |
| Control                        | 2.32                           | 3.98 | 5.1                       | 8.0  | 14.0                       | 30.2 | 2.9                                  |
| Nitrogen control               | 4.72                           | 7.12 | 10.2                      | 13.0 | 23.2                       | 43.2 | 4.3                                  |
| Phosphorus control             | 3.92                           | 5.87 | 11.2                      | 14.2 | 22.4                       | 40.2 | 3.8                                  |
| <i>Azospirillum</i>            | 4.26                           | 6.12 | 11.8                      | 16.2 | 28.2                       | 46.1 | 4.6                                  |
| AM fungi                       | 3.90                           | 5.93 | 14.5                      | 19.6 | 25.1                       | 44.2 | 4.0                                  |
| <i>Azospirillum</i> + AM fungi | 5.01                           | 8.12 | 16.6                      | 21.2 | 31.6                       | 52.6 | 4.8                                  |
| CD (p = 0.05)                  | 0.32                           | 0.61 | 0.10                      | 1.4  | 2.9                        | 4.1  | -                                    |

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Table 2. Effect of combined inoculation of *Azospirillum* and AM fungi on yield attributes of Co 12 finger millet

| Treatments                     | No. of finger/plant | Ear head length (cm/plant) | Haulms yield (t/ha) | Grain yield (t/ha) | Percent increase over control |
|--------------------------------|---------------------|----------------------------|---------------------|--------------------|-------------------------------|
| Control                        | 4.0                 | 5.7                        | 5.21                | 3.16               | -                             |
| Nitrogen control               | 6.4                 | 8.0                        | 5.88                | 3.76               | 18.4                          |
| Phosphorus control             | 6.0                 | 7.0                        | 5.44                | 3.63               | 15.2                          |
| <i>Azospirillum</i>            | 7.0                 | 7.8                        | 5.88                | 4.07               | 29.0                          |
| AM fungi                       | 6.8                 | 6.9                        | 5.69                | 3.73               | 18.0                          |
| <i>Azospirillum</i> + AM fungi | 7.3                 | 8.0                        | 6.29                | 4.31               | 36.8                          |
| CD (p = 0.05)                  | -                   | 0.22                       | 0.33                | 0.22               | -                             |

## References

- Appa Rao Podles (1995). Seed bacterization of *Bacillus subtilis* AF1 on growth, nodulation and yield of pigeonpea. *Indian J. Microbiol.*, 35(3): 199-204.
- Gopal, S.K. (1991). Relevance of biological nitrogen fixation to Indian Agriculture AMI 32<sup>nd</sup> Ann. Conf. p. 110.
- Kundu, B.S. and Gaur, A.C. (1982). Yield increase of wheat after inoculation with *Azotobacter chroococcum* and Phosphobacteria. *Curr. Sci.*, 51: 291-293.
- Ramakrishnan, K. and Thamizhiniyan, P. (2009). The effect of NPK fertilizer and AM fungi on the yield and quality characters of cotton. *Plant Arch.*, 9(1): 87-88.
- Saxena, A.K. and Tilak, K.V.B.R. (1994). Interrelationship among the beneficial soil microorganisms. *Indian J. Microbiol.*, 36: 91-106.
- Vijayakumar, B.S., Bhiravamurthy, P.V. and Anand, M.G. (2000). VAM fungi association in *Lycopersicon esculentum* L. grown in semi-arid tropical soils of Puttaparthi, *A.P.J. Ecobiol.*, 12(1): 73-74.