Interaction between AM fungi and biofertilizers in moth bean

DR.NISHI MATHUR

Department of Botany and Biotechnology
Mahila P.G.Mahavidhyalaya, Jodhpur (Raj.)

***Abstract*: Experiments were conducted in order to evaluate efficacy of different biofertilizers i.e., Mycorrhizal fungi, *Rhizobium, Pseudomonas* and *Azatobacter* on nutrient uptake and nodulation in Moth bean. Nodulation in Moth bean varied in different treatments of microorganisms. Nodulation was found to be correlated with nitrogenase activity of the roots. Among the various treatments of biofertilizers, maximum nodulation was observed in tripartite relationship of plant, Mycorrhiza and *Rhizobium* during the present study. Similar results were also observed in nutrient uptake in moth bean plant by different biofertilizers during present study.**

***Keywords*: mycorrhiza, *Rhizobium, Pseudomonas* and *Azatobacter*, moth bean.**

INTRODUCTION

Moth bean is an important proteinaceous leguminous, kharif crop of arid and semiarid region in India. The leguminous plants respond particularly well to mycorrhizal infections, which indirectly increases the possibilities of atmospheric N - fixation through improved P-uptake (1). Beneficial plant-microbe interactions in the rhizosphere are the determinants of plant health and soil fertility. In the era of sustainable agricultural production, the interactions in the rhizosphere play a pivotal role in transformation, mobilization, solubilization etc. from a limited nutrient pool in the soil and subsequent uptake of essential plant nutrients by the crop plants to realize full genetic potential of the crop. Soil microorganisms are very important in the biogeochemical cycles of both inorganic and organic nutrients in the soil and in the maintenance of soil health and quality (2). Thus, the need of the time is to enhance the efficiency of the meager amount of external inputs by employing the best combination of beneficial microbes for sustainable agricultural production (3). Soil-plant-microbe interactions are complex and there are many ways in which the outcome can influence the plant health and productivity (4). Present investigation deal with interaction between various biofertilizers and moth bean and its effect on nutrient uptake and nodulation and productivity of moth bean.

MATERIAL AND METHODS

A pot culture experiment was conducted during crop season using p-deficient sterilized sandy soil with pH 7.6. Soil was sterilized by autoclaving at 1.1 Kg cm pressure for 2 hr. Moth bean was grown in 30cm diam. earthen pots containing 6 Kg of sterilized soil. Sand containing extramatrical chlamydospores and root segment infected with AM fungi *Glomus deserticola* (Thaxter sensu Gerd). Growth for 90 days in *C. ciliaris* pots served as the inoculum. Inoculum contains 450- 500 extramatrical chlamydospores on infected root bits 100 gm soil. Pots were filled with soil 5 cm less then the regular filling. Mycorrhizal inoculum (200 g /pot) was spread over the soil surface to form a thin layer and over this 5 cm soil was added. Peat based inoculum of *Rhizobium* was used for treating moth bean seeds. Peat based effective mutant of *Azotobacter* were applied in soil. Ten seeds per pots were sown. After germination five plants/pots were maintained. Pots were watered regularly. Observation on seed germination, nodulation, plant dry weight, leg hemoglobin, total N and total P content were recorded. The mycorrhizal colonization was determined according to Phillips and Hayman(5). Plant dry weight and other observation were determined at 60 days and 90 days after sowing. Nutrient content in root and shoots were determined by the standard method of Jackson (6).

RESULTS AND DISCUSSION

Plant inoculated with mycorrhiza in combination with *Rhizobium* and *Azotobacter* yielded highest percent germination of moth bean. Mycorrhiza alone also provided highest seed germination. *Rhizobium* and *Azotobacter* alone had no effect on seed germination. Inoculation with all the three agents (mycorrhiza, *Rhizobium*, *Azotobacter*) recorded maximum number of nodules as well as nodule dry weight (Table-1). Plant inoculated with all the three bio-agent treatment, viz., mycorrhiza plus *Rhizobium, Azotobacter* recorded higher nutrient uptake and biomass production as compared with plants inoculated singly with mycorrhiza or combination of mycorrhiza + *Azotobacter* and mycorrhiza + *Rhizobium*.
Further, Mathur and Vyas (7) observed that nodulation and plant growth was affected by degree of mycorrhization, i.e. both were increased at higher levels. Interaction between host and symbiont also varied with cultivars. Now it can be concluded that mycorrhiza or *Azotobacter* or *Rhizobium* or their combination can have important effect on nodulation and nitrogen fixation in legumes. Mathur and Vyas (8) reported interaction between AM fungi, *Azatobacter* and *Rhizobium* in Cow pea. They observed that mycorrhiza or *Azatobacter* or *Rhizobium* or their combinations can have important effect on nodulation and nitrogen fixation in legumes. They also suggested that principal effect of mycorrhiza on nodulation is phosphorus mediated. Mathur,et,al,(9) reported better growth performance of Tecomella undulate due to dual inoculation of *Azospirillum brasilense* and *Glomus fasciculatum*. They also observed more than 80% increase in plant productivity due to the above dual inoculation.

Table 1: Showing the growth response of moth bean to the *G. deserticola*.

S. No.	Treatment	No. of nodules Per plant		Plant dry wt. g plant^{-1}		Leg hemoglobin mg g^{-1} fr.wt. nodule		Total – P mg plant^{-1}		Total – N mg plant^{1}	
		60days	90days	60days	90days	60days	90days	60days	90days	60days	90days
1	*Rhizobium*	38	42	21.1	24.2	3.61	4.72	15.2	17.4	10	12
2	*Azotobacter*	31	36	18.5	22.3	1.82	2.97	12.9	15.4	11	13
3	*G. deserticola*	53	58	22.4	26.4	2.62	3.90	18.2	21.0	12	15
4	*Rhizobium* + *G. deserticola*	88	95	27.8	32.6	4.13	5.20	21.4	24.2	15	18
5	*Azotobacter* + *G. deserticola*	56	61	24.5	28.4	3.10	4.27	19.7	22.3	13	16
6	Control	22	26	17.1	20.0	1.72	2.74	11.9	14.3	04	06

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