

Effect Of Inoculation Of Vam Fungi On Enhancement Of Biomass And Yield In Okra

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ABSTRACT

The growth of three local varieties of Okra ,viz, Parbhani kranti, Arkanamica and Selection-51 were assessed with inoculation of VAM fungi such as *Glomus fasciculatum* and *Gigaspora gigantea* at nursery stage by pot culture experiments. After 70 DAS Increase in biomass was recorded in plants inoculated with VAM fungi as compared to uninoculated plants. The cultivar Parbhani kranti was found highly susceptible to *Glomus fasciculatum* and shown maximum response in growth parameters like , increase in number of leaves , flowers and fruit set ,while minimum growth response was recorded in Selection – 51 .comparatively of the two Vesicular Arbuscular Mycorrhizal fungi *Glomus fasciculatum* was found most effective in growth of plant as compared to *Gigaspora gigantea* .

Key words : Okra , *Glomus fasciculatum* , *Gigaspora gigantean* , Biomass, Yield

INTRODUCTION

In many parts of the world vegetable forms a major part of the diet those who use vegetables less or those who are not in a position to offer them suffer from mineral deficiency diseases. Several vegetables are exported to foreign countries providing an opportunity of earning foreign exchange. Okra(Bhindi) is an annual vegetable crop. Its tender green fruits are used as a vegetable and are generally marketed in the fresh state. Its all plant parts are used for various purpose. The mycorrhizal fungi are the key components of soil microbiota .They are obligate symbionts are not host specific (Bonfante – Fasolo 1987). Closely related plant species and even cultivars within the same species differ in their degree of susceptibility to VA mycorrhiza colonization. For a given type of mycorrhizal association the appropriate

fungus and plant must form a compatible pair with which implies that a certain degree of recognition and specificity must be involved .

In present paper attempts were made to study the effect of some VAM fungi on growth and yield of three cultivars of Okra plant .

MATERIALS AND METHODS

Selection of Plants : Three important local crop varieties(Cv) of Okr (Bhindi) Viz, Parbhani kranti (CV1),Arkanamica (Cv2) and Selection-51(Cv3) were used to study the response of VAM fungi. Pot culture experiments were conducted with 5 kg of local soil sample (loamy clay soil) with low fertility. five seeds of each cultivars are used after surface sterilization with 0.01 % aqueous HgCl₂ and washing thrice with sterile distilled water were sown at depth of about 3 cm.

Inoculation of VAM fungi : Fungal inoculum containing extrametrical Chlamydospores, infected root segments and hyphae having the uniform infective propagules were prepared .Inoculation with VAM fungi was done by the layering method (Jackson et al 1972). Pots were filled 2 cm less than regular filling. Mycorrhizal inoculum 100 gm was spread over the soil surface by hand to form a thin layer and over which 2 cm soil was added. Three replicates were maintained for each fungus inoculum and a single control pot for each treatment. Plants were harvested after 70 days of growth and processed to determine fresh weight and dry weight respectively. Mycorrhizal efficiency was calculated based on the total dry weight of the plant by using the formula (Mohansingh and Tilak, 1990)

$$\text{Mycorrhizal efficiency} = 100 \left(\frac{1 - \text{nonmycorrhizal plant weight}}{\text{mycorrhizal plant weight}} \right)$$

Estimation of fresh and dry weight : After 70 days of growth the plants from both the sets (control and treated) were uprooted taking care not to damage the roots. The roots were washed in running water till the adhering soil particles were removed. The fresh weight of the root and shoot were recovered after removing the external moisture for both control and inoculated separately . The roots and shoot were oven dried for 72 hours at 70⁰C. The dry weight of root and shoot was separately recorded.

Measurement of shoot and root length : The length of five randomly selected plants was measured by using the scale, starting from soil level upto the tip of the shoot and root.

Measurement of Yield : Yield of each plant were measured by measuring individual fruits to each treated and untreated plant and recorded accordingly.

RESULTS AND DISCUSSION

The effect of *Glomus fasciculatum* and *Gigaspora gigantean* were assessed on the three Cultivars of Okra such as Parbhani kranti, Arkanamika and Selection – 51. The experimental data revealed that (Table 1) in Parbhani kranti, the fresh weight of root and shoot was maximum as compared to the plants uninoculated by VAM fungi. In Cultivar Arkanamika, the fresh weight of root and shoot was maximum in plants inoculated by VAM fungi as compared to the control plant.

Table 1. Effect of VAM fungi on increase in biomass of three cultivars of Okra at 70 DAS

Treatment	Parbhani kranti		Arkanamika		Selection – 51	
	Fresh weight (Root + shoot) (gm)	Dry weight (Root + shoot) (gm)	Fresh weight (Root + shoot) (gm)	Dry weight (Root + shoot) (gm)	Fresh weight (Root + shoot) (gm)	Dry weight (Root + shoot) (gm)
Control	42.23	11.5	24.564	6.06	16.644	9.527
<i>Glomus fasciculatum</i>	99.2	39.482	29.831	6.198	24.85	13.926
<i>Gigaspora gigantean</i>	88.3	46.714	49.434	16.312	39.242	17.965
SE	17.46	10.74	7.57	3.39	6.60	2.44
CD at 5%	44.87	27.60	19.45	8.71	16.96	6.27

While in Selection – 51 ,the fresh weight of root and shoot was less (16.644gm) as compared to the inoculated plants. The dry weight of control plant was (9.527 gm) and the plant inoculated by *Glomus fasciculatum* shows the dry weight (13.926gm) which is more over control but less than the plant (17.965gm) inoculated by *Gigaspora gigantea*.

By comparing all the three cultivars the maximum dry weight of root and shoot was noted in the cultivar Parbhani kranti and minimum recorded in Arkanamika. In Parbhani kranti variety

the dry weight of root and shoot was less (11.5 gm) but in plant inoculated by *Glomus fasciculatum* was maximum (39.48 gm). While the plant inoculated by *Gigaspora gigantean* was showed maximum dry weight than the control plant and plant inoculated by *Glomus fasciculatum*. The similar results in terms of biomass production was noted (Mathur and Vyas, 1995) at 90 DAS after inoculation.

Table 2. Effect of VAM fungi on increase in yield of three cultivars of Okra at 70 DAS

Treatment	Number of leaves			Number of flowers			Number of fruits		
	cv ₁	cv ₂	cv ₃	cv ₁	cv ₂	cv ₃	cv ₁	cv ₂	cv ₃
Control	25	16	13	02	02	02	06	04	05
<i>Glomus fasciculatum</i>	27	26	14	04	04	04	08	07	06
<i>Gigaspora gigantean</i>	28	24	15	05	03	03	05	05	07
SE	0.88	3.05	0.58	0.88	0.58	0.58	0.88	0.88	0.58
CD at 5%	0.26	7.84	1.49	2.26	1.49	1.49	2.26	2.26	1.49

Cv1 – Prabhai kranti , Cv2 – Arkanamika ,Cv3 – Selection – 51

The VAM fungi such as *Glomus fasciculatum* and *Gigaspora gigantean* were assayed for their effect on three cultivars of okra in increase in yield parameters such as leaves, flowers and fruits.(Table 2) .In CV₁, the control plant produced 25 leaves, which was less in number than the plants inoculated by *Glomus fasciculatum* and *Gigaspora gigantean* that produced 27 and 28 leaves per plant. While in CV₂ the total number of leaves was 16 which is very much less than the plants infected by VAM fungi. In CV₃ the maximum number of leaves (15) were produced by plant which was inoculated by *Gigaspora gigantea* .

The effect of VAM fungi viz., *Glomus fasciculatum* and *Gigaspora gigantea* were noted on three different cultivars of Okra (Parbhani kranti, Arkanamika, Selection – 51). The plants inoculated by *Gigaspora gigantean* also showed maximum increase of leaves than the control plant but less than the plant inoculated by *Glomus fasciculatum*. The similar type of yield was noted by (Conwayll Powell, 1981) in *Chrysanthemum*. The influence of different

VAM fungi on growth and difference in plant growth character may be due to the efficient association of VAM fungi and their ability to enhance nutrient uptake. The increase in yield attributes may be due to effective root colonization, which enhanced phosphorus uptake of roots due to exploration of soil volume and increase in the surface area for absorption of nutrients (Tinker, 1978). The inoculation of Garlic plant with *Glomus mosseae* significantly increased plant height number of functional leaves per plant (Wani and Konde, 1998). In the cultivar CV₁, CV₂ and CV₃ the production rate of flower was uniform in non-inoculated plants. But the plants inoculated by *Glomus fasciculatum* were able to produce maximum number of flowers than the control plant. The plant inoculated by *Gigaspora gigantean* also produced maximum flowers (CV₁, - 05, CV₂ – 03 and CV₃ – 03) than the control plant but minimum than the plant inoculated by *Glomus fasciculatum*. The increase in the number of flowers due to inoculation of *Glomus fasciculatum* and *Gigaspora gigantean* was noted in all the three cultivars such as Parbhani kranti (CV₁), Arkanamika (CV₂) and Selection – 51 (CV₃). The number of flowers was constant in control plants of all three cultivars, but it increased more due to inoculation of VAM fungi. Similar types of results were recorded in Chilli plant. The plant infected by *Glomus fasciculatum* showed the highest growth, flowering and yield (Bagyaraj and Sreeramula, 1982). The plants that were not inoculated by VAM fungi produced less number of fruits (CV₁, - 06, CV₂ – 04 and CV₃ – 05) as compared the plants affected by VAM fungi. The plant inoculated by *Glomus fasciculatum* produced maximum number of fruits (CV₁, - 08, CV₂ – 07 and CV₃ – 06) than the control plant. The plants inoculated by *Gigaspora gigantean* produced less number of flowers than the plants inoculated by *Glomus fasciculatum* but more than control plant. By comparing all the three cultivars and their response to VAM inoculation, the maximum number of leaves produced by Parbhani kranti, maximum number of flowers by Parbhani kranti and fruits also by Parbhani kranti. The values of all the treatments and cultivars are significant at 5 % level. The data revealed that the non-inoculated control plants showed less number of fruits per plant. While maximum numbers of fruits were produced in plants that were inoculated by VAM fungi. The effect of *Glomus fasciculatum* and *Glomus mosseae* and *Acaulospora laevis* was studied in three cultivars of Chrysanthemum. Among the VAM fungi *Glomus fasciculatum* found to be the best colonizer and recorded the highest growth and yield (Haripriya and Sriramchandrasekharan, 2002). By comparing the two VAM fungi *Glomus fasciculatum* and *Gigaspora gigantea*, the *Glomus fasciculatum* found more effective in increase in the number

of leaves, number of flowers and number of fruits as compared to *Gigaspora gigantea*. The treatments given are less significant at 5 % level..

CONCLUSION

It can be concluded that VAMycorrhizal fungi functions as good biofertilizer as the growth parameters of plant found to be enhanced as compared to the control plants which was not inoculated .The mycorrhizal fungi does additional work of root as they absorbs minerals and nutrients from the rhizosphere soil of plant and provides to the aerial part of plant due to which aerial parts of plant grow very well .

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