

Response of Mango Seedlings to VA-Mycorrhizal Inoculation

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SUMMARY

A pot culture experiment using sterilized soil was conducted to study the effect of VA-mycorrhizal fungi viz., *Glomus epigaeum*, *Glomus mosseae* and *Gigaspora calospora* and their combination on growth and root colonization of mango seedlings (var. local). The combined inoculation of three VA-mycorrhizal fungi was superior over all the inoculation treatments in recording the plant height, number of leaves, root length, fresh and dry weight of shoot and root. The VAM root colonization percentage in mango seedlings was increased from 58.82 to 73.89 per cent over non - mycorrhizal seedlings (0.00 %) indicating that VA mycorrhizal inoculation is necessary to increase the growth parameters and dry matter accumulation of mango seedlings.

Key words :

VA-mycorrhizae,
Mango, Root
colonization

Mango is one of the most popular fruit crops grown in tropical and subtropical countries. It is considered as 'National fruit of India' and is rightly called as 'king of fruits' due to unique taste, flavour and is popular within all sections of society. Mango is cultivated vegetatively by adopting several techniques like inarching, budding, stone grafting but veneer grafting is adopted in large scale for maximum growth and yield. Whatever method of grafting is followed, the seedling stocks have to be healthy and vigorous and should have desirable height and thickness. VA-mycorrhizal fungi improve uptake of phosphorus and other micronutrients. The mycorrhizal fungus is a specialized member of rhizosphere or root region microorganisms. Mycorrhizal plants contain higher concentration of P in their tissues than control (Harvey and Smith, 1982). Increase in uptake of other nutrient elements such as zinc, sulphur and copper have also been reported as influenced by VAM inoculation (Hayman, 1982). Hence, an experiment was conducted on mango seedling to observe the effect of inoculation of Vesicular arbuscular mycorrhizae (VAM) viz., *Glomus epigaeum*, *Glomus mosseae* and *Gigaspora calospora* and their combinations on growth and root colonization of mango seedlings.

MATERIALS AND METHODS

A pot culture experiment was conducted during June 2006 to May 2007 in completely randomized design with three replications and eight treatments. The mango seedlings were inoculated with single and their mix VAM inoculum adjusting the dose finally to 150 g / pot. This inoculum of *Glomus epigaeum*, *Glomus mosseae* and *Gigaspora calospora* contained 680-800 spores / 50ml soil by volume. The mango stones were sown in pots with Soil + FYM (1:1) mixture containing 12.45 kg /ha phosphorus and 207.90 kg/ha nitrogen. The growth observations of mango seedlings like height, number of leaves, stem girth, root length, dry weight of shoot and root and mycorrhizal dependency percentage were recorded at 90 and 180 days after sowing.

RESULTS AND DISCUSSION

The results obtained from the present investigation are presented below :

Height and root length:

The height and root length (Table 1) of mango seedlings were significantly influenced due to different VAM inoculations both at 90 and 180 days, respectively. The plant height of mycorrhizal plant ranged from 13.46 to 21.71 cm and 29.08 to 36.00 cm at 90 and 180 days,

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Table 1: Effect of VA-mycorrhizal inoculation on height and root length of mango seedlings

Inoculations	Plant height in cm at days		Root length in cm at days	
	90	180	90	180
	<i>Glomus epigaeum</i> (GE)	13.46	29.08	9.39
<i>Glomus mosseae</i> (GM)	18.00	34.07	18.35	25.10
<i>Gigaspora calospora</i> (GC)	16.26	32.43	12.56	23.79
GE + GM	17.11	33.50	13.40	25.95
GE + GC	16.30	30.98	9.39	18.49
GM + GC	18.26	34.44	13.32	28.30
GE + GM + GC	21.71	36.00	20.60	33.67
Non-mycorrhizal (NM)	12.46	26.70	5.52	12.70
Mean	16.69	32.15	12.80	23.06
S.E. \pm	0.287	0.848	0.43	0.32
C.D. (P=0.05)	0.86	2.54	1.31	0.97

respectively indicating differential response of VAM species. The combined inoculation of three VAM fungi *i.e.* GE + GM + GC recorded the maximum plant height (21.71 and 36.00 cm at 90 and 180 days, respectively) over the rest of inoculation treatments. The non-mycorrhizal mango seedlings recorded the least plant height *i.e.* 12.46 and 26.70 cm at both stages of plant growth. Whereas mixture of three VAM fungi *i.e.* GE + GM + GC recorded significant increase in root length (20.60 and 33.67 cm) at 90 and 180 days, respectively. The non-mycorrhizal (control) mango seedlings recorded least root length 5.52 and 12.70 cm at 90 and 180 days, respectively. The results of present investigation are in conformity with results reported by Sukhada Mohandas (1988) in papaya and Singh *et al.* (2000) in sweet orange cv. MOSAMBI.

Number of leaves:

The number of leaves (Table 2) as influenced by mixture of three VAM fungi *i.e.* GE + GM + GC recorded the significant increase in number of leaves (18.71 and 23.45) at 90 and 180 days, respectively. However, an inoculation of GM alone was next in superiority in increasing the number of leaves at both stages of crop growth. The non mycorrhizal (control) mango seedlings recorded least number of leaves *i.e.* 8.09 and 11.02 leaves / plant at 90 and 180 days, respectively. These results were in conformity with those of Singh *et al.* (2000) in orange cv. Mosambi and Manjunath *et al.* (2001) in papaya.

Stem girth:

The results of mango seedling stem girth (Table 2)

Table 2 : Effect of VA-mycorrhizal inoculation on number of leaves and stem girth of mango seedlings

Inoculations	No. of leaves at days		Stem girth (mm) at days	
	90	180	90	180
	<i>Glomus epigaeum</i> (GE)	9.50	15.72	5.22
<i>Glomus mosseae</i> (GM)	16.38	21.14	7.17	14.83
<i>Gigaspora calospora</i> (GC)	12.34	16.26	5.94	8.23
GE + GM	14.45	17.14	7.18	12.43
GE + GC	9.42	13.54	6.54	9.59
GM + GC	14.54	20.32	8.65	15.34
GE + GM + GC	18.71	23.45	9.15	18.22
Non-mycorrhizal (NM)	8.09	11.02	4.72	7.50
Mean	12.94	17.32	6.82	11.78
S.E. \pm	0.23	0.35	0.23	0.22
C.D. (P=0.05)	0.70	1.05	0.69	0.68

as influenced by inoculation with different VA-mycorrhizae were significant both at 90 and 180 days at both the stages of crop growth.

Inoculation with mixture of VAM fungi *viz.*, GE + GM + GC recorded the significant increase in seedling stem girth (9.15 and 18.22 cm at 90 and 180 days, respectively) The non-mycorrhizal mango seedlings recorded the least stem girth *i.e.* 4.72 and 7.50 cm at both stages of plant growth. The results of present investigation were found here in conformity with results reported by Reena and Bagyaraj (1990) in tamarind and Manjunath *et al.* (2001) in papaya.

Dry weight of shoot and root:

The results of dry weight of shoot and root (Table 3) as influenced by inoculation with different VA-mycorrhizae were significant both at 90 and 180 days. At both the stages inoculation with mixture of GE + GM + GC recorded the significant increase in dry weight of shoot and root (3.89 and 5.92 g / plant and 3.04 and 4.22 g / plant, respectively) at 90 and 180 days, respectively. However, the inoculations of GM + GC and GE + GM were next in superiority in increasing the shoot and dry weight at both the stages of crop growth.

The non mycorrhizal (NM) mango seedlings recorded the least dry weight of shoot and root (1.84 and 2.33 g / plant and 1.45 and 2.07 g / plant) at 90 and 180 days. The present results are therefore in conformity with earlier results reported by Dixon (1988) in citrus jamberi seedlings and Sukhada Mohandas (1988) in papaya.

An increase in dry weight of shoot and root of mango seedlings could be attributed to an increase in nutrient

Table 3 : Effect of VA-mycorrhizal inoculation on dry weight of shoot and root of mango seedlings

Inoculations	Dry weight of shoot (g) at days		Dry weight (g) of root at days	
	90	180	90	180
<i>Glomus epigaeum</i> (GE)	2.39 (29.89)	1.94 (17.57)	3.44 (47.63)	2.85 (37.68)
<i>Glomus mosseae</i> (GM)	2.94 (59.78)	2.42 (46.66)	4.49 (92.70)	3.37 (62.80)
<i>Gigaspora calospora</i> (GC)	2.52 (36.95)	2.07 (25.45)	3.47 (48.92)	2.93 (41.54)
GE +GM	3.07 (66.84)	2.47 (44.56)	4.17 (48.96)	3.42 (65.21)
GE+GC	2.44 (32.60)	1.56 (7.58)	3.10 (33.04)	2.17 (4.83)
GM+GC	3.65 (98.36)	2.92 (101.37)	4.82 (106.86)	3.64 (75.84)
GE+GM+GC	3.89 (111.41)	3.04 (109.65)	5.92 (154.07)	4.22 (103.86)
Non-mycorrhizal (NM)	1.84	1.45	2.33	2.07
Mean	2.84	2.26	3.97	3.08
S.E. \pm	0.35	0.26	0.38	0.32
C.D. (P=0.05)	1.05	0.79	1.16	0.97

Figures in parentheses indicate percent increase over non- mycorrhizal *i.e.* uninoculated control

uptake and subsequent accumulation of dry matter as influenced by mycorrhizal inoculation.

Mycorrhizal dependency percentage:

The Mycorrhizal dependency percentage (Table 4) as influenced by inoculation with different VAM fungi ranged from 107.61 to 198.89 and 117.37 to 192.72 per cent at 90 and 180 days, respectively indicating that the VA mycorrhizal inoculation was necessary to increase the growth parameters, dry matter accumulation of mango seedlings. These results are in conformity with those of Sonawane *et al.* (1997) in grapevine and Rupnawar and Navale (2000) in pomegranate.

In general the combined inoculation of all three VA-mycorrhizae (*Glomus epigaeum* + *Glomus mosseae* + *Gigaspora calospora*) was superior over all the inoculation treatments in recording plant height, root length, number of leaves, stem girth, dry weight of shoot and root and mycorrhizal dependency values. *Glomus*

mosseae + *Gigaspora calospora* and *Glomus epigaeum* + *Glomus mosseae* inoculations were next in superiority in increasing the above parameters of mango seedlings.

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Table 4 : Effect of VA-mycorrhizal inoculation on mycorrhizal dependency values of mango seedlings

Inoculations	Mycorrhizal dependency values at days	
	90	180
<i>Glomus epigaeum</i> (GE)	125.36	142.72
<i>Glomus mosseae</i> (GM)	154.72	178.63
<i>Gigaspora calospora</i> (GC)	131.51	146.63
GE +GM	157.73	167.95
GE + GC	107.61	117.37
GM + GC	188.49	192.72
GE + GM + GC	198.89	192.72
Non-mycorrhizal (NM)	--	--

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