https://doi.org/10.29321/MAJ.10.A02225

Madras Agric. J. 73 (1) : 32-35 January, 1986

GROWTH RESPONSES OF VESICULAR ARBUSCULAR MYCORRHIZAE ON PULSES

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All the three species of VA mycorrhizal fungi were effective in increasing the growth parameters of blackgram, greengram and cowpea. Highest effect was noticed in *Glomus etunicatum*-cowpea interaction. Placement method was found to be the best method of inoculation for *G. etunicatum* on cowpea.

In recent years studies on the effect of Vesiculararbuscular mycorrhiae (VAMF) on crop plants are increasingly reported. Several workers have reported large increases in plant growth and nutrient uptake by introducing efficient (VAMF Powell and Daniel, 1978). However studies on the effect of VA mycorrhizal fungi on pulses are few. The growth responses of three important pulses *viz*., cowpea (*Vigna anguiculata* L.) greengram (*V. radiata* L.) and blackgram (*V. mungo* L.) to three VA mycorrhizal species *viz*, *Glomus etunicatum* Becker & Gerd., *G fasciculatum* (Thaxter Sensu. Gerd.) Gerd & Trappe and *G .mosseae* (Nic.& Gerd) Gerd. & Trappe are presented here.

MATERIALS AND METHODS

The effect of soil inoculum of *G. etunicatum*, *G. fasciculatum* and *G. mosseae* prepared through sorghum pot culture were tested on cowpea, greengram and blackgram (Ramaraj and Shanmugam, 1984). Plants were raised in tube pots. Three methods of inoculation *viz*., seed treatment, placement and broadcasting were tried. In seed treatment method, the seeds were first mixed with 1 per cent carboxymethyl cellulose and then the seeds were mixed with the soil inoculum. In placement method, the soil inoculum was placed it in the seed hole and then the seed was placed over it. In broadcasting method, the soil inoculum was mixed with the top soil and the seeds were sown. The experiment was conducted in randomized blocks design with three replications. Observations were taken on the growth parameters *viz*, shoot length, rootlength, shoot weight, root weight and yield. The results are presented in Tables 1 to 3.

RESULTS AND DISCUSSION

In all the three pulses the growth parameters were significantly higher in the VAMF inoculated plants than control.

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Among different VAMF species tested highest effect was noticed with *G. etunicatum* followed by *G. mosseae*. Among the three methods of inoculation tried, placement was the best for *G. etunicatum* and *G. mosseae* in cowpea while in greengram, highest effect was got with seed treatment of *G. etunicatum* and *G. fasciculatum*. In blackgram the growth responses due to the different methods of inoculation varied with the VAMF species. However, placement of *G. etunicatum* recorded the highest shoot weight, root weight and pod weight. The role of VAMF in increasing plant biomass and yield has been reported previously in several crops Shanmugam *et al.*, 1981). However among pulses, enhanced growth and increased yield due to VAMF inoculation has been found in soybean and cowpea (Islam and Ayanaba, 1981). The results from this experiment is in agreement with the report of Islam and Ayanaba (1981) who found that cowpea responded positively to *G. fasciculatum* and *G. mosseae*.

Placement was found to be the best method of inoculation for cowpea which recorded the highest growth parameters and yield. This is in agreement with the observation of Islam and Ayanaba (1981) who reported that placing cowpea seed and inoculum (*G. mosseae*) in the same planting hole increased root infection, shoot yield, phosphorus content and grain yield. The next best method of inoculation for cowpea was broadcasting. In greengram and blackgram, both placement and seed treatment were equally effective in increasing growth. Hayman *et al.*, (1981) reported a similar result in red clover (*Trifolium repens* L.) with *G. fasciculatum* and *G. caladonicum* wherein placement method was the best followed by multiseeded pellets. Powell (1979) used multiseeded pellets effectively in white clover (*Trifolium pratense* L.) with *Glomus* and *Gigaspora* species. The observations from the present study corroborateed these reports. Eventhough plecement was the most effective method, for practical application it may be difficult, since large quantity of inoculum is required in the fields and there are a lot of limitations to produce inoculum in bulk (Hayman, 1982). Hence seed inoculation will be more practicable than other methdos as the inoculum required is very little. Successful applications of VAMF by seed treatment have been reported in onion and tomato by Gaunt (1978). Pelletting of seeds with *G. fasciculatum* using carboxymethyl cellulose has also been reported for Brazilian sour orange (Hayman *et al*, 1981). Successful inoculation of *Glomus* spp. by seed inoculation in sorghum, blackgram and acid lime has also been reported (Shanmugam and Ramaraj, 1982). In clover and VAMF (*Glomus* spp. and *Gigaspora* spp) interaction, seed treatment with carrier materials like lignite or sterilised clay

Table 1. Effect of *Glomus* spp. on growth parameters of cowpea 90 (DAS)

Treatment		Length (cm)		Weight (g/plant)		Yield of pod (g/Plant)
		Shoot	Root	Shoot	Root	
G. etunicatum	S. T.	82.7	29.7	32.2	5.0	2.5
	P. M.	123.7	28.3	43.4	8.4	3.6
	B. C.	120.7	37.0	32.4	7.2	3.0
G. fasciculatum	S. T.	92.3	22.7	31.2	3.9	1.5
	P. M.	99.0	28.7	34.7	7.5	1.8
	B. C.	101.0	30.0	30.4	5.4	1.2
G. mosseae	S. T.	81.3	22.3	27.0	3.3	2.3
	P. M.	108.3	28.3	41.9	6.8	2.7
	B. C.	104.7	28.0	31.0	7.4	2.1
Control		55.0	16.0	22.6	2.4	1.1
C. D. (P=0.05)		16.7	4.9	3.4	1.5	0.5

Table 2. Effect of *Glomus* spp. on growth parameters of greengram (75 DAS)

Treatments		Length (cm)		Weight (g/plant)		yield of pod (g/plant)
		Shoot	Root	Shoot	Root	
G. etunicatum	S. T.	29.2	19.6	14.4	1.9	0.6
	P. M.	26 9	16.8	13.1	1.6	0.9
	B. C.	28.5	18.9	10.0	1.4	0.6
G. fasciculatum	S. T.	22.3	12.3	10.3	1.4	0.4
	P. M.	21.0	10.9	12.1	1.4	0 2
	B. C.	19.5	10.2	10.6	1.3	0.9
G. mosseae	S. T.	26.4	20.0	13.2	1 7	0.4
	P M.	20.2	15.2	9.9	1.2	0.7
	B. C.	28.6	18.4	12.5	1.6	0.7
Control		17.7	4.8	9.7	1.0	0.1
C. D P(=O. 05)		2.6	1.6	1.2	0.3	NS

Table 3. Effect of *Glomus* spp. on growth parameters of blackgram (75 DAS)

Treatments		Length (cm)		Weight (g/plant)		Yield of pod (g/plant)
		Shoot	Root	Shoot	Root	
G. etunicatum	S. T.	39 8	19.8	16 7	2.1	0.4
	P. M.	28.5	22.3	22.1	2 7	1.0
	B. C.	34.8	18.7	15.0	1.8	0 6
G. fasciculatum	S. T.	25.2	14.7	12.8	1.8	0.5
	P. M.	24.8	16.8	14.1	1.8	0.3
	B. C.	28.5	14.7	12.4	1 6	0.2
G. mosseae	S. T.	33.3	28.0	15.9	2.2	0 2
	P. M.	31.0	15.3	16 8	1.6	0.2
	B. C.	29 8	18.1	14.9	2.1	0 8
Control		21.3	14.3	12.3	1.2	0.1
C. D. (P=0.05)		3.3	3.7	1.6	0.4	0.2

mixed with sievings or soil from pot culture have also been found to give good results (Hayman *et al.* 1981).

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