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Effect of VAM Fungal Genera on Phosphorus Content of *Jatropha curcas* (L.) and *Pongamia pinnata* (L.) Pierre

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Abstract

The characterization of VAM fungi were made in five genera of VAM fungi occurred in species but based on number of spores available around root zone, *Acaulospora* sp. and *Glomus* sp. were predominant in *Jatropha curcas* and *Pongamia pinnata*, respectively. A polyhouse experiment was laid out to screen and select efficient VAM fungi for *Jatropha curcas* and *Pongamia pinnata*. Five different VAM fungal genera with P-combination were used for selecting best symbiont for both species. The seedlings inoculated with *Acaulospora* + P for *Jatropha curcas* and *Glomus* sp + P–for *Pongamia pinnata* had greater plant height, collar diameter, root and shoot length, total plant dry biomass and phosphorus content when compared to non-inoculated plants.

Key words : Biofuel yielding plants, VAM inoculation, P-content, *Jatropha curcas* (L.), *Pongamia pinnata* (L.) Pierre.

In India, *Jatropha curcas* and *Pongamia pinnata* are gaining importance commercially as biodiesel plant species and are being advocated for development of wasteland and dry land. India has 146 m ha of waste land (1), of which 33 million ha can be reclaimed by raising biodiesel plantations, in addition to arable land that is being used for plantation. The Indian Government's 300 million dollar National biofuel program has the potential to create the world's first large scale National Biodiesel Industry. The VAM fungi are a major component of the soil microbial community, forming symbiotic association with roots of over 90% of the terrestrial plants. VA mycorrhizae have gained significance because of their role in growth and early establishment of plant species used in afforestation programs, soil fertility, nutrient uptake and bio-control of plant diseases (2). Members of Endogonaceae are widely distributed in agricultural and forest soils worldwide. Over 81% of the 89 shrub species in arid and semi-arid areas of the world are endomycorrhizal (3). As both the species are commonly grown in varied climatic conditions their yielding behavior depends on the soil environment in which they grow and if effective VAM fungi are inoculated at seedling stage they may establish fast. Keeping this in view, the present investigation was undertaken with following objective to assess the effect of different VAM fungal genera on phosphorus content of *Jatropha curcas* and *Pongamia pinnata* at 120 DAI.

Methods

Mycorrhizal spores were collected from rhizosphere soil samples, the predominant spore types were isolated using pasteur's pipettes under stereo microscope. Later spores were surface sterilized using streptomycin 200 ppm + chloramine-T 2% for 20 minutes. The surface sterilized spores were used for mass multiplication. Based on spore population and root colonization percentage five predominant VAM genera isolated from each soil type were selected. Their morphological characteristics were compared with literature (4). Five VAM isolates selected from *Jatropha curcas* and *Pongamia pinnata* are *Glomus* sp., *Gigaspora* sp., *Sclerocystis* sp., *Acaulospora* sp.,and *Scuttellospora* sp. These isolates were stored in refrigerator for further multiplication.

Results and Discussion

Jatropha curcas

On the 120 days after inoculation, the signifi-

Table 1. Effect of different VAM fungal genera on phosphorus content of *Jatropha curcas* and *Pongamia pinnata* at 120 DAI. DAI—Days after inoculation, PUEN-Phosphorus uptake enhancement.

	'P' content (mg/g) (120 DAI)							
	Jatropha curcas				*Pongamia pinnata*			
Treatment	Shoot	Root	Total	PUEN (%)	Shoot	Root	Total	PUEN (%)
T_1 –Control (uninoculated)	0.30	0.07	0.38	0.00	0.22	0.07	0.29	0.00
T_2 –*Glomus* sp.	0.39	0.08	0.48	20.83	0.23	0.08	0.31	6.45
T_3 –*Sclerocystis* sp.	0.33	0.08	0.42	9.52	0.25	0.07	0.32	9.37
T_4 –*Scutellospora* sp.	0.36	0.08	0.45	15.55	0.27	0.07	0.34	14.70
T_5 –*Gigaspora* sp.	0.36	0.08	0.46	17.39	0.26	0.07	0.33	12.12
T_6 –*Acaulospora* sp.	0.37	0.20	0.58	34.48	0.25	0.07	0.32	9.37
T_7 –*Glomus* sp. with phosphorus	0.39	0.08	0.48	20.83	0.30	0.10	0.40	27.50
T_8 –*Sclerocystis* sp. with phosphorus	0.35	0.08	0.44	13.63	0.29	0.10	0.39	25.64
T_9 –*Scutellospora* sp. with phosphorus	0.39	0.08	0.48	20.83	0.28	0.08	0.36	19.44
T_{10} –*Gigaspora* sp. with phosphorus	0.38	0.08	0.47	19.14	0.27	0.07	0.34	14.70
T_{11} –*Acaulospora* with phosphorus	0.47	0.30	0.78	51.28	0.26	0.07	0.33	12.12
T_{12} –All five genera with phosphorus	0.42	0.09	0.52	26.92	0.28	0.09	0.37	21.62
T_{13} –All five genera without phosphorus	0.40	0.08	0.49	22.44	0.24	0.09	0.33	12.12
Mean	0.37	0.10	0.01		0.26	0.08	0.34	
SE ±	0.01	0.01	0.03		0.00	0.01	0.01	
CD at (5%)	0.02	0.02			0.02	0.03	0.02	

cantly higher total phosphorus was noticed in plants inoculated with *Acaulospora* sp. + P (0.78 mg/g) which was statistically at par with treatment with *Acaulospora* sp. (0.58 mg/g) followed by all five genera + P (0.49 mg/g). The least total phosphorus content was observed in uninoculated control (0.40 mg/g). As for the phosphorus uptake, the highest was noticed in plants inoculated with *Acaulospora* sp. + P (51.28%) followed by *Acaulospora* sp. (34.48%) (Table 1).

Pongamia pinnata

On 120 DAI, the significantly highest total P-content was recorded in plants inoculated with *Glomus* sp. + P (0.40 mg/g) which was statistically at par with *Sclerocystis* + P (0.39 mg/g) followed by *Scutellospora* sp. + P (0.36 mg/g). (Table 1). The least total phosphorus content was observed in uninoculated control (0.29 mg/g). The highest phosphorus uptake was noticed in plants inoculated with *Glomus* sp. + P (27.50%) followed by *Sclerocystis* sp. + P (25.64%) and all five VAM genera + P (21.62%). This may be due to increased availability of nutrients which helps in greater and quicker production of biomass. The mycorrhizal fungi present around root zone which trigged the growth of population of P-solubilized bacteria thereby it may hinder the soluble form which enhance the growth of seedlings. These results are in conformity with the findings of Bagyaraj (5) in *Leucaena leucocephala*, Gurumurthy et al. (6). in *Tectona grandis* and Verma et al. (7). in *Pongamia pinnata.*

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