

Effect of VA Mycorrhizae inoculation on vegetative growth in *Portulaca oleracea* L. (Purslane, Gholu)

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ABSTRACT: : Purslane has smooth, reddish, mostly prostrate stems and the leaves may be alternate or opposite, clustered at nodes and ends. The yellow flowers have five regular parts and are up to 6 mm. wide. Seeds are formed in a tiny pod. It is rarely used as vegetable in Maharashtra in some tribal regions. Efforts are taken to improve growth parameters by VAM inoculation and phosphate. Considering its nutritive and medicinal value purslane must be brought in main stream of cultivation as vegetable. To promote its cultivation status VAM inoculation may help increase its commercial status.

Key Words: VAM, *Portulaca*, VAM, Vegetative growth.

INTRODUCTION

Portulaca oleracea L. also known as common purslane, verdolaga, or red root is an annual succulent of family Portulacaceae, which may reach 40 centimeters (16 in) in height. In Maharashtra it is called as Gholu. It has smooth, reddish, mostly prostrate stems and the leaves may be alternate or opposite, clustered at nodes and ends. The yellow flowers have five regular parts and are up to 6 mm. wide. Seeds are formed in a tiny pod. It is rarely used as vegetable in Maharashtra in some tribal regions.

VAM means vesicular arbuscular mycorrhizal fungi. They form symbiotic association with majority of plants. They improve phosphate absorption capacity of plants to promote growth and development. VAM grows in close association with the roots and play an important role in transfer of soil nutrients to the plant. In exchange, the plant supplies the fungus with sugars. Mycorrhizal fungi have been suggested as having a role in uptake of water at during drought stress, and heavy metals contaminated soil (Courtecuisse, 1999). The hyphae of arbuscular mycorrhizal fungi penetrate roots and grow extensively between and within living cortical cells, forming a very large and dynamic interface between symbionts. The hyphae also extend from root surfaces into the surrounding soil, binding particles and increasing micro- and macro-aggregation (Auge, 2001). The VAM selected for the research was *Glomus fasciculatum*.

MATERIAL AND METHODS

Investigation was conducted at the Department of Botany, Arts, Commerce and Science College, Narayangaon, Pune to study the response of *Portulaca oleracea* L to VA mycorrhizal inoculation.

Mature healthy seeds of *Portulaca oleracea* L were collected from local area, Narayangaon Tal. Junnar, Dist. Pune (Maharashtra) and used in the experiments. Earthen pots with 30 cm diameter, and depth, with a hole at the base for drainage system were selected and were filled with 3 kg of sterilized soil mixture of sand: soil: FYM in 1: 2: 1 proportion. The pots were placed in full sunlight and were watered till field capacity a day before sowing and alternate days till the final harvest. Recommended phosphate fertilizer was procured from Suryakant agro service, Kalamb added at different levels as suggested in various treatments.

In *Portulaca oleracea* L. there were five sets with five treatments in sterilized soil.

Set I – UP00 - Control, uninoculated without phosphate.

Set II – IP00 - VAM inoculated without phosphate.

Set IV – IP100% - VAM inoculated with 1gm phosphate per pot.

Set III – UP75% - Uninoculated with 0.75 gm phosphate per pot.

Set IV – IP50% - VAM inoculated with 0.5 gm phosphate per pot.

The similar sets were made for non sterilized soil also.

Ten root segments of each plant were collected and subjected for detection of mycorrhizal colonization. The root segments were fixed in F.A.A. for 24 hours and were autoclaved in 10% KOH. The autoclaved root segments were washed in 1 percent HCl- and stained with cotton blue in lactophenol. The stained roots were mounted on micro slide in lactophenol and were observed under microscope for the presence and kind of VAM fungi. Identification is attempted solely on manual for identification of VAM fungi by Schenck and Perez, (1987). Frequency was calculated using the formula,

$$\% \text{ frequency of mycorrhizal colonization} = \frac{\text{Number of mycorrhizal root segments}}{\text{Total number of root segments screened}} \times 100$$

Further observations were recorded at flowering period for vegetative parameters. Dry biomass on 60th day for which samples were oven dried at 60° C for 48 hours. S.E was calculated using excel programme

OBSERVATION

Table 1: Growth performance of *Portulaca oleracea* L in response to various levels of phosphate, and VAM in non sterilized and sterilized soil.

Soil type	Non sterilized					
	I	II	III	IV	V	VI
Set						
Treatments	UP00	IP00	UP100	IP100	IP75	IP50
Parameters	*	*	*	*	*	*
Plant height (cm)	7.00±0.2	10.00±0.2	12.00 ± 0.4	17.00 ± 0.3	17.00 ± 0.13	16.10±0.02
No. of Leaves	12.00 ± 00	16.00±00	14.66±0.47	20.00±0.31	17.00±0.34	15.00±0.27
% VAM Colonization	00	10	00	40	20	10
Spore count (Per 50 gm of soil)	00	09	00	25	26	23

Soil type	Sterilized					
	I	II	III	IV	V	VI
Set						
Treatments	UP00	IP00	UP100	IP100	IP75	IP50
Parameters	*	*	*	*	*	*
Plant height (cm)	8.00±0.2	12.00±0.03	13.00 ± 0.33	18.00 ± 0.13	18.00 ± 0.10	17.10±0.22
No. of Leaves	15.00 ± 00	12.00±12	17.66±0.46	20.00±0.33	19.00±0.58	18.00±0.33
% VAM Colonization	00	10	00	50	15	20
Spore count (Per 50 gm of soil)	00	10	00	26	24	25

UP00 (Control , un-inoculated, without phosphate & VAM). **IP00** (VAM Inoculated, without phosphate). **UP100** (VAM un-inoculated with 1gm phosphate per pot). **IP100** (VAM Inoculated with 1gm phosphate per pot). **IP75** (VAM Inoculated with 0.75gm phosphate per pot). **IP50** (VAM Inoculated with 0.50gm phosphate per pot). Standard *deviation (SD).

RESULTS AND DISCUSSION

The result of present investigation clearly indicates that *Portulaca oleracea* L. responds well to the mycorrhizal inoculation under pot condition.

Maximum plant height was noted in plants inoculated with VAM at 100 percent recommended phosphate and least in control in both sterilized and non sterilized soil. Many workers showed that VAM alone or with phosphate increased growth. Mosse, *et al.*, (1969) observed that mycorrhizal onion seedlings grew better in both sterilized and non sterilized soil as compared to untreated plants. Arafat *et al.*, (1995) showed increased growth in *Vicia faba* in hydroponic culture.

Maximum number of leaves was found in plants inoculated with VAM at 100 percent recommended phosphate and least in control in both sterilized and non sterilized soil. VAM or Phosphate alone did not show marked effect as compared to combinations of VAM and phosphate. Similar trend was observed in Red Maple (*Acer rubrum*) reported by Daft and HacsKaylo (1977) in *Tamarindus indica*, L., *Acacia nilotica* and *Calliandra calothyrsus* by Reena and Bagyaraj (1990).

Inoculation of plants with VAM without phosphate shows two fold increase in Total leaf area as compared to uninoculated plants without phosphate. VAM with 50 percent recommended phosphate shows tenfold increase as compared to uninoculated plants without phosphate. Generally the inoculation of VAM along with recommended phosphates shows increase in leaf area per plant. Similarly Biermann and linderman (1983) reported that total leaf area was increased in inoculated plants as compared to uninoculated plants in China aster. Similar results were recorded by Kanade and Bhosale (2014) in *Cassia tora* L., Kanade and Bhosale (2013) in *Dolichos lab-lab*, Linn. and Kanade and Bhosale (2013) in *Sida acuta*, Burm.

Percentage of VAM colonization was higher in mycorrhizal plants with 50 percent recommended

phosphate in sterilized and non sterilized soil. Similar observation was reported by Okon *et al.*, (1996) in *Gliricidia sepum* and *Senna siamea*. Further there is decrease in VAM colonization level at 100 percent recommended phosphate and higher soil phosphate levels. There is increase in VAM colonization level in nonsterilized soil inoculated with VAM also observed by Bagyraj and Manjunath (1980) in Cotton Cowpea, Menge, *et al.*, (1998) in Citrus. Present investigation clearly indicates that *Portulaca oleracea* L. responds well to *Glomus fasciculatum*. VAM inoculation in combination with Phosphate at all levels increased height of shoot, Total leaf area and Dry biomass in both non sterilized and sterilized soil.

CONCLUSION

Portulaca oleracea L. is competitive growing weed which requires very less care to be taken and grows intensively in natural habitat. Considering its nutritive and medicinal value purslane must be brought in main stream of cultivation as vegetable. To promote its cultivation status VAM inoculation may help increase its commercial status.

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