SUMMARY
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In recent days hydrocarbon bearing plants gaining more importance to utilize their productivity. VA -mycorrhiza are the most ubiquitous soil fungi associated with plant roots, its morphology influenced by the host root structure. The ability of these fungi to produce dramatic response in plant growth is well documented. The present study was undertaken to quantify the VAM fungi, population dynamics, histo-chemistry, Nutrients physiology interaction with other beneficial microorganisms and fungicidal effect on experimental plants. A number of methods for estimating vesicular arbuscular mycorrhizal colonization and related root physical properties are currently used. Amongst the more popular are percentage of root segments, colonized percentage, total root length. Although both intra-and extra-radical fungal mycelium involved in this process, but most experimental work on VA-mycorrhiza was extensively studied with the development of the intra-radicle phase. Intense colonization usually gave good growth stimulation and this indicated, mycorrhizal function to benefited the growth of experimental plants. Each genera of species form different types of chlamydospores, zygospores in the rhizosphere soil. From the survey, variability of VA-mycorrhizal spores population in the experimental plants attributed the native vegetation. Conservation and efficient utilization of VA-
mycorrhizal spores and their biodiversity are of crucial importance for sustainable plant production system, VAM- fungi identification, conservation, ecological information in natural and disturbed sites would require accumulation, collection, isolation, and spore cultures.

Isolated spores *Glomus fasciculatum* and *Glomus mosseae* selected for inoculation purpose. Good quality of inoculum was multiplied with the germplasm *Pennisetum typhoideum* and *Sorghum bicolar* respectively, so as to get sporocarps, spores, freshly colonized root fragments and rhizospheric soils. There are many evidence that, inoculation with VA-mycorrhizal fungi can lead to a greater stimulation of growth and nutrient relation of mycorrhizal plants compared to non-mycorrhizal. The performance of these mycorrhizal fungi is agreement in the work of (Gerdemann, 1965; Red head, 1968; Kormanik et al., 1982; Bagyaraj, 1990; Lakshman, 1992; Durga et al., 2000). The mycorrhizal plants showed positive growth responses on the basis of plant height, biomass production, percentage of colonization. The maximum shoot weight was recorded in *Jatropha curcus*. This study was brought out that to obtained maximum benefit from VA-mycorrhizae and the capability between the fungus and host both the partner competitiveness was tested. The results from this study indicates that the potential benefits from VAM in the young seedling productions is most encouraging. Histochemical study revealed the localization of metabolites in the
experimental plants, arbuscular wall material showed the presence of polysaccharides. The acidic property and PAS reactivity suggested that wall is primarily glycolipid composition. This contrast with the walls of vesicles and hyphae which are chitinous. The absence of starch grains in arbuscules and presence of starch grains in the host tissue leads to concluded that the carbohydrate material might have been taken by the arbuscules in other soluble form but not as starch direct. Protein components occurred in the interfacial matrix of the host and mycorrhiza was evident from the positive reaction to the reagent. Lipid accumulation was more in vesicles get transformed into different forms of chemicals.

In a study of Phosphorus transport and host growth, the polyphosphate is a major P received in VA-mycorrhizae especially in proliferating arbuscules. The cell wall bound peroxidase activity was significant than non-mycorrhizal plants. The changes in the enzymatic activity during arbuscules life revealed potential nutrient transfer from host to the fungus, and fungus to the host during arbuscules degradation. Research on beneficial application of VAM (Glomus fasciculatum and G. mosseae) proved better uptake of minerals. Synergistic interaction with P fertilization (Super phosphate and Rock phosphate) in hydrocarbon yielding plants were scanty. Fertilizer application is an essential method to increase production when nutrients are exhausted from the soil, fertilizer has to be added in order to increase the biomass production.
VAM association to become functionally effective when the fertilizers are applied in a recommended level. Mycorrhizal inoculation viz. *Glomus fasciculatum* increased plant height, total dry weight of root and shoot. Higher fertilizer application was reduced the total VAM fungal population. The effect of mycorrhizas on plant growth was depended on interactions between fungal strain, soil and host. Different levels of Super phosphate and efficient VAM *Glomus fasciculatum* are most useful in hydrocarbon yielding plants, but Rock phosphate with *Glomus fasciculatum* inoculation was most significant to *Madhuca indica* plants.

The microbial interactions concerning VAM fungi and Phosphate solubilizing bacteria (*Bacillus polymyxa*) are of relevance because, they have improved plant establishment, development and nutrient acquisition in *Ricinus communis* (Mysore local). Thus, for maximizing the growth and vigour of Castor seedlings a combined application of VAM (*Glomus mosseae*) and Phosphate solubilizing bacteria (*Bacillus polymyxa*) is recommended.

VAM fungi have more competitive ability in soils. The metabolic transport path in root and stems are protected by fungicidal action. The detailed investigation made on these five hydrocarbon yielding plants and the knowledge gained from the nature of VA-mycorrhizae its distribution, population dynamics growth response, fertilizer application. Interaction with other microorganisms, suggested that, the hydrocarbon yielding
plant seedlings must have been accompanied by their mycorrhizal fungi when planted in denuded areas.

**Conclusion**

- The mycorrhizal association is a true symbiosis that benefits both fungus and host in a variety of ways.
- Appressorial hypal structures were recorded on the root surface prior to penetration in *Jatropa curcus*.
- VAM infection could be easily identified based on yellow colour of the roots in *Madhuca indica*.
- Intercellular hyphae with coiled linier orientation display was observed in *Jatropa gossifolia*.
- The VAM spores such as *Acaulospora thaiwania*, *A.nicolsonii*, *Gigaspora rosea*, *Glomus tenebrosum*, *Sclerocystis pakisthanica*, *S. pachycaulis*, *Scutellispora aborosea* are considered to be additional record from five experimental plants.
- VAM spores were screened in 260 different localities where, experimental plants were grown.
- Low pH and higher organic matter did not influenced the spore population.
- Highest number of spores i.e. 613/100g soil were recovered from Gokak of *Belgaum district and very least number of sclerocystis species were recovered.
Winter season was the most favorable season for VAM spore production.

It has experimentally observed that *Glomus fasciculatum* was most efficient strain to inoculate on young seedlings of *Jatropha curcus J. gossifolia* and *Madhuca indica*. Similarly *Glomus mosseae* was efficient strain for *Ricinus communis* varieties to get sustainable plant growth.

The increased spore population with respect to the mycorrhizal colonization was not correlated with each other in castor varieties.

Localization of polyphosphate granules in the fungal components of arbuscules and hyphae indicated the accumulation of phosphates absorbed during metabolic process of fungus in mycorrhizal plants.

The acidic property of Periodic acid Schiff's reagent in the present investigation fungal wall is primarily composed of glycolipid.

Detection of enzymatic activity in the arbuscules of mycorrhizal plants revealed the potential nutrient transfer from the host to the fungus and fungus to the host during arbuscular degradation.

It is confirmed that *Glomus fasciculatum* plus RP 600mg/kg soil was most effective in promoting plant growth of *Madhuca indica*.

The degree of mycorrhizal colonization and spore population was reduced drastically with the increased Super phosphate treatment.

Macro and micronutrients concentrations progressively increased when the plants are inoculated with *G. fasciculatum* at different doses of Sp and RP treatments. On contrast to this, Mg concentration was higher in non-mycorrhizal plants.
Interaction between VAM (*Glomus mosseae*) and PSB in the *Ricinus communis* (Mysore local) variety showed more effective than the *G.fasciculatum* with PSB. This indicated that, *G.mosseae* had better host specificity to the Mysore local variety.

Dual inoculation to *Ricinus communis* (Var: Mysore local) with *Glomus mosseae* and PSB showed most significant growth, plant biomass production and nutrients uptake.

The fungicide Capton with mycorrhizae demonstrated negative effect on castor plants by depressing plant height P content in shoots and spore number in the rhizosphere.