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Examination of beneficial interaction between VAM fungi and root of Patchouli

A. Misra and M. L. Gupta

Central Institute of Medicinal and Aromatic Plants, Lucknow-226015, India.

Abstract

Patchouli (*Pogostemum cablin* Bent.) is a highly valued aromatic plant. Vesicular-arbascular mycorrhizal (VAM) fungi were obtained from the roots of *Pogostemon cablin*. The presence of VAM improved seedling growth by facilitating the nutrient uptake of P and Zn in the P and Zn depleted soils of the controlled region of Central Institute of Medicinal and Aromatic Plants farm. VAM fungi were identified as *Glomus fasciculatum*. Application of *G. fasiculatum* can be successfully used for plantation of *Pogostemon cablin*, and its sustainability on an entisol degraded soils.

Keywords: Patchouli, VAM, Zn, Ca, and micronutrients.

INTRODUCTION

Patchouli (*Pogostemon cablin* Benth*)* of family Asteraceae is an important high value essential oil bearing plant. The most important oil is sesquiterpene-patchoulol and its precursor nor-patchoulenol (Trifilieff, 1980). The site of oil accumulation is in both the glandular trichomes and in unique, plant specific, specialized internal structures in leaves (Henderson et al., 1970). Due to their peculiar powerful woody fragrance and strong fixative properties (Kraft et al., 2005), these components are extensively used in perfumery, cosmetics, confectionary, and food industries. It is native to the tropical and subtropical areas (Neuss, 1980). Apart from patchulol, the acidic components of oil and bio-genetic precursor of minor constituent is nor-patchoulenol (Trifilieff, 1980). Because of all these features, it is extensively used in perfumery, confectionary, cosmetics and food industries. It is wildly grown in the gardens and obtained in natural surroundings of the tropical and subtropical areas (Neuss, 1980). It often grows in degraded soils at low altitude having non-availability of iron, and poor fertility of P and Zn. In this communication, the presence of the vesicular–arbascular mycorrhizal (VAM) fungus, *Glomus fasciculatum* (Thaxt) Sensu Gerd with patchouli obtained and its influence on growth, productivity in phosphorus and Zinc depleted soil increased the uptake of phosphorous and zinc, with unavailable Fe. Furthermore, when P and Zn levels in soils are low, VAM stimulate significant increase in P and Zn uptake resulting in a dramatic increase in plant growth (Gerdemann, 1968; Mosse, 1973). We hypothesized that the association of VAM would facilitate the growth, productivity and higher biomass obtained due to syner-getic effect of VAM photosynthates. Reports revealed that no specific and systematic work has been done on VAM association with *P. cablin* except a few reports on the occurrence of *Glomous mosseae* in *Ca*asuarina equisetifolia and for *Glomus aggregatum* in *Cymbopogon martini*.

MATERIALS AND METHODS

Root samples with surrounding soil of the rhizosphere were collected from a degraded low altitude entisol soil at the Central Institute of Medicinal and Aromatic Plants research farm. Terminal feeder roots were collected carefully, washed and cleared with 10% KOH. The roots were washed with 5 N HCl, stained with tryphan blue, mounted in lactophenol as described by the methods of Phillip and Hayman (1970) and examined under light microscope. Spores of VAM fungi were isolated from the surrounded soil by wet sieving and decanting methods as described by Gerdemann and Nicolson (1963). VAM was identified by following the key suggested by Trappe (1982) and Scheck and Perez (1987) Phosphorus and Zn in soil and the tissue of the root zones were analyzed as described in Gupta and Jananrdhanan (1991) and Misra (1991).

RESULTS AND DISCUSSION

VAM fungi were found to colonize the roots of *P. cablin* (Figure 1B) with vesicles and a bascules being present in

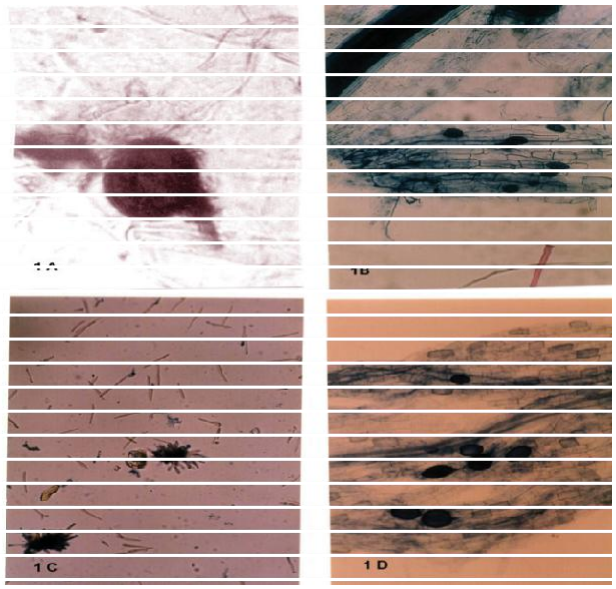

Figure 1. Patchouli (*P. cablin*) root showing colonization by VAM-fungus. A. Hyphal network of endomycorrhizae bearing spores associated with *P. cablin* roots; B. Vesicles and a bascules in root cortical cells of *P. cablin*; C. Mature and broken spore of *G. fasciculatum*; D. *Sporocarp* of *G. fasciculatum.*

root cortical cells (Figure 1B). The fungus was identified as *G. fasciculatum* (Thaxt. Sensu Gerd) Gerd and Trappe based on spore morphology (Figure 1C). Chlamydopores (Figure 1D) were subglobose to or ellipsoidal or cylindrical, hyaline to light yellow to yellow, with occulted opening in the subtending hyphae one to two walled. The VAM fungus was identified as *G. fasciculatum* (Schenck and Perez, 1987). The present study indicates the association of VAM fungus *G. fasciculatum* with *P. cablin*. Relative to the soil concentration, P and Zn concentrations in the roots were higher with 0.081% P in soil and 1.08% P and 0.07 and 8.2 µg/g Zn in soil and plant roots, respectively. Reports on VAM colonization of other medicinal and aromatic plants include *G. mosseae*, *G. fasciculatum* and *Scallospora calospora* in Casuarina spp. *G. aggregatum* in Cymbopogon martini and in *Taxus wallichiana* Zucarnii trees it was reported to enhance the growth and biomass (Sidhu et al, 1990) (Misra et al., 2004). The presence of VAM in roots of patchouli suggests that VAM inoculation could be used to increase growth of this plant. Indeed preliminary results suggest better growth and productivity of Patchauli (*P. cablin* L.) inoculated with *G. mosseae*.

Conclusion

Patchouli (*P. cablin* Benth*.)* has shown the association of VAM of Patchouli and without the VAM.

REFERENCES

Kraft P, Eichenobere W, Frech D (2005). From Vetiver to Patchouli: Discovery of a new high-impact Spiro cyclic patchouli odorant. Euro. J. Org. Chem., 15: 3233-3245.

Henderson W, Hart JW, How P, Judge J (1970). Chemical and morphological studies on the sites of sesquiterpene accumulation in *Pogostemon cablin* (Patchouli). Phytochemical, 9: 1219-1228.

Trifilieff E (1980). Isolation of the postulated precursor of non-patchoulenol in patchouli leaves. Phytochemical, 19: 2467.

Neuss N (1980). The spectrum of biological activities of indole alkaloids . *In*: Philipson JD, Zenk MH (eds.). Indole and biogenetically related alkaloids. London: Academic Press, pp. 293-313

Phillips JM, Hayman DS (1970). Improved procedures for clearing roots and staining parasitic and vesicular-arbascular mycorrhi. Trans. Br. Mycol. Soc., 55: 158-163.

Gerdemann JW, Nicolson TH (1963). zal fungi for rapid assesssment of infection. Spores of mycorrhizal Endogone species extracted from soil by wet sieving and decanting. Trans. Br. Mycol. Soc., 46: 235-446.

Schenck NC, Perez Y (1987). Manual for identification of VAM mycorrhizal fungi, University of Florida, Gaineville, Florida.

Sidhu OP, Bahel HM, Gupta ML, Janaradhanan KK (1990). Occurence of Vesicular-arbascular mycorrhiza in *Cassuarina equisetifolia* L. Curr. Sci., 59: 422-423.

Gupta ML, Janardhanan KK (1991). Mycorrhizal association of *Glomus aggregatum* with palmarosa enhances growth and biomass. Plant and Soil.131:261-263.

Misra A, Gupta ML, Singh UB (2004). Occurence of Vesicular-arbascular mycorrhizal fungi in *Taxus wallichiana* Zuccarini. J. Plant Biol., 31: 1-3.