Mycorrhizal Status of Jojoba Seedlings

A.S. Khalie1 and K.A. Elkhider2
Department of Botany, College of Science, King Saud University, Riyadh 11451, P.O. Box 2455, Saudi Arabia

Jojoba [Simmondsia chinensis (Link) Schnied] was introduced into the Barah semi-arid area (lat. 14°N, long. 30°30'E) in Sudan. Jojoba is of great economic importance because of its liquid wax content. Bloss (1) reported that jojoba was assumed to be non-mycorrhizal. However, in a later investigation, he concluded that jojoba is mycorrhizal under natural conditions, but added that jojoba plants produced from seeds in the greenhouse for field plantings were not usually mycorrhizal. Because jojoba has been found to be mycorrhizal and growth response to mycorrhizae has been reported in woody plants (2), further investigation of the mycorrhizal status of jojoba in the seedling state, especially in the Sudan, is needed.

In Aug. 1985, 20 random jojoba seedlings produced from seeds grown on unsterilized native soil substrate, in polyethylene bag containers in Barah Nursery, were used for study. Soil was carefully removed to uncover the youngest roots. Samples of 1 g of roots were collected from each seedling, washed with tap water, and preserved in a plastic vial containing formalin acetic acid alcohol (FAA) fixative solution. Other subsamples of the jojoba roots were saved as inocula. Soil samples to be used as substrates for pot cultures were also collected from the cultivation bags, scaled in clean plastic bags, and taken to the laboratory in the Botany Dept. at King Saud Univ., Saudi Arabia.

Jojoba FAA-fixed roots were cut into 1-cm-long segments, washed with tap water, cleared in 10% KOH, and stained in trypan blue with lactophenol as per Phillips and Hayman (5). Twenty-five segments of fine roots from each jojoba seedling were mounted in clear lactophenol and scanned microscopically for VA mycorrhizal infection. The collected soil was shaken free from root and debris and then autoclaved for 1 hr at 115°C under 1.05 kg·cm⁻². Twelve 0.7-liter pots were filled with this autoclaved soil. The saved inoculum roots, cut into 1-cm segments, were added to the pots; the roots served as inocula for the mycorrhizal fungi (4). In each pot, some pregerminated Sudan grass [Sorghum sudanense (Piper stapf)] seeds were planted. The pots were placed in a greenhouse that provided growing conditions of 12-hr photoperiod, 106 μmol·s⁻¹·m⁻², 27°C, and watered as required. After 9 weeks, 100 g of the soil from each pot was collected and the spores from the soil batches were obtained by wet-sieving and decanting according to the procedure devised by Gerdemann and Nicolson (3). The characteristic features found in jojoba fixed roots brought from the nursery were vesicles, arbuscules, and hyphae (Fig. 1, A, B, and C, respectively). The VA mycorrhizal colonization averaged 87% and ranged from 72% to 95%. The fungal characteristics of the jojoba root segment corresponded to the spores (Fig. 1D) of the only fungus obtained from the pot cultures of Sudan grass inoculated with jojoba roots, which was Glomus fasciculatum (Thaxter Gerd) Gerd. & Trappe as per the classification proposed by Gerdemann and Trappe (4). Jojoba seedlings produced from seeds were found to be mycorrhizal under the prevailing conditions in Barah Nursery. This finding is not in agreement with the conclusion of Bloss (1). In this study, G. fasciculatum was found both in pot cultures and associated with jojoba roots, supporting the observation that G. fasciculatum is the most common endosymbiont in semi-arid sites (6).

This native mycorrhizal fungus would appear to be a good endosymbiotic partner with the jojoba plant in the semi-arid ecological zonation of the Barah area, since it is adapted to such environmental conditions and capable of heavy colonization. Accordingly, inoculation of jojoba seedlings prior to their transfer to sites may enhance their growth and subsequently upgrade their potential role in revegetation practices.

Literature Cited


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1Assistant Professor.
2Research Assistant.

Fig. 1  A) Jojoba root segment showing abundant VA mycorrhizal infection. × 54. (B) Root segment showing more detail of internal hyphae and arbuscules. × 54. (C) Root segment with well-developed internal vesicles formed by G. fasciculatum. × 67.5. (D) Spore of G. fasciculatum. × 270.