



Investigation of Mycorrhizal Status of *Hammada elegans* in Uniazah Range Area, Saudi Arabia

A.S. Khaliel

Department of Botany, College of Science, King Saud University, Riyadh, Saudi Arabia.

This work is to test the response of *Hammada elegans* to native mycorrhizal association. A survey to collect root samples, which is dominant in the range area at Uniazah in Saudi Arabia, was carried out during the period from October 1982 to April 1983. Root samples were stained and scanned under the microscope for mycorrhizal assessment. It has been found that *H. elegans* is mycorrhizal, the percentage of infection averaged 57%. A confirmatory test has been conducted by trapping this type of mycorrhizae by Sudan grass. This indicates that some chenopods can establish mycorrhizal association under natural conditions in this area.

Earlier studies indicate that family chenopodiaceae is unlikely to establish mycorrhizal association under natural condition (Stahl 1900; Maeda 1954; Ground 1969); however, there is evidence that annual chenopods are mycorrhizal (Koch 1961).

Mycorrhizae are important for the survival of plants and in sustaining their growth in the physiologically demanding dune environment (Koske *et al.* 1975). Since *Hammada elegans* is useful in the revegetation practices and sand stabilization, the investigation of its mycorrhizal status was encouraged.

Materials and Methods

The site selected for this investigation was Uniazah Range Area (lat. 26° 10' N Long. 44°E), Saudi Arabia. The sand dunes vegetation is fragmently dominated by

H. elegans. Stout shrub (30–70 cm high) with glaucous green succulent terete branches, occurs in saline deserts (Migahid 1978).

At least 30 plant samples of *H. elegans* were carefully excavated till the youngest roots were reached. Two to five grams of these roots were collected for each subsample plant, washed with tap water and preserved in FAA solution in plastic vials. The vials were carried to the laboratory for mycorrhizal assay.

Root samples were washed with tap water from the fixative solution and cut into 1 cm long segments and heated in 10% KOH to 90 °C for one hour using a double water bath. Then, the roots were stained according to Phillips and Hayman procedure (1970).

Each 25 root segments were placed on slide in clear lactophenol and covered. Slides were examined at 100× under a compound light microscope for mycorrhizal infection. The characteristic features of endomycorrhizae looked after were, vesicles, arbuscules and hyphal coiling. When any of these were found in a sample, infection was recorded to determine the percentage of infection for *H. elegans* in every four slides.

To confirm occurrence of mycorrhizae in *H. elegans*, soil was taken from 50 cm depth beneath a shrub of *H. elegans* and used as inoculum for sudan grass seeds. The pot culture was watered with Hoagland's solution lacking phosphorus. After 60 days the roots of the baiting plant were harvested and stained according to Phillips and Hayman procedure (Phillips and Hayman 1970).

Results

The characteristic features of endomycorrhizae sought were, vesicles, arbuscules and hyphal coiling, Figs. 1–4. The infection averaged 57%. Also, the reinfection test for the baiting plant was positive. When scanned under the microscope the roots were found to be mycorrhizal.

The author identified the mycorrhizal characteristics according to the classification of mycorrhizal fungi proposed by Gerdeman and Trape (1974), the sought fungal characteristics correspond to the fungus *Glomus mosseae*.

Discussion

Contrary to the earlier studies which indicate that family chenopodiaceae is unlikely to establish mycorrhizal association (Stahl 1900; Maeda 1954; Ground 1969), this study displays the fact that one member of the family chenopodiaceae,

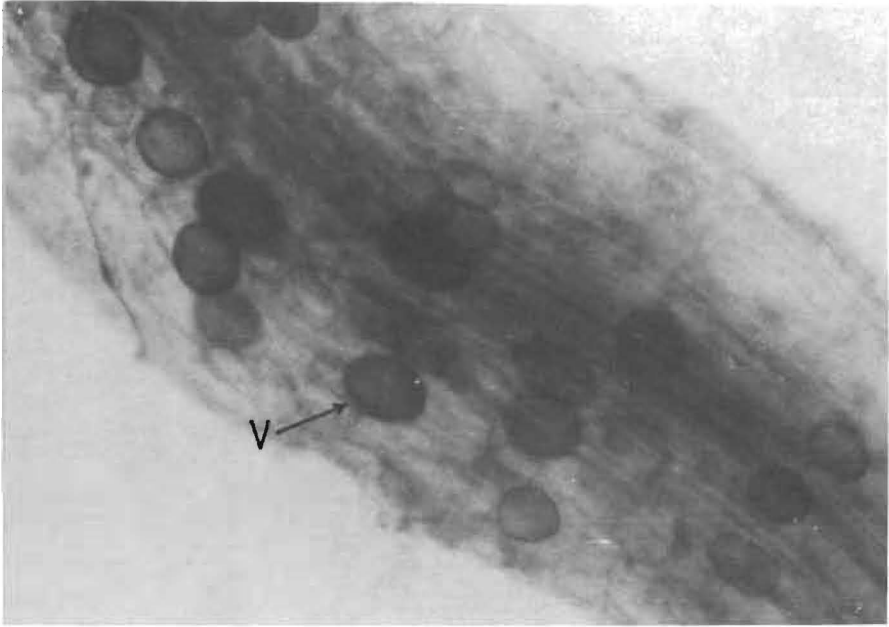


Fig. 1. Stained root segments of *H. elegans* heavily infected with VA mycorrhizal Fungus (*Glomus-Mosseae*).

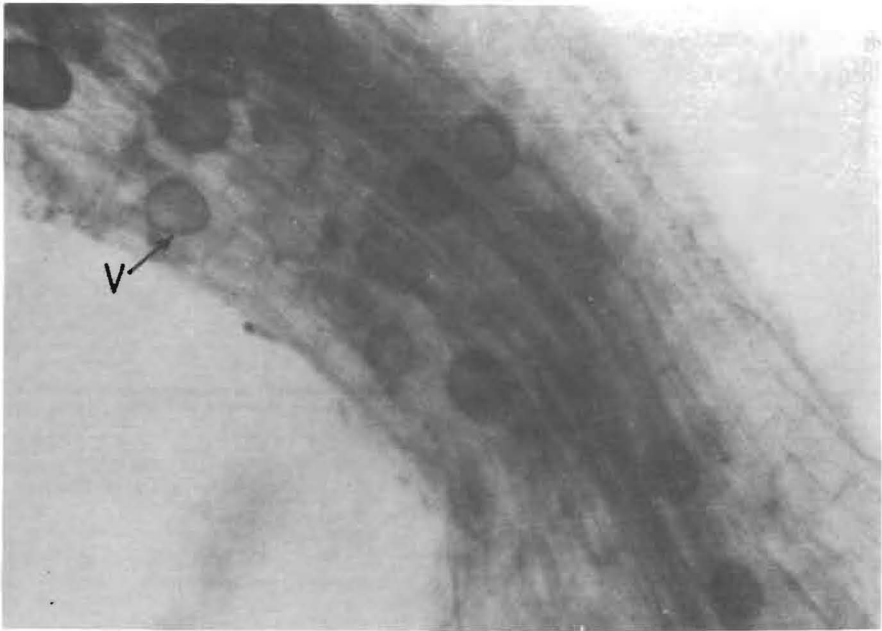


Fig. 2. Stained root segments of *H. elegans* heavily infected with VA mycorrhizal Fungus (*Glomus-Mosseae*).

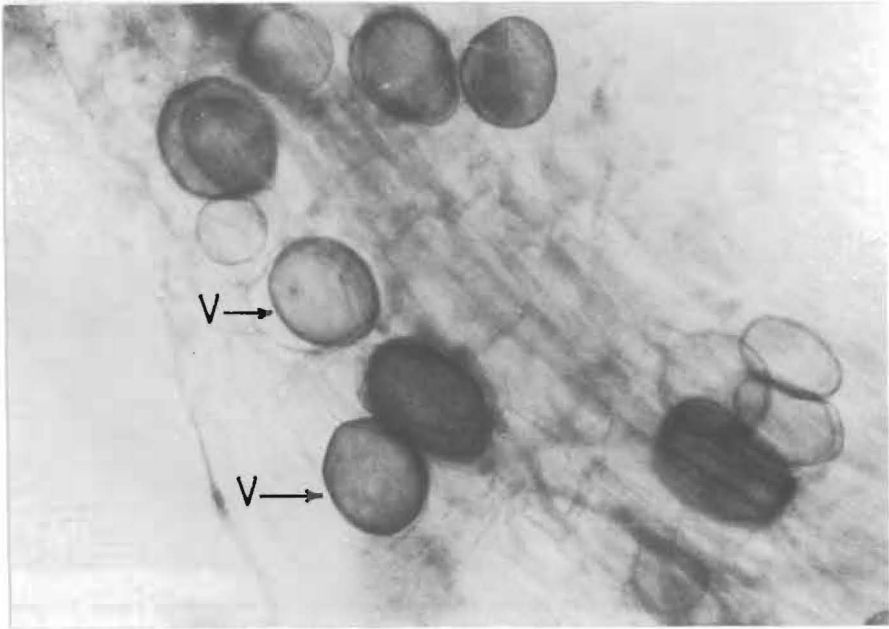


Fig. 3. Stained root segments of *H. elegans* with well developed vesicles (V) by *Glomus Mosseae*.

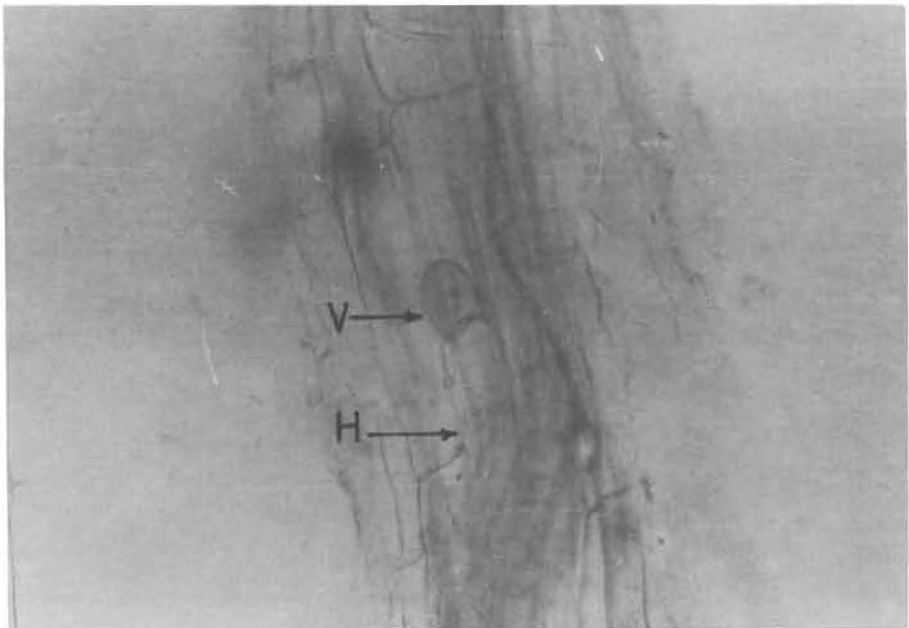


Fig. 4. Single vesicle with attached hypha (H) inside the cortex.

i.e. *H. elegans* was found to be mycorrhizal under natural habitat of Uniazah range area.

The chenopod in this study is a woody perennial, whereas, the chenopods reported by Madea (1954) and Koch (1961) were mostly field crop annuals (Stephen and Aldon 1967).

In sand dunes, sand movement, deficiency of nutrient and organic matter, high evaporation rates and other factors contribute to make the dunes harsh and unfavourable medium for plant growth (Cowles 1899; Olson 1958). Any factor that improves nutrient uptake by dune plants is likely to contribute to the success of the dune vegetation. Mycorrhiza establishes mutual association with the dune plant. The fungus assists the plant with ion uptake, especially phosphorus, and the plant provides the nutrient for the fungus. (e.g. Stevenson 1964; Nicolson 1967; Gerdemann 1968; Safir *et al.* 1972).

Therefore, the investigation of the mycorrhizal status of the dune plants is vital to sand stabilization and revegetation programmes.

References

- Cowles, H.C. (1899). The ecological relations of the vegetation of the sand dunes of Lake Michigan. *Bot. Gaz.* **27**, 95–117; 167–202; 281–308; 361–391.
- Gerdemann, J.W. and Trappe, J.M. (1974). The Endogonaceae in the Pacific North west. *Mycologia Momoir* No. 5. The New York Botanical Garden, Bronx, New York.
- Gerdemann, J.W. (1968). Vesicular-arbuscular mycorrhiza and plant growth. *Annu. Rev. Phytopathol* **6**, 397–418.
- Ground, L.F. (1969). A beaded endotrophic mycorrhizae of northern and southern red Oak. *Mycologia*, **61**, 408–409.
- Koch, H. (1961). Untersuchungen über die mycorrhiza der Kulturepflanzen unter besonderer Berücksichtigung von *Alhea Officinalis* L., *Helianthus annuus* L. und *Solanum lycopersium* L. *Gartenbauwissenschaft*, **26**, 5–32.
- Koske, R.E., Sutton, J.C., and Sheppard, B.R. (1975). Ecology of Endogone in Lake Huron sand dunes. *Can. J. Bot.* **53**, 87–93.
- Maeda, M. (1954). The meaning of Mycorrhizae in regard to systematic botany. *Kumamoto J. Sci.* **3**, 57–84.
- Migahed, A.M. (1978). *Flora of Saudi Arabia*, King Saud Univ. Publication, **1**, 273.
- Nicolson, T.H. (1967). Vesicular-arbuscular mycorrhiza a universal plant symbiosis. *Sci. Prog.* **55**, 561–581.
- Olson, J.S. (1958). Rates of succession and soil changes on southern lake Michigan sand dunes. *Bot. Gaz.* **119**, 125–170.

- Phillips, J.M. and Hayman, P.S.** (1970). Improved procedure for cleaning roots and staining parasitic and VA mycorrhizae fungi for assessment of infection. *Trans. Br. Mycol. Soc.* **55**, 159–161.
- Safir, G.R., Boyer, J.S. and Gerdemann, J.W.** (1972). Nutrient status and mycorrhizal enhancement of water transport in soybean. *Plant Physio.* **49**, 700–703.
- Stahl, E.** (1900). Der suin der Mycorrhizenbildung *Jahrb. wiss. Botan.* **34**, 539–668.
- Stephen, E.W. and Aldon, E.F.** (1967). Endomycorrhizal (VA) associations of some arid zone shrubs. *South Not.*, **2D** (4), 437–444.
- Stevenson, E.W. and Aldon, E.F.** (1967). Endomycorrhizal (VA) associations of some arid zone shrubs. *South Not.*, **2D** (4), 437–444.
- Stevenson, G.** (1964). The growth of seedlings of some pioneer plants and the microorganisms associated with their roots. *Trans. Br. Mycol. Soc.* **47**, 331–337.

فحص مدى اصابة نبات الرمث بفطريات الميكورايزا بمنطقة المراعى والغابات بعنيزة بالمملكة العربية السعودية

عبد الله الصالح الخليل

قسم علم النبات ، كلية العلوم ، جامعة الملك سعود ،

المملكة العربية السعودية

يتلخص هذا البحث في فحص مدى اصابة نبات الرمث (حمادا اليقنس) بفطريات الجذور (الميكورايزا) . لقد تم اجراء مسح لتجميع عينات جذور نبات الرمث السائد بمنطقة المراعى والغابات بعنيزة في المملكة العربية السعودية في الفترة ما بين اكتوبر ١٩٨٢م الى ابريل ١٩٨٣م . . وعولجت هذه الجذور بطريقة فليبيس وهيمان لتصبغها ومن ثم فحصت مجهريا فوجد ان متوسط النسبة المئوية للاصابة في نبات الرمث حوالي ٥٧٪ . . كما اجريت ايضا تجربة ايثانية لصيد هذا النوع من الفطريات بواسطة عشب السودان .

هذا يدل على ان بعض اعضاء العائلة الرمامية يمكنها تكوين علاقة تكافلية مع فطريات الجذور (الميكورايزا) تحت الظروف الطبيعية في هذه المنطقة .