Glomus intraradices– A POTENTIAL ARBUSCULAR MYCORRHIZA FUNGUS (AMF) TO ENHANCE OIL PALM VEGETATIVE GROWTH

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MPOB INFORMATION SERIES • ISSN 1511-7871 • JUNE 2013 MPOB TT No. 534

Endophytic microorganisms such as arbuscular mycorrhiza fungi (AMF) are among the many effective microorganisms (EM) present in the host system of various plants; often without ill effects on the plants (Holderness *et al*., 2000; Sieber, 2002). A majority of land plants form symbiotic association with the fungi. Mycorrhizae play a key role for soil microorganisms in the soil-plant system that are fundamental for soil fertility and plant nutrition (Smith and Read, 2008). The use of mycorrhiza is widespread in agriculture due to their benefits on the plant system. It is a symbiotic association where it influences the plant's growth, water and nutrient absorption, and protection from root diseases. Characterisation of symbiosis is by the bidirectional movement of nutrients, of which carbon supply goes to the fungus, while phosphorus and the inorganic material move to the plant, thus providing a critical linkage between the plant root system and the soil (Smith and Read, 2008). A high input of fertilisers, removal of topsoil, erosion, and other agricultural practices are some of the activities that can reduce beneficial soil fungi. Shamala (2010) had shown that AMF promotes the growth of oil palm seedlings significantly. However, compatibility between the fungus and the host needs to be established prior to introducing this association. This is because only certain AMF species promote the growth of oil palm (Shamala, 2010). Reintroducing mycorrhizal fungi in oil palm planting areas can improve plant establishment and growth towards higher yield.

OBJECTIVES

The objective of this study was to determine the potential of AMF as a vegetative enhancer on oil palms. The study was investigated in the nursery and in the field using a seedling bait technique.

METHODOLOGY

The genus *Glomus* has a wide host range. *Glomus intraradices,* has been extensively investigated as a potential growth enhancer for various crops. The species is able to produce arbuscules, vesicles and spores as colonising structures within the plant root system. *Figure 1* shows the spores of *G. intraradices*. Assessments of growth were carried out at the nursery and in the field via a seedling baiting technique. In the nursery, oil palm two to three months old seedlings were pre-inoculated with *G. intraradices*. In both experiments oil palm seedlings were inoculated with 2 g (50 spores g^{-1}) of the AMF species. The study assessed vegetative growth (VG) parameters of the seedlings namely; plant height and girth, total leaf area and frond count. Seedlings were provided with standard fertiliser application. Seedlings in the nursery were assessed after seven months, while the seedlings in the field were assessed after 20 months of assessment.

VEGETATIVE GROWTH

A single application of *G. intraradices* significantly improved plant height, girth, total leaf area and frond count of the seedlings in the nursery,

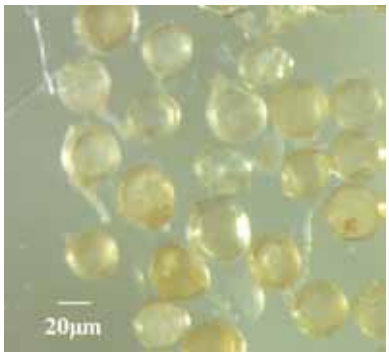

Figure 1. Spores of Glomus intraradices.

ISSN 1511-7871
9 771511 787001

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compared to the control (without AMF) assessment. Growth increases of 21% for plant height, 17% for girth, 36% for total leaf area and 11% for frond count were recorded, compared to the control. *Figures 3* and *4* illustrated significant differences in leaf area and height of seedlings that were colonised with *G. intraradices*(T1) compared to the control (T2). The roots were also assessed for AMF colonisation. The secondary and tertiary roots were extensively colonized by the fungi (*Figure 2*). The treatment was repeated in the field and recorded similar vegetative growth.

Significant differences were observed in the field seedling bait trial. Eight month old seedlings were planted in the field and were assesed up to the age of 20 months. *Tables 1* and *2* describe the significant differences in height and root count of treated and control seedlings.

The potential vegetative enhancement by this AMF was successfully demonstrated in the nursery and field.

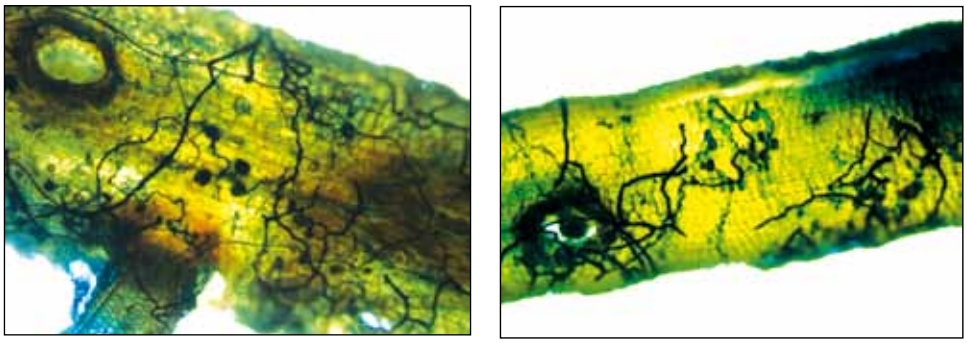

Figure 2. Colonisation of Glomus intraradices within oil palm roots.

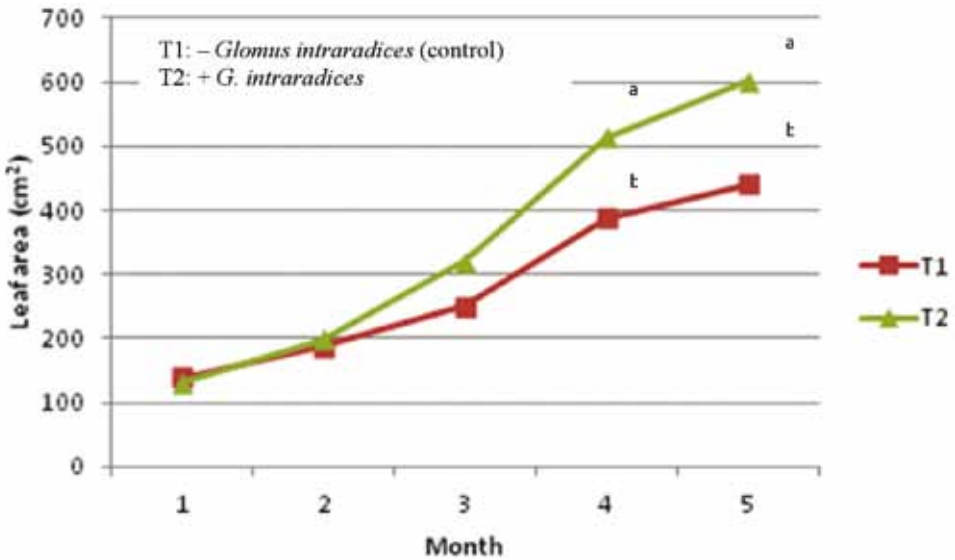

Figure 3. Leaf area of oil palm seedlings treated with Glomus intraradices(G.i) and the control (a and b denote significant difference using ANOVA, Tukey P<0.05).

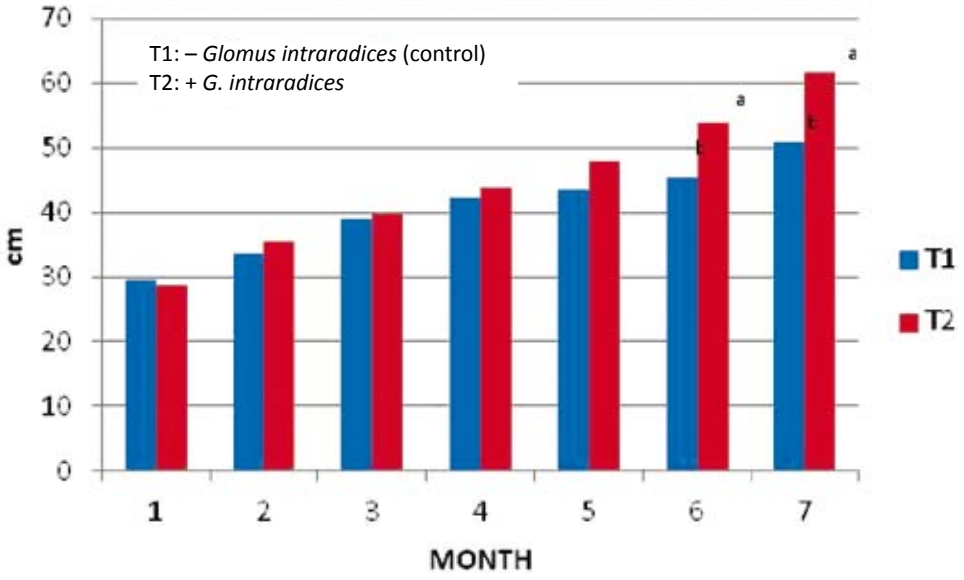

Figure 4. Height increments of oil palm seedlings treated with Glomus intraradices(G.i.) and the control (a and b denote significant difference using ANOVA, Tukey P<0.05).

TABLE 1. MEAN OF HEIGHT INCREMENT OF OIL PALM SEEDLINGS IN THE FIELD UP TO 20 MONTHS OLD

Treatment	Mean Height (cm)			
	Months			
	8	12	16	20
T1 (- *Glomus intraradices*)	104.08a	164.30a	227.31a	291.32b
T2 (+ *G. intraradices*)	101.78a	165.14a	246.17a	321.35a

Note: Means with the same alphabet within the same column are not significantly different at P<0.05, using Tukey test (values are means 13 replications)

TABLE 2: MEAN OF ROOT COUNT OF OIL PALM SEEDLINGS IN FIELD AFTER 20 MONTHS

Treatment	Root count (unit)
T1 (- *Glomus intraradices*)	65.42a
T2 (+ *G. intraradices*)	78.10b

Note: Means with the same alphabet are not significantly different P<0.05, using Tukey test (values are means 13 replications).

POTENTIAL TAKERS

The technology could be adopted by biofertiliser producers and other entrepreneurs.

BENEFITS TO THE INDUSTRY

One of the largest and costliest components in the oil palm industry is fertiliser. The current application of fertilizers include organic, inorganic and biofertilisers. Mycorrhizae association provides an efficient phosphorus supply to the plants. The technology of utilising microbes is a green technology. A compatible association of AMF and the host plant will help boost vegetative growth, thus reducing fertiliser application in the nursery and field.

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