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ARBUSCULAR MYCORRHIZAL FUNGI OF UGANDAN BANANA PLANTATION SOILS

by
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SUMMARY

ARBUSCULAR MYCORRHIZAL FUNGI OF UGANDAN BANANA PLANTATION SOILS

This first study of arbuscular mycorrhizal fungi in Uganda involved (1) the assessment of the mycorrhizal inoculum potential of banana farm soils, (2) isolation of AMF species and (3) determination of the potential of a selected AMF among the isolated indigenous species to colonize micropropagated banana plantlets.

A greenhouse bioassay was conducted to assess the arbuscular mycorrhizal (AM) fungi inoculum potential of 18 different banana farm soils. Sudan grass was used as a host plant. Root colonization by AMF occurred in all the 18 sites analyzed. The highest mycorrhizal inoculum potential was recorded at Ntugamo district. The mycorrhizal inoculum potential of Ugandan soils was found to be higher in soils containing the banana type *Musa* AAA than soils containing banana type *Musa* ABB. However, it was found that site was the main factor influencing the mycorrhizal inoculum potential of Ugandan soils.

Banana rhizospheric soils were retrieved for single morphotype pot culture production of some individual species of AMF. Pure cultures of *Glomus mosseae* (Nicolson & Gerdemann) Gerdemann and Trappe and *Glomus etunicatum*

Becker and Gerdemann were isolated under glasshouse conditions using sudan grass a host plant.

The ability of the indigenous AMF to colonize micropropagated banana plantlets was evaluated at the *in vitro* and weaning phase of growth. Surface sterilized *G. mosseae* spores were used as inoculum. Mycorrhization was demonstrable at 10 weeks post-inoculation for both *in vitro* phase and weaning phase banana plantlets under misting tunnel conditions. Root colonization levels ranged from 0-5% of the test plant for both stages of banana growth. Thirty percent of the *in vitro* plantlets were mycorrhizal and 50% of the weaning phase plantlets were mycorrhizal.

OPSOMMING

ARBUSKULÊRE MIKORISALE SWAMME IN UGANDESE PIESANGPLANTASIE GRONDE

Hierdie eerste studie van arbuskulêre mikorisale swamme (AMS) in Uganda het ingesluit: (1) die bepaling van die mikorisale inokulumpotensiaal van piesanggronde, (2) isolasie van AMS spesies en (3) bepaling van die potensiaal van 'n geselekteerde inheemse spesie om piesangplante in weefselkultuur te koloniseer.

'n Glashuisbiotoets is uitgevoer om die arbuskulêre mikorisale (AM) swaminokulum potensiaal van 18 verskillende piesangplaas-gronde te bepaal. Sudan gras is as gasheerplant gebruik. Wortelkolonisering deur AMS het in al 18 van die persele ontleed, plaasgevind. Die hoogste mikorisale inokulumpotensiaal is in die Ntugamo distrik opgeteken. Die mikorisale inokulumpotensiaal van Ugandese gronde is gevind om hoër te wees in gronde met die piesangtipe *Musa* AAA as gronde met die piesangtipe *Musa* ABB. Dit is nietemin gevind dat ligging die belangrikste invloed op die mikorisale inokulumpotensiaal van Ugandese gronde gehad het.

Piesang risosfeergronde is versamel vir enkel-morfotipe produksie in potte van sommige individuele spesies van AMS. Suiwer kulture van *Glomus mosseae*

(Nicolson & Gerdemann) Gerdemann & Trappe en *Glomus etunicatum* Becker & Gerdemann is onder glashuistoestande, met sudan gras as gasheerplant, geisoleer.

Die vermoë van die inheemse AMS om piesangplante in weefselkulture te koloniseer is in die *in vitro*- en speengroei fases bepaal. Oppervlak-ontsmette *G. mosseae* spore is as inokulum gebruik.

Mikorisering is 10 weke na inokulering vir beide die *in vitro*- en speengroei fases onder mistonneltoestande aangedui. Wortel koloniseringsvlakke het van 0-5% van die toetsplante in beide groeifases, gewissel. Dertig persent van die *in vitro* plante en 50% van die speengroeifase plante was mikorisaal.

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single large oil vacuole (C). The outer wall has completely sloughed off. Note thickening of laminate layer at point of hyphal attachment. Bar = 19.6 µm.

Figure 3: *G. mosseae* (Nicolson & Gerdemann) Gerdemann & Trappe spore showing funnel-shaped hypha (FH) and fragment of outer wall layer (SW). Spore contents consisting of lipid droplets of different sizes (C). Bar = 13 µm.

Figure 4: *G. mosseae* (Nicolson & Gerdemann) Gerdemann & Trappe spore showing funnel-shaped hypha. Bar =16 μm.

Figure 5: *G. etunicatum* Becker & Gerdemann spore showing outer hyaline wall layer (HW) that is sloughing off (SW) and inner laminate wall layer (LL). Bar = 16.8 µm.

Figure 6: *G. etunicatum* Becker & Gerdemann spore with outer wall beginning to slough off. Bar =20 µm.

Figure 1 and 2. *G. mosseae* (Nicolson & Gerdemann) Gerdemann & Trappe in roots of weaning phase banana plantlets showing darkly staining vesicles (V). Note the abundant root hairs (R) of Grainde Naine (*Musa acuminata* AAA). Bar = 21 µm.

Figure 3 and 4: *G. mosseae* (Nicolson & Gerdemann) Gerdemann & Trappe in roots of *in vitro* banana plantlets showing intraradical spores (S) and intratradical foraging hyphae (i) growing parallel to each other and the root axis. Vesicles are seen in figure 3. Bar =14.4 µm.

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ABBREVIATIONS

s	second
min	minute(s)
ml	millilitre
cm	centimeter
g	gram
mm	millimeter
µm	micrometer
AMF	Arbuscular mycorrhizal fungi
AF	Acid fuschin
SDH	Succinate dehydrogenase