FUNGAL PARASITES OF *MELOIDOGYNE INCOGNITA* IN AN ALABAMA SOYBEAN FIELD SOIL[1]

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RESUMEN

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Resultados de un reconocimiento de hongos parásitos de *Meloidogyne incognita* (Kofoid & White) Chitwood en un campo de soya [*Glycine max* (L.) Merr.] de Alabama reveló la presencia de varias especies. Las más frecuentes fueron: *Aureobasidium pullulans* (DeBary) Arnaud, *Fusarium oxysporum* Schlecht., y *Paecilomyces lilacinus* (Thom) Samson.

Palabras claves adicionales: combate biológico, dinámica poblacional, ecologia, manejo de plagas, métodos de combate, patologia de nematodos.

A number of surveys of the mycofloras associated with cysts and eggs of phytonematodes in agricultural soils in the southeastern United States have been conducted in recent years (3,4,7,9,11). These have involved cysts and eggs of *Heterodera glycines* Ichinohe derived from soybean field soils and eggs of *Meloidogyne arenaria* (Neal) Chitwood from peanut field soils. To our knowledge, no investigation of fungi associated with eggs of *Meloidogyne incognita* (Kofoid & White) Chitwood has been conducted in the United States or elsewhere.

Reports of fungi associated with the root knot genus *Meloidogyne* Goeldi have been relatively few. Stirling and Mankau (14,15) described *Dactylella oviparasitica* Stirling and Mankau as a parasite of egg masses of an unnamed *Meloidogyne* species in California. In Peru, eggs of *M. incognita* var. *acrita* Chitwood, from potato roots, were found to be heavily infected by *Paecilomyces lilacinus* (Thom) Samson. This fungus has recently been shown, *in vitro,* to be capable of colonizing *M. incognita* eggs (1). Morgan-Jones et al. (10) reported *Verticillium chlamydosporium* Goddard to be an effective parasite of *M. arenaria* females, and Godoy et al. (7) encountered *Fusarium oxysporum* Schlecht., *P. lilacinus, Pseudopapulospora kendrickii* Sharma, and *V. chlamydosporium* as egg parasites

of this nematode. *Paecilomyces lilacinus* occurred with the highest frequency, followed by *V. chlamydosporium*.

In order to determine if naturally occurring fungal antagonists attack eggs of *Meloidogyne incognita,* as several do to species of *Heterodera* and *M. arenaria,* a survey has been undertaken.

Galled soybean plants were collected from a sandy loam soil infested with *M. incognita* at the Gotler Farm, near Elberta, Baldwin County, Alabama in September, 1983. The field had been planted with soybeans for the preceeding five years.

Root pieces with galls (0.5 cm) were washed thoroughly in running tap water for 24 hr and placed in enzyme solution to soften tissues (6). Immediately following this they were blended for 30 sec with 150 ml of sterile demineralized water in a Virtis® 45 homogenizer at low speed. An egg suspension containing streptomycin sulphate was prepared by the method of Godoy et al. (7). Aliquots (0.5 ml) of egg suspension, containing approximately 150 eggs, were pipetted into 10 sterile watch glasses. These were placed in petri dishes and incubated at 25 C in the dark for 7 days. At the end of this period, 50 eggs were randomly examined in each watch glass with a stereomicroscope to determine level of parasitism. Eggs were recorded as being parasitized when obvious radial hyphal growth emerged from them. Of the 500 *M. incognita* eggs examined, fungal growth was observed in 148 (29.6%).

Three hundred parasitized eggs (30 from each watch glass) were selected for fungal taxonomic studies and removed with fine, sterile needles and transferred to petri dishes (5 per dish) containing 0.2% colloidal chitin agar with mineral salts (5) and streptomycin sulphate (100 μg/ml). The plates were incubated at 25 C for 6 days and the resultant fungal colonies identified. Five apparently non-parasitized eggs were removed from each watch glass and plated onto each of 10 chitin agar plates to serve as controls.

Seven fungal species and an unidentified yeast were encountered (Table 1). The level of fungal occurrence was somewhat lower than that recorded in *M. arenaria* from peanut field soil in Alabama (7) but the mycoflora was more diversified taxonomically. As was the case with *M. arenaria,* however, *Fusarium oxysporum* and *Paecilomyces lilacinus* occurred in significant numbers. Eggs in the control plates produced no fungal colonies, and healthy larvae had hatched from 32% of them at the end of the 6-day incubation period. Unhatched larvae were, presumably, also viable.

Fusarium oxysporum has been previously implicated as an effective pathogen of phytonematode eggs. Nigh et al. (13) encountered it in eggs of *Heterodera schachtii* Schmidt in California and it has been reported

Table 1. Fungi associated with parasitized eggs (n=300) of *Meloidogyne incognita*.

Species	No. parasitized eggs (n = 300)	% Frequency
Alternaria alternata	6	2.0
Aureobasidium pullulans	48	16.0
Curvularia lunata	14	4.7
Fusarium oxysporum	92	30.7
Gliocladium roseum	36	12.0
Nigrospora sphaerica	12	4.0
Paecilomyces lilacinus	58	19.3
Yeast	34	11.3

from eggs of *H. glycines* (9,11) as well as those of *M. arenaria* (7). *Paecilomyces lilacinus* has been recorded in Alabama not only from *Meloidogyne* species but from older cysts of *Heterodera glycines* (4). Morgan-Jones et al. (12) have demonstrated conclusively its ability to penetrate healthy eggs of *M. arenaria* with ease and to cause larval destruction.

We are unaware of a previous association between *Aureobasidium pullulans* (De Bary) Arnaud and nematode eggs, although this fungus is known to be ubiquitous in soil and cosmopolitan in distribution. It is known to produce many extracellular enzymes (2). It has been recovered from a human lymph node (8), from cheloid blastomycosis in man, and is known to cause similar lesions in rabbits (16). There is reason to believe that naturally occurring populations of these fungi exert some control on *M. incognita in vivo*.

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