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Survey of Predacious Fungi in Some Saudi Arabian Soils*

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Abstract: A preliminary survey was conducted in Saudi Arabia to isolate and identify some endozoic and nematode-trapping fungi of agricultural soils. The study included 12 agricultural areas in the kingdom. Nineteen species were detected and identified for the first time. Nine species were found to be endozoic against some free-living nematodes in soil. Whereas the remaining 10 species were predacious and nematode- trapping of the genus *Tylenchus*. The use of these fungi in the biological control of plant-parasitic nematodes of different crops and their prevention was discussed in the present study.

Key words: Predacious fungi, nematode-trapping fungi, endozoic fungi, agricultural soils, nematodes, Saudi Arabia

INTRODUCTION

Suppression of plant-parasitic nematodes with nematode predators, parasites or disease agents is a desirable alternative to chemicals (Baker and Cook, 1974; Fox, 2001; Arnold, 2003; Caltigirone, 1981; Debach and Rosen, 1991; Van Lenteren, 1988).Biological control agents occur in diverse taxa and include nematode-trapping or endo-parasitic fungi, predatory nematodes, arthropods, bacterial parasites and predatory protozoa. Understanding this diversity will be a critical step in adapting management practices to realize the full potential of biological control (Baker and Cook, 1974; Cook and Baker, 1996; Arnold, 2003).However, because of the large number of potential bio-control agents it is desirable and beneficial to focus efforts on one agent (Decker, 1998; Allard and Coutinho, 2000).

Nematode-trapping fungi are common soil inhabitants and have been found in many types of soil. In spite of their ubiquitous occurrence, the role of these fungi in controlling nematode populations in the soil is practically unknown (Fox, 2001).These fascinating group of fungi have the capacity to capture, kill and digest living nematodes in a number of ways (Barron, 1977, 1981).On the other hand, some fungi may infect nematodes with their conidia (endozoic fungi). Irrespective of the mode of capture, the end result is completely digested nematode filled with hyphae (Decker, 1998; Duddington, 1962, 1975; Karling, 1938; Pramer and Stall, 1959).

Considerable studies that have been done regarding isolation, identification and the use of these agents to control nematodes in soil (Decker, 1998; Van Lenteren, 1988; Fox, 2001).In Saudi Arabia no previous work has been published on predacious fungi. Therefore, the objective of the present work is to cast light on these group of fungi in the country.

MATERIALS AND METHODS

A preliminary survey of different sampling sites representing various geographical regions in Saudi Arabia was carried out between January 2002-September 2003. A total of 42 soil samples were collected from different twelve areas according to the method described by Giuma (1986).The

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sampling sites chosen were mostly from cultivated soils which were moist and rich in organic matter. Samples were put in clean polyethylene bags, labeled and brought to the laboratory, then kept in refrigerator until used. A pinch of soil (about 1 g) was inoculated in the center of disposable plastic Petri dish (10 cm diam.) containing 30 cc corn meal agar. Plates were incubated at room temperature and examined periodically for dead nematodes associated with fungi using binocular stereoscopic research microscope (45x). Identification of fungi with their trapping and parasitic mechanism was done from semi-permanent prepared slides by the aid of the research compound binocular microscope (Olympus Type, Japan). A pictorial key sometimes was found useful for confirmative identification in some fungal species (Cooke and Godfrey, 1964).

RESULTS AND DISCUSSION

Results of the survey revealed that a total of 19 species were either endozoic or nematode-trapping fungi that inhibited agricultural soils of Saudi Arabia (Table 1 and 2).These species are belonging to 12 genera of different fungal groups. The genus *Acaulopage* (2 species), *Arthrobotrys* (4 species), *Catenaria* (1 species), *Dactylaria* (2 species), *Dactylella* (1 species), *Drechmeria* (1 species), *Harposporium* (1 species), *Meria* (1 species), *Monacrosporium* (2 species), *Stylopage* (1 species), *Myzocytium* (1 species), *Nematoctonus* (1species) and *Verticillium* (1species) (Table 1 and 2). Of these fungi 10 species were nematode-trapping, while the remaining 9 species were endozoic. The description of these genera was found to be in close agreement to the previous one reported early by different workers elsewhere (Barron, 1977, 1981; Drechsler, 1935, 1937, 1940, 1941, 1954a, b, 1946, 1950; Giuma and Cook, 1972; Jansson, 1990; Jansson and Jaffee, 1990). The majority of these fungi were isolated from the Southern region of Saudi Arabia. This may be due to the soil fertility of agricultural soils at that areas. The endo-parasitic fungus *Acaulopage tetraceros* was recovered from the majority of the surveyed areas, followed by *Arthrobotrys oligospora* which constitute a constricting rings to capture nematodes in soil. Other fungi were less predominant and restricted to specific areas i.e., *Dactylaria brochophga, Drechmeria coniospora, Harposporium anguillulae, Meria coniospora* and *Myzocytium* sp. that were predominant to the Southwest area. The results also indicated that there is exact diversity of the trapping structures or infecting nematode mechanisms in isolated fungi. Most of the dead captured nematodes are belonging to the genus *Rhabditis* sp. and *Tylenchus* sp.

Table 1: Nematode-trapping fungi isolated from different agricultural soils of Saudi Arabia

Fungi isolated (fungal group)	Place of sampling soil	Percentage occurrence	Trapping structure	Description authority
Arthrobotrys candida (Hyphomycetes)	South west, west	++	Sticky knobs	Drechsler (1937)
A. dactyloides Hyphomycetes)	South west, west, east	+	Constricting rings	Drechsler (1937)
A. musiformis (Hyphomycetes)	South west, West	+	Sticky networks	Drechsler (1937)
A. oligospora (Hyphomycetes)	South west, west, middle, east	+++	Sticky networks	Drechsler (1937)
Dactylaria brochophga (Hyphomycetes)	South west	+	Constricting rings	Drechsler (1937)
D. candida (Hyphomycetes)	South west, north	+	Sticky knobs	Drechsler (1937)
Dactylella ellipsospora (Hyphomycetes)	South west, west, east	+	Sticky cells	Drechsler (1937)
Monacrosporium cionopagum (Hyphomycetes)	South west, west	+	Sticky branches	Drechsler (1950)
M. phymatopagum (Hyphomycetes)	South west, north, west	+	Sticky sessile unicellular knobs	Drechsler (1954)
Stylopage lepte (Phycomycetes)	South west, west, east	+	Sticky networks	Drechsler (1935)

Low = +, Moderate = ++, High = +++

Table 2: Endozoic fungi isolated from different agricultural soils of Saudi Arabia

Fungi isolated (fungal group)	Place of sampling soil	Percentage occurrence	Infecting nematode mechanism	Description authority
Acaulopage dichotoma (Phycomycetes)	South west, middle	+	Infecting conidiospores	Drechsler (1954)
A. tetraceros (Phycomycetes)	South west, middle, west, east	+++	Infecting conidiospores	Drechsler (1935)
Catenaria anguillulae (Chytridiomycetes)	West, east, south	++	Endozoic uniflagellate zoospores	Barron (1981)
Drechmeria coniospora (Hyphomycetes)	South west	+	Adhesive conidiospores	Drechsler (1937)
Harposporium anguillulae (Hyphomycetes)	South west	++	Endozoic with conidia and chlamydospores	Karling (1938)
Meria coniospora (Hyphomycetes)	South west	+	Infecting conidiospores	Drechsler (1941)
Myzocytium sp. (Phycomycetes)	South west	+	Endozoic with biflagellate zoospores	Barron (1977)
Nematoctonus haptocladus (Hyphomycetes)	South west, east, middle	+	Infecting conidiospores	Drechsler (1946)
Verticillium chlamydosporium (Hyphomycetes)	South west, west, north	+	Sticky conidiospores	Barron (1981)

Low = +, Moderate = ++, High = +++

Despite the fact that no previous work has been done on predacious fungi from Saudi Arabian soils; the present study is considered as preliminary survey and need further investigations to involve these group of fungi in the control measures of plant-parasitic nematodes that threaten the production of some crops as biological means substitute chemicals.

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