EFFECT OF CULTURE FILTRATES OF *FUSARIUM OXYSPORUM* F. SP. *CICERI* AND *FUSARIUM SOLANI* ON HATCHING AND JUVENILE MOBILITY OF *MELOIDOGYNE INCOGNITA*[1]

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ABSTRACT

Mani, A., and C. L. Sethi. 1984. Effect of culture filtrates of *Fusarium oxysporum* f. sp. *ciceri* and *Fusarium solani* on hatching and juvenile mobility of *Meloidogyne incognita*. Nematropica 14:139-144.

The culture filtrates (CFs) of *Fusarium oxysporum* f. sp. *ciceri* (Padwick) Synd. and Hans. and *Fusarium solani* (Mart.) Sacc., were tested at different concentrations and exposure times against the root-knot nematode, *Meloidogyne incognita* (Kofoid & White) Chitwood, to determine their efficacy in inhibiting egg hatch and juvenile mobility. The hatching pattern of eggs in CFs revealed that the CFs of both the test fungi exhibited a high degree of ovistatic effects at 10, 20, and 40% concentrations and ovicidal effects at 80 and 100% concentrations. There was a progressive increase in immobility of juveniles as the concentration of CFs and exposure period were increased. CF of *F. solani* was far more potent than that of *F. oxysporum* f. sp. *ciceri* in inhibiting hatch and immobilizing the second-stage juveniles of *M. incognita*.

Additional key words: nematode-fungal interactions, fungal metabolites, root-knot nematode, inhibition of nematode activities.

RESUMEN

Mani, A., y C. L. Sethi. 1984. Effectos de los filtrados de cultivos de *Fusarium oxysporum* f. sp. *ciceri* y *Fusarium solani* en la emergencia y la movilidad de los estadios juveniles de *Meloidogyne incognita*. Nematropica 14:139-144.

Los filtrados de cultivos de *Fusarium oxysporum* f. sp. *ciceri* (Padwick, Synd. and Hans. y Fusarium solani (Mart.) Sacc. fueron probados a diferentes concentraciones y tiempo de exposición frente al nematodo nodulador de las raices, *Meloidogyne incognita* (Kofoid & White) Chitwood, para determinar su eficiencia en inhibir la emergencia de sus larvas y disminuir la movilidad de sus estadios juveniles. El modelo de emergencia de las larvas reveló que los filtrados de los cultivos de las dos hongos probados retardan en alto grado la emergencia de las larvas a concentraciones del 10, 20 y 40% llegando a una total inhibición de la emergencia a concentraciones del 80 y 100%. Se observó un aumento progresivo de la inmovilidad de las estadios juveniles a medida que aumentan la concentración de las filtrados y el tiempo de exposición. *F. solani* fue

más potente que *F. oxysporum* f. sp. *ciceri* en inhibir la emergencia e inmovilizar los segundos estadios juveniles de *M. incognita*.
Palabras claves adicionales: interacción nematodo-hongo, productos del metabolismo fungoso, nematodo nodulador de las raices, inhibición de las actividades del nematodo.

INTRODUCTION

Concomitant occurrence of *Fusarium oxysporum* f. sp. *ciceri* (Padwick) Snyd. and Hans. and *F. solani* (Mart.) Sacc., with *Meloidogyne incognita* (Kofoid and White) Chitwood on chickpea (*Cicer arietinum* L., cv. JG.62) resulted in reduced multiplication of the nematode (3). One of the possible reasons could be that the pathogens might produce toxic substances in the growth media which affected nematode activity. Sakhuja *et al.* (4) suggested that the presence of some toxic substance in culture filtrates (CFs) of *F. oxysporum* Schlect and *F. equiseti* (Corda) Sacc. arrested the hatch of *M. incognita* temporarily, whereas the CF of *Rhizoctonia solani* Kuhn appeared to contain some toxic substance which killed the eggs. Similar observations were also made by other workers using different fungi (1, 5). This paper reports the effect of CFs of *F. oxysporum* f. sp. *ciceri* and *F. solani* on hatch and mobility of *M. incognita* as a measure of the production of toxic metabolites by those fungi.

MATERIALS AND METHODS

The CFs were obtained by growing the fungi on Czapek's liquid medium (2) for 15 days in an incubator at 30±1 C. The filtrates thus collected were passed through Whatman® No. 42 filter paper to remove mycelial fragments. Two separate experiments were carried out, keeping these filtrates as stock solutions. From them, concentrations of 10, 20, 40, 80, and 100% (v/v) were prepared using sterile water. Five ml of each concentration was pipetted into 5-cm-diam Petri dishes with tap water as controls. Five uniform-size egg masses of *M. incognita* were hand-picked and placed into each dish. All the dishes were maintained in an incubator at 28±1 C. The number of juveniles hatched was recorded at 3-day intervals up to 30 days. For each concentration, 5 sets of dishes with 3 replicates in each set were maintained. Hatch in CFs was recorded on every third day. After the observation, egg masses from one set from each concentration were transferred to tap water and the hatch in water was recorded for the balance of the 30-day period.

The effect of CFs on juvenile mobility was tested with 6 concentrations, 0, 10, 20, 40, 80, and 100%. Five ml of the solution was added to each Petri dish and about 100 freshly hatched second-stage juveniles were suspended in each dish. Observation on the immobility of juveniles was

recorded after 4, 8, 24, and 48 hours of exposure. The immobility of juveniles was confirmed by gently touching them with a fine needle.

All data were analyzed following standard procedures for analysis of variance. Differences between means were evaluated for significance according to Duncan's multiple range test (6). All differences referred to in the text were significant at the 5% or lower level of probability.

RESULTS AND DISCUSSION

Results (Table 1) revealed that the percentage of juveniles hatched was reduced gradually as the concentration of CFs was increased from 10 to 100% at all exposure periods. Similarly, fewer juveniles emerged when exposure to CFs was increased from 3 to 15 days at all concentrations. In both CFs at 10% and 20% concentrations there was a gradual and marked reduction in the percentage of juveniles hatched with increase in the exposure period as compared to other concentrations, where the reduction in hatch was more abrupt after the initial 3-day exposure. A higher rate of hatch was noticed when egg masses were transferred to water after exposure in CF. In water too, there was less hatch when the exposure period of egg masses in CF was increased from 3 to 15 days. The results suggested that both the CFs exhibited ovistatic effects at 10 and 20% concentrations and a high degree of ovicidal effects at 40, 80, and 100% concentrations. However *F. solani* caused almost 100% ovicidal effects at 80 and 100%, and at these concentrations, there was no hatch even in water. The above results indicated that culture filtrate of *F. solani* was more potent than that of *F. oxysporum* f. sp. *ciceri*. The present study suggested strongly the production of toxic principles by the fungi in culture medium. The possibility of the production of toxic metabolites by several other fungi had been suggested by earlier workers (1, 4, 5).

Though immobility increased with increase in time of exposure and concentration to CF of *F. oxysporum* f. sp. *ciceri*, it did not produce appreciable reductions in juvenile mobility. It caused a maximum of only 15.6% immobility even at 100% concentration after 48 hrs of exposure (Table 2). However in CF of *F. solani*, there was a steady and higher rate of juvenile immobility with increase in concentration and exposure period. There was 100% immobility of juveniles at 40, 80, and 100% concentrations after 48 hr and it again indicated the production of toxic metabolities by *F. solani*. Shukla and Swarup (5) observed similar results and suggested that the lethal effect of the CF of *Sclerotium rolfsii* to juveniles of *M. incognita* was due to low pH and some inhibitory substances present in CF. Thus our results corroborate earlier findings on the effect of CF on juvenile mobility of *M. incognita*.

In conclusion, our results strongly indicate the production of toxins

Table 1. Effect of culture filtrates of *Fusarium oxysporum* f. sp. *ciceri* and *F. solani* on hatching of *Meloidogyne incognita eggs.*[z]

Concentration (%)	Per cent eggs hatched over control[y]									
	F. oxysporum f. sp. *ciceri* Days in filtrate + days in water					*F. solani* Days in filtrate + days in water				
	3+27	6+24	9+21	12+18	15+15	3+27	6+24	9+21	12+18	15+15
10	25 a (90)	15 a (73)	14 a (50)	11 a (49)	8 a (43)	39 a (65)	35 a (47)	24 a (22)	20 a (9)	17 a (5)
20	22 a (97)	17 a (82)	8 b (66)	8 a (70)	6 b (60)	32 a (77)	21 b (42)	17 a (5)	15 a (5)	13 a (3)
40	10 b (93)	2 b (64)	3 c (45)	3 b (34)	3 c (21)	11 b (90)	9 c (50)	3 b (5)	3 b (0)	3 b (0)
80	8 b (92)	2 b (78)	2 c (69)	1 c (14)	1 d (0)	1 c (0)	1 d (0)	0 bc (0)	0 c (0)	1 bc (0)
100	3 c (94)	1 b (74)	0 d (0)	0 c (0)	0 d (0)	0 c (0)	0 d (0)	0 c (0)	0 c (0)	0 c (0)

[z]Data in columns followed by the same letter and data in rows underscored by the same line are not significantly different (P=0.05) according to Duncan's multiple range test; each value is the mean of three replications.

[y]Values in parentheses represent the percentage of hatch recorded in water out of the total hatch.

Table 2. Effect of culture filtrates of *Fusarium oxysporum* f. sp. *ciceri* and *F. solani* on immobility of second-stage juveniles of *Meloidogyne incognita*.[z]

Concentration (%)	% immobility at different time intervals (hrs)							
	F. oxysporum f. sp. *ciceri*				*F. solani*			
	4	8	24	48	4	8	24	48
Check (Water)	0.3 c	0.3 d	0.7 c	1.2 e	0.9 d	0.9 c	0.9 c	1.5 d
10	1.4 b	1.4 c	2.0 b	3.7 d	6.2 c	8.4 b	10.9 b	17.0 c
20	1.9 b	2.2 bc	3.1 b	4.2 cd	8.0 bc	11.3 b	12.5 b	86.1 b
40	1.8 b	2.4 bc	3.7 b	6.3 c	11.0 b	12.0 b	14.8 b	100 a
80	2.9 b	3.5 b	7.6 a	10.0 b	16.7 a	21.6 a	34.3 a	100 a
100	5.2 a	5.9 a	8.5 a	15.6 a	21.8 a	26.6 a	34.8 a	100 a

[z]Data in columns followed by the same letter and data in rows underscored by the same line are not significantly different (P=0.05) according to Duncan's multiple range test; each value is the mean of three replications.

by *Fusarium solani* in growth medium which have adverse effect on the hatching of eggs and mobility of second-stage juveniles of *M. incognita*.

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