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INTERACTION BETWEEN NON-PATHOGENIC *FUSARIUM* ISOLATES AND *FUSARIUM* SPECIES CAUSING DRY ROT OF POTATO TUBERS

[54]

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ABSTRACT

Twenty isolates of various *Fusarium* spp. were isolated from rotted potato tubers and soil adhering to tubers and other plant materials. Five *Fusarium* spp., *i.e. F. sambucinum, F. oxysporum, F. culmorum, F. equiseti* and *F. semitectum* were frequently isolated from rotted potato tubers, while two isolates of *F. sambucinum* were isolated from soil. Six isolates of *F. oxysporum* and *F. solani* were isolated from other plant materials. The pathogenicity of 14 isolates of *Fusarium* spp. from potato tubers or adhering soil showed varied reactions. Five isolates were pathogenic to tuber slices cv. Spunta and the remaining 9 isolates were not pathogenic. The highly pathogenic isolates were *F. sambucinum* (FSA1 and FSA7). Meanwhile, *F. solani* (FSO15) from peach and (FSO17) from sugar cane were pathogenic and caused the highest infection percentage and severity to potato tuber slices. Other isolates, *F. sambucinum* (FSA2 and FAS9) and *F. semitectum* (FSE12) from tubers, *F. oxysporum* (FOX13) from sorghum and *F. solani* (FSO18) from sesame were slightly pathogenic. Results indicate that increased disease severity was positively correlated with weight of rotted tissue of tuber slices. On the contrary, there was a negative correlation between disease severity and sporulation of *Fusarium* spp. on tuber slices. Dry rot incidence was greatly reduced when *F. culmorum* (FCU4) were inoculated simultaneously with *F. sambucinum* (FSA1), where weight of rotted tissue and sporulation capacity were also reduced. The degree of disease suppression varied among avirulent isolates tested. Examination of sections of tuber slices either inoculated with avirulent or virulent *Fusarium* species revealed different reactions. In case of virulent isolate *F. sambucinum* (FSA7), a large number of fungal hyphae had colonized the tuber cells after 48 h compared with 24 h. The pathogen penetrated parenchyma cells and growth occurred inter- and interacellularly, and direct host cell wall penetration was frequently recorded. However, in case of avirulent isolate *F.sambucinum* (FSA3), fungal growth was mainly restricted to the outermost cell layers and a number of the invading hyphae appeared to be severely damaged as evidenced by the frequent occurrence of distorted hyphal cells. Fungal ingress toward the inner tuber tissues was apparently halted.

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INTRODUCTION

Fusarium dry rot of potatoes is a world wide economic problem (**Nielsen, 1981**). The disease may cause greater losses of potatoes than any other post-harvest disease (**Powelson *et al* 1993**). Crop losses attributed to dry rot have been estimated to average of 6 % to 25 % (**Chelkowski, 1989**). There are many species of *Fusarium* reported to cause dry rot of potato-worldwide (**Nielsen, 1981**). Some of these *Fusarium* species, also, produce mycotoxins (**Marasas *et al* 1984**). Such mycotoxins, e.g. trichothecenes, can pose serious health problems for animals and humans (**Marasas *et al* 1984 and Smith & Moss, 1985**).

Controls of dry rot disease have been accomplished primarily by chemical fungicides. However, all potato cultivars are susceptible to dry rot (**Leach and Webb, 1981**). Meanwhile, the developments of population of *Fusarium* insensitive to fungicides possess other constraint to disease management (**Hanson *et al* 1996**). Therefore, alternative approaches for minimizing damage from dry rot are currently investigated (**Schisler *et al* 1997 and Benhamu & Garand, 2001**). Non-pathogenic strains of *Fusarium* play an important role in soil microbial ecology and soil suppressiveness to various plant pathogens (**Alabouvette *et al* 2001** and **Trouvelot *et al* 2002**). **Mostafa (1991)** demonstrated that various non-pathogenic *Fusarium* species reduced dry rot of potato. The objective of this study was to assess the interaction between various pathogenic and non-pathogenic *Fusarium* isolates on potato tuber slices and the histological changes associated with these interactions.

MATERIAL AND METHODS

All experiments were conducted in the laboratories of Department of Plant Pathology, Faculty of Agriculture, Ain Shams University, Cairo, during 2002-2004 .

Isolation of *Fusarium* spp.

Samples of rotted potato tubers were collected from store-houses and markets at different governorates *i.e.* Giza, Kalyubia and Sharkia. Tubers were surface sterilized with 70% alcohol and flamed, aseptically cut at the zone of infection and a small portions from the infected tissues were transferred to Petri dishes containing water agar medium. After incubation at 25 C for 48 hours, a small portions of developing colony edges were transferred to Petri dishes containing potato sucrose agar medium (PSA) and incubated at 25 C for 7 days.

Meanwhile, *Fusarium* spp. were also isolated from soil adhering with potato tubers using PSA medium supplemented with 5g/L pentachloro-nitrobenzene (PCNB). *Fusarium* colonies were selected and transferred to PSA then incubated at 25°C for 7 days. Isolation was also made from seeds of maize, sorghum and sesame, and from olive roots, and from peach and Sugar Cane stems.

Colonies were examined after 7days with a light microscope under low magnification (X10). Growth from colonies of single *Fusarium* spp. was transferred directly to PSA medium. Single-spore isolates of each species were obtained as described by **Theron and Holz (1991).** *Fusarium* spp. were identified on the basis of the morphological characteristics following **Booth (1971).**

Inoculum production

Spore suspensions of various tested *Fusarium* isolates were prepared from 7 to 10 days old cultures and adjusted to 10^4 conidia/ml using a haemocytometer.

Pathogenicity tests

Potato tubers, cv. Spunta, obtained from local retail stores were used. Tubers were washed to remove excess soil, surface sterilized in 0.5 % sodium hypochlorite for 10 -15 min. and rinsed in distilled water. Slices, about 10 mm. thick, were cut with a sterile knife, rinsed in sterile water, placed on wet sterile filter paper in 15 cm. glass Petri dishes. Each slice was inoculated with 0.5 ml spore suspension of each tested isolates, using a syringe and incubated for 3 days at 25C. The progress of infection was examined daily on 8 replicate slices for each isolate by measuring the area of rotted surface, weight of the rotted tissues and number of formed spores after 3 days of inoculation. Control slices were inoculated with sterilized water free of the fungus.

Dual inoculation of tuber slices with pathogenic and non-pathogenic Fusaria

Spore suspension of various non-pathogenic isolates (FSA3, FCU4, FOX5, FOX6, FEQ8, FSA10, FEQ11, FOX14, FOX16, FSA19, FOX20) or pathogenic isolates (FSA1, FSA7, FSO15, FSO17) was simultaneously inoculated into tuber slices as described above. Control slices were inoculated with o.5 ml. spore suspension of pathogenic isolate only.

The disease symptoms on potato tubers and severity of infection were recorded using the scale described by **Sharawy (1988).** Meanwhile, weight of rotted tissue, sporulation capacity and percentage of inhibition or stimulation were also determined compared with the tested pathogenic isolate.

Tissue processing for light microscope

Samples for histological studies were taken from potato slices artificially-inoculated with a pathogenic isolate of *F.sambucinum* (FSA7) and non-pathogenic isolate of *F. sambucinum* (FSA3), 24 and 48 h after inoculation.

These samples were killed and fixed in FAA solution on 70% alcoholic bases for 24 hr. Samples were washed in changes of 50 % ethyl alcohol, then dehydrated in ascending concentrations of ethyl alcohol. Samples were embedded in paraffin as described by **Miksche, (1976).** Sections were microtomed at 9-12 microns. Ribbons of serial sections were fixed to slides by means of Albusol adhesive (5ml albumin, 10 ml formalin and 185 ml distilled water). Sections were stained with safranin-light green solutions, and then mounted in Canada balsam. Photomicrographs were obtained by a Nikon Type 115 camera (Nikon FX-35)

Statistical analysis

All experiments were set up in a complete randomized design. Data were sub-

jected to analysis of variance (ANOVA) using the Statistical Analysis System (SAS Institute, Inc., 1996). Means were separated by Duncan's multiple range test at $P \leq 0.05$ level.

RESULTS

Isolation of *Fusarium* spp.

Fourteen isolates of *Fusarium* species were isolated from rotted potato tuber and soil adhering to tubers. Meantime, six *Fusarium* isolates were, also, isolated from other plant materials, *i.e.* seeds of maize, sorghum and sesame, and stems of peach and sugar cane, and roots of olive. Five species of *Fusarium*, *i.e. F. sambucinum*, *F. oxysporum*, *F. culmorum*, *F. equiseti* and *F. semitectum*, were frequently isolated from rotted potato tubers, while two isolates of *F. sambucinum* were isolated from soil. However, only *F. oxysporum* and *F. solani* were isolated from other plant materials (Table, 1).

Pathogenicity tests

Variation of pathogenicity of 14 isolates of *Fusarium* spp., isolated from potato tubers or adhering soil, were tested. Five isolates only were pathogenic to tuber slices cv. Spunta and the remaining 9 isolates were not pathogenic (Table, 2). The highly pathogenic isolates were *F. sambucinum* (FSA1 & FSA7) caused the highest disease severity (96 and 100 %, respectively). Meantime, *F. solani* (FSO15), isolated from peach's stem, and isolate FSO17, from stem of sugar cane, were pathogenic to potato tubers cv. Spunta and caused a hight disease severity (about 93 and 72 %, respectively) to potato tuber slices. Other isolates, *F. sambucinum* (FSA2 and FAS9) and *F. semitectum* (FSE12) from tubers, *F. oxysporum* (FOX13) from sorghum and *F. solani* (FSO18) from sesame were slightly pathogenic (Table 2). Data in Table (2) indicate that increased disease severity was positively correlated with weight of rotted tissue of tuber slices. In most cases, there was a negative correlation between disease severity and sporulation of *Fusarium* spp. on tuber slices. The highly pathogenic *F. sambucinum* isolates (FSA1 and FSA7) sporulate less on tuber slices than the slightly pathogenic isolate (FSA2). The same trend was occurred with *Fusarium solani* isolates FSO15 and FSO17.

Interaction between non-pathogenic and pathogenic *Fusarium* species

Results presented in Tables (3-6) indicate the effect of simultaneous inoculation of various avirulent *Fusarium* species and four virulent *F. sambucinum* (FSA1 and FSA7) and *F. solani* (FSO15 and FSO17) isolates on incidence of potato tuber rot. Dry rot incidence was greatly reduced when *F. culmorum* (FCU4) inoculated simultaneously with *F. sambucinum* (FSA1), where weight of rotted tissue and sporulation capacity were also reduced (Table, 3). The degree of inhibition varied among avirulent isolates either in reduction of disease severity, weight of rotted tissue and sporulation capacity compared with the virulent isolate.

Data in Table (4) show clearly that all tested *Fusarium* isolates reduced the infection causes by the virulent isolates *F. sambucinum* (FSA7). However, four isolates *i.e. F. sambucinum* (FSA19), *F. oxysporum* (FOX5, FOX14 and FOX20) caused completes inhibition of infection (Table, 4).

Table 1. Isolates of *Fusarium* species isolated from potato tubers, soil and other plant materials from different locations in Egypt during 2002

***Fusarium* sp.**	**Isolate code**	**Host / Source**	**Location**
F .sambucinum	FSA2	Tuber	Giza
F. culmorum	FCU4	Tuber	Giza
F .oxysporum	FOX5	Tuber	Kalyubia
F .oxysporum	FOX6	Tuber	Kalyubia
F .sambucinum	FSA7	Tuber	Sharkia
F. equiseti	FEQ8	Tuber	Sharkia
F .sambucinum	FSA9	Tuber	Sharkia
F .sambucinum	FSA10	Tuber	Kalyubia
F. equiseti	FEQ11	Tuber	Kalyubia
F. semitectum	FSE12	Tuber	Giza
F .sambucinum	FSA19	Tuber	Giza
F .oxysporum	FOX20	Tuber	Kalyubia
F .sambucinum	FSA1	Soil	Giza
F .sambucinum	FSA3	Soil	Giza
F .oxysporum	FOX13	Sorghum seeds	Giza
F .oxysporum	FOX14	Maize seeds	Giza
F. solani	FSO15	Peach stem	Kalyubia
F .oxysporum	FOX16	Olive roots	Giza
F. solani	FSO17	Sugar-cane stem	Assiut
F. solani	FSO18	Sesame seed	Giza

Table 2. Pathogenicity of *Fusarium* spp. isolates to slices of potato tubers cv. Spunta

Fusarium spp	Isolate code	% of rotted area	Disease* severity	Weight of rotted tissue (g)	Sporulation capacity (10^5/cm^2)
F.sambucinum	FSA1	100.0	96.1 b	13.5 d	3.9 h
	FSA2	12.5	5.5 h	0.2 h	62.5 c
	FSA3	0.0	0.0 i	0.0 h	0.0 i
	FSA7	100.0	100.0 a	14.5 c	4.0 h
	FSA9	62.5	38.3 f	6.5 f	4.7 g
	FSA10	0.0	0.0 i	0.0 h	0.0 i
	FSA19	0.0	0.0 i	0.0 h	0.0 i
F.solani	FSO15	100.0	92.8 c	27.5 a	41.5 d
	FSO17	75.0	71.6 d	20.6 b	97.2 a
	FSO18	62.5	42.2 e	07.2 e	6.0 f
F. oxysporum	FOX5	0.0	0.0 i	0.0 h	0.0 i
	FOX6	0.0	0.0 i	0.0 h	0.0 i
	FOX13	12.5	0.3 i	0.2 h	75.0 b
	FOX14	0.0	0.0 i	0.0 h	0.0 i
	FOX16	0.0	0.0 i	0.0 h	0.0 i
	FOX20	0.0	0.0 i	0.0 h	0.0 i
F. semitectum	FSE12	12.5	5.0 g	1.1 g	6.9 e
F. culmorum	FCU4	0.0	0.0 i	0.0 h	0.0 i
F. equiseti	FEQ8	0.0	0.0 i	0.0 h	0.0 i
	FEQ11	0.0	0.0 i	0.0 h	0.0 i

* Measured as percentage of surface colonized by the fungus.

** Values followed by the same latter in each column are not significantly different at $P \leq 0.05$ according to Duncan's multiple range tests.

Table 3. Effect of simultaneous combination of avirulent *Fusarium* isolates on infection of potato tuber slices by a highly virulent *Fusarium sambucinum*(FSA1)

Fusarium spp.	Isolae code	% of rotted area	% inhibition or stimulation	Weight of area (g)	% inhibition or stimulation	Sporulation capacity (10^5/cm^3)	% inhibition or stimulation
F.sambucinum	FSA3	94.7 b	30.4	7.2 f	- 37.4	6.8 hi	51.1
	FSA10	98.9 a	36.2	10.5 c	- 8.7	6.5 i	44.4
	FSA19	82.1 g	13.0	10.0 d	- 13.0	9.8 f	117.7
F. oxysporum	FOX5	57.9 k	- 20.0	5.5 g	- 52.2	33.8 b	651.0
	FOX6	77.4 i	6.5	11.0 b	- 4.3	7.1 h	57.7
	FOX14	83.2 f	14.5	8.0 e	- 30.4	35.1 a	680.0
	FOX16	86.8 e	19.6	8.0 e	- 30.4	8.9 g	97.7
	FOX20	89.5 d	23.2	11.4 ab	- 0.9	17.6 c	291.1
F. equiseti	FEQ8	78.9 h	8.7	7.6 ef	- 33.9	16.8 d	273.3
	FEQ11	92.6 c	27.5	11.7 a	1.7	8.9 g	97.7
F. culmorum	FCU4	51.6 l	-32.6	4.3 h	- 62.6	12.9 e	186.6
F.sambucinum (control)	FSA1	72.6 j	_	11.5 a	_	4.5 j	_

* Values followed by the same latter in each column are not significantly different at $P \leq 0.05$ according to Duncan's multiple range tests.

Table 4. Effect of simultaneous combination of avirulent *Fusarium* isolates on infection of potato tuber slices by a highly virulent *Fusarium sambucinum* (FSA7)

Fusarium spp.	Isolae code	%of rotted area	% inhibition or stimulation	Weight of area (g)	% inhibition or stimulation	Sporulation capacity (10^5/cm^3)	% inhibition or stimulation
F.sambucinum	FSA3	81.6 b	- 14.0	7.8 b	- 15.2	11.2 e	229.4
	FSA10	0.5 f	- 67.8	2.0 e	- 78.3	7.3 f	114.7
	FSA19	0.0 i	- 100.0	0.0 g	- 100	0.0 h	-100.0
F. oxysporum	FOX5	0.0 i	- 100.0	0.0 g	- 100	0.0 h	-100.0
	FOX6	48.3 e	- 49.1	5.2 d	- 43.5	16.9 d	397.0
	FOX14	0.0 i	- 100.0	0.0 g	- 100	0.0 h	-100.0
	FOX16	12.2 h	- 87.1	1.6 f	- 82.6	20.5 b	502.9
	FOX20	0.0 i	- 100.0	0.0 g	- 100	0.0 h	-100.0
F. equiseti	FEQ8	15.5 g	- 83.6	1.8 ef	- 80.4	23.2 a	582.4
	FEQ11	60.5 d	- 36.3	6.7 c	- 27.2	6.9 f	102.9
F. culmorum	FCU4	74.4 c	- 21.6	7.5 b	- 18.5	17.9 c	426.5
F.sambucinum (control)	FSA7	95.0 a	_	9.2 a	_	3.4 g	_

* Values followed by the same latter in each column are not significantly different at $P \leq 0.05$ according to Duncan's multiple range tests

Data in Table (5) show that *F. oxysporum* (FOX14) from maize greatly reduced infection and sporulation of the pathogenic isolate (FSO15) of *F. solani* on tuber slices. The same trend of results (Table, 6) were also observed with the other pathogenic isolate of *F. solani* (FSO17).

Histological observations

Examination of sections of tuber slices either inoculated with avirulent or virulent *Fusarium* species revealed different reactions (Figs. 1 and 2). In case of virulent isolate *F. sambucinum* (FSA7), a large number of fungal hyphae had colonized the tuber cells after 48 h compared with 24 h (Fig. 1). The pathogen penetrated parenchyma cells and growth occurred inter- and intracellularlly, and direct host cell wall penetration was frequently recorded. However, in case of avirulent isolate *F. sambucinum* (FSA3), fungal growth was mainly restricted to the outermost cell layers (Fig. 2) and a number of the invading hyphae appeared to be severely damaged as evidenced by the frequent occurrence of distorted hyphal cells. Fungal ingress toward the inner tuber tissues was apparently halted.

DISCUSSION

The results of the present study indicate that *F. sambucinum* and *F. solani* were the major *Fusarium* species associated with dry rot disease of potatoes in Egypt, while *F. oxysporum*, *F. semitectum*, *F. culmorum* and *F. equiseti* were minor pathogens. However, variation among several *Fusarium* species to cause dry rot of potato in Egypt was observed. Isolates of *F. sambucinum* caused extensive rotting of potato tubers compared with other *Fusarium* species. *Fusarium* isolates from other hosts showed varied effects. *F. solani* isolated from peach or sugar cane stems were pathogenic to potato tuber slices, while isolates from sorghum, maize and olive were non-pathogenic. This may indicates that variation in pathogencity of *Fusarium* isolates was not related to the original host plant species. Similar results were also reported by other researchers (**Hanson *et al* 1996** and **Satyaprasad *et al* 1997**). *Fusarium* spp. that cause dry rot of potato are primarily regarded as tuber-borne fungi, and propagules in soil adhering to tubers are known to cause tuber rot. This suggests that contamination of potato tubers by such *Fusarium* species from soil or other sources creates a risk from dry rot.

Simultaneous inoculation of various avirulent *Fusarium* species reduced the infection of potato tuber slices by virulent *Fusarium* isolates. Dry rot incidence was greatly reduced when *F. culmorum* (FCU4) inoculated simultaneously with *F. sambucinum* (FSA1). However, The degree of inhibition varied among avirulent isolates either in reduction of disease severity, weight of rotted tissue and sporulation capacity compared with the virulent isolate. These results are in agreement with **Mostafa, (1991)** in that various non-pathogenic *Fusarium* species reduced dry rot of potato. Non-pathogenic isolate of *F.*oxysporum, may capable of evoking biochemical events characteristic of the natural plant disease resistance process (**Benhamou and Garand, 2001**).

In the present study, examination of sections of tuber slices either inoculated with avirulent or virulent *Fusarium* species revealed different reactions. In case

Table 5. Effect of simultaneous combination of avirulent *Fusarium* isolates on infection of potato tuber slices by a highly virulent *Fusarium solani* (FSO15)

Fusarium spp.	Isolae code	%of rotted area	% inhibition or stimulation	Weight of area (g)	% inhibition or stimulation	Sporulation capacity (10^5/cm^2)	% inhibition or stimulation
F.sambucinum	FSA3	96.1 a	11.0	23.0 f	- 13.5	48.3 c	13.4
	FSA10	64.4 i	- 25.6	18.8 g	- 29.3	30.2 g	- 29.1
	FSA19	90.5 c	4.5	28.6 b	7.5	17.8 j	- 58.2
F. oxysporum	FOX5	95.5 b	10.3	25.9 d	- 2.6	36.9 e	- 13.4
	FOX6	86.1 f	- 0.6	23.0 f	- 13.5	49.8 b	16.9
	FOX14	47.7 j	- 44.9	10.4 h	- 60.9	24.7 i	- 42.0
	FOX16	86.1 f	- 0.6	23.8 e	- 10.5	29.4 h	- 31.0
	FOX20	88.8 d	2.5	28.6 b	7.5	10.3 k	- 75.8
F. equiseti	FEQ8	90.5 c	4.5	29.0 a	9.0	52.5 a	23.2
	FEQ11	83.3 g	- 3.8	26.7 c	0.4	32.7 f	- 23.2
F. culmorum	FCU4	67.7 h	- 21.8	18.7 g	- 29.7	07.6 l	- 82.2
F.solani (control)	FSO15	86.6 e	_	26.6 c	_	42.6 d	_

* Values followed by the same latter in each column are not significantly different at $P \leq 0.05$ according to Duncan's multiple range tests.

Table 6. Effect of simultaneous combination of avirulent *Fusarium* isolates on infection of potato tuber slices by a highly virulent *Fusarium solani* (FSO17).

Fusarium spp.	Isolae code	% of rotted area	% inhibition or stimulation	Weight of area (g)	% inhibition or stimulation	Sporulation capacity (10^5/cm^2)	% inhibition or stimulation
F.sambucinum	FSA3	97.3 b	22.5	40.6 b	16.3	68.0 e	- 26.6
	FSA10	62.7 g	- 21.0	22.7 g	- 35.0	28.8 l	- 68.9
	FSA19	45.0 h	- 43.3	17.6 j	- 49.6	30.8 j	- 66.8
F. oxysporum	FOX5	27.7 k	- 65.1	18.6 i	- 46.7	100.0 c	7.9
	FOX6	98.3 a	23.8	46.1 a	32.0	30.4 k	- 67.2
	FOX14	22.2 l	- 72.0	08.2 l	- 76.5	55.0 h	- 40.7
	FOX16	35.5 k	- 55.3	13.5 k	- 60.3	106.6 b	15.0
	FOX20	43.9 i	- 44.7	20.3 h	- 41.8	111.4 a	20.2
F. equiseti	FEQ8	78.8 e	- 0.8	29.8 f	- 14.6	43.8 i	- 52.8
	FEQ11	77.7 f	- 2.1	32.2 e	- 7.7	61.6 f	- 33.5
F. culmorum	FCU4	96.1 c	21.0	38.5 c	10.3	59.8 g	- 35.5
F. solani (control)	FSO17	79.4 i	_	34.9 h	_	92.7 d	_

* Values followed by the same latter in each column are not significantly different at $P \leq 0.05$ according to Duncan's multiple range tests.

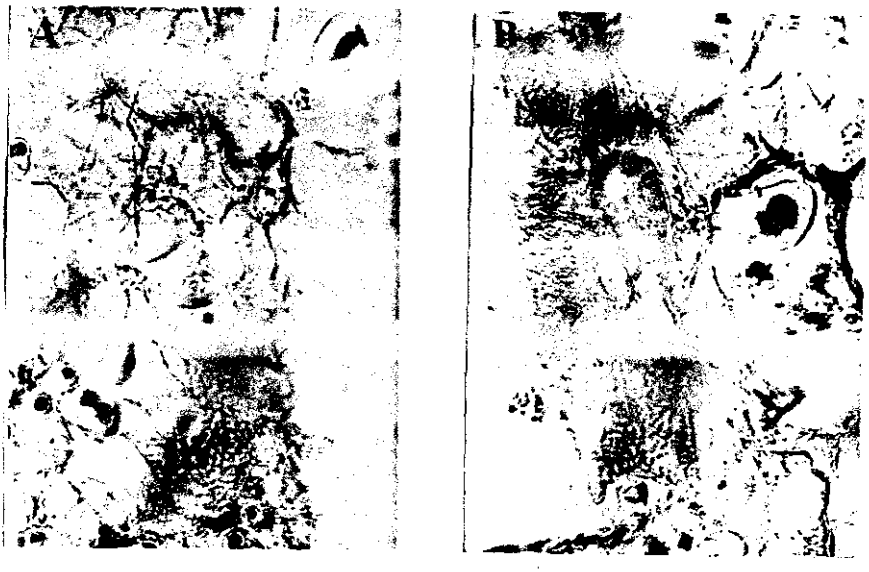

Fig. 1. Histopathology of infection of potato tuber by virulent *Fusarim sambucinum* (FSA7) after 24 h (A) and 48 h (B) of inoculation

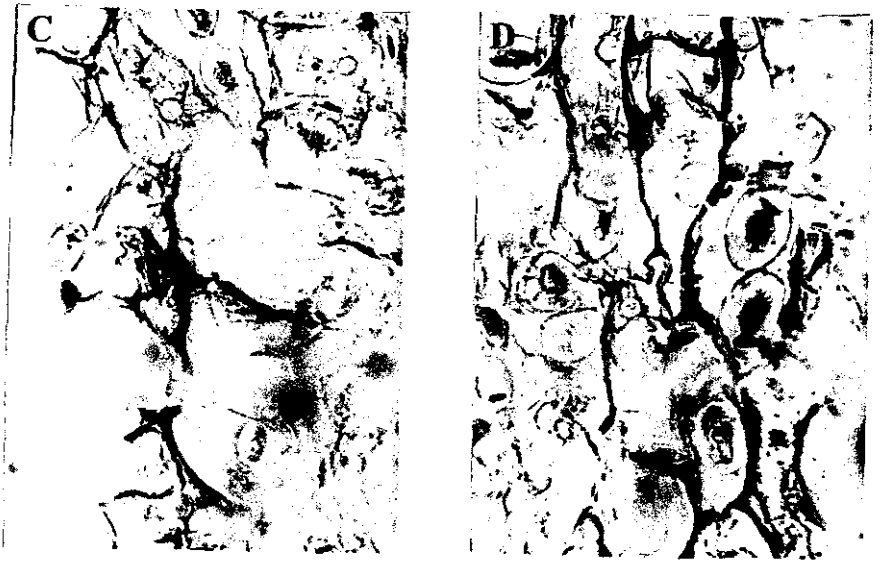

Fig. 2. Histopathology of infection of potato tuber by avirulent *Fusarim sambucinum* (FSA3) after 24 h (C) and 48 h (D) of inoculation

of avirulent isolate *F. sambucinum* (FSA3), fungal growth was mainly restricted to the outermost cell layers and a number of the invading hyphae appeared to be severely damaged as evidenced by the frequent occurrence of distorted hyphal cells. The mechanism of reduced infection is unknown however, **Mostafa, (1991)** postulated that the compounds accumulate in potato tuber in response to infection by non-pathogens play a secondary role in the limitation of the challenge. The prime factor determines the state of interaction between pathogenic Fusaria and potato tuber may be the recognition site between host and pathogen.

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مجلة حوليات العلوم الزراعية ، كلية الزراعة ، جامعة عين شمس ، القاهرة ، م٤٩ ، ع(٢)، ٧٥٩ - ٧٧١ ، ٢٠٠٤

التفاعل بين عزلات الفيوزاريوم الغير ممرضة وأنواع الفيوزاريوم المسببة للعفن الجاف في البطاطس

[٥٤]

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يعتبر العفن الجاف من أخطر الأمراض الفطرية التي تصيب البطاطس أثناء التخزين. يهدف هذا البحث إلى دراسة تأثير عزلات الفيوزاريوم الغير ممرضة على أنواع الفيوزاريوم المسببة للعفن الجاف في البطاطس. تم عزل ٢٠ عزلة تنتمي إلى ستة أنواع مختلفة من الفيوزاريوم من درنات بطاطس مصابة ومن حبيبات التربة العالقة بها ومن مصادر نباتية أخرى. شملت هذه العزلات خمسة أنواع معزولة من الدرنات المصابة والتربة وهي *F. sambucinum, F. oxysporum, F. culmorum, F. equiseti, F. semitectum* و *F. oxysporum, F. solani* تم عزلهما من المصادر الأخرى .

أظهرت العزلات المختلفة تفاوت في قدرتها على إحداث الإصابة بالمرض على شرائح درنات البطاطس صنف سبونتا، حيث كانت بعض هذه العزلات كانت قادرة على إحداث الإصابة بشدة والبعض الآخر كانت غير ممرضة . وأضحت النتائج أن الشدة المرضية كانت مرتبطة إيجابياً مع مساحة ووزن الطبقة المتعفنة على شرائح البطاطس، ولكن في معظم العزلات كان هناك ارتباط عكسي مع القدرة على التجرثم.

ثبطت بعض العزلات الغير ممرضة قدرة العزلات الممرضة على إحداث الإصابة وقللت من شدتها، وفي بعض العزلات وصلت نسبة التثبيط إلى ١٠٠ % .

أظهرت الدراسة التشريحية المرضية للقطاعات المأخوذة من شرائح درنات بطاطس معدية بأحد العزلات الممرضة وأخرى بعزلة غير ممرضة أن الفطر نمى وانتشر بسرعة ليخترق عدة طبقات من الخلايا وذلك في حالة العزلة الممرضة، وكان انتشاره قليلاً في حالة العزلة الغير ممرضة حيث حدث تغلظ لجدر خلايا العائل وتكونت ترسيبات كثيرة على جدر هذه الخلايا .

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