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Pathological Studies on Fungal Diseases of Date Palm in New Valley Governorate

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During seasons 2010/2011, leaf base rot, black scorch and inflorescences rot diseases have been observed on date palm trees and off-shoot in nurseries and orchards of El-Kharga, Paris, El-Dakhla and El-Farafrah Oases in New Valley Governorate. Disease infection and severity (%) on date palm (var. Saidy) in the surveyed districts were found to be different. Several fungal species belonging to different genera were isolated from diseased samples collected from the surveyed districts. Frequency of the isolated fungi was different according to locality. Pathogenicity tests indicated that *Botryodiplodia theobromae* was the causal of leaf base rot disease and *Thielaviopsis paradoxa* was the causal of black scorch and inflorescences rot diseases. Saidy was the highly susceptible variety to leaf base rot followed by var. Higazi which also was the highly susceptible one to black scorch and inflorescences rot diseases, followed by var. Saidy. Meanwhile, var. Tamr was the least susceptible one to all tested diseases. Efficiency of six different fungicides for controlling the diseases in the orchards was tested. Topsin M_{70}, Rizolex-T, Score, Kemazed and Ridomil Gold Plus caused the highest reduction in incidence of leaf base rot, black scorch and inflorescences rot diseases.

Keywords: *Botryodiplodia theobromae*, date palm diseases; fungicides and *Thielaviopsis paradoxa.*

The New Valley is considered as the biggest Governorate in Egypt, when covering about one fifth of the total surface area of Egypt. It consists of three Oases, *i.e.* El-Kharga, El-Dakhla and El-Farafrah. Irrigation depends on wells equipped with pumps in El-Kharga while, the other Oases water is still under artesian pressure. Climate is arid, there is almost no rain fall in the year. Relative humidity ranged from 25 to 50% in winter and summer season, respectively. Temperature around 30-45°C at the period from March to October months.

Date palm (*Phoenix dactylifera* L.) trees and off-shoot are subjected to attack by several fungal diseases in New Valley Oases and in different regions around the world as well. The most world-wide spread of such diseases are bayoud (*Fusarium oxysporum* f.sp. *albedinis*), black scorch (*Thielaviopsis paradoxa* or *Chalara paradoxa*), leaf base rot (*Botryodiplodia theobromae* or *Diplodia phoenicum*), graphiola leaf smut or spot (*Graphiola phoenicis*), inflorescence rot or khamedj (*Mauginiella scaettae* or *Thielaviopsis paradoxa*), leaf spots (different species of *Alternaria*, *Annellophora*, *Chaetosphaeropsis*, *Drechslera*, *Helminthosporium*, *Mycosphaerella*, *Phoma*, *Stemphylium, Nigrospora*, *Pestalotia* and *Xylohypha*) and

root rots (*Chaetomium* sp., *Chalaropsis radicicola*, *Diplodia phoenicum*, *F. equiseti, F. moniliforme*, *F. oxysporum*, *F. proliferatum*, *F. semitectum*, *F. solani*, *Gliocladium* sp., *Phomopsis* sp., *R. solani* and *T. paradoxa*) (Gariani *et al.*, 1994; Edongali, 1996; El-Alwani and El-Ammari, 2001; Al-Sharidi and Shahwan, 2003; Abdullah *et al*., 2005; Zaid *et al.*, 2005 and Abass *et al.*, 2007).

Under the Egyptian conditions, leaf base rot (caused by *Botryodiplodia theobromae* or *Diplodia phoenicum*), black scorch (caused by *Thielaviopsis paradoxa*) and inflorescence rot or khamedj (caused by *Mauginiella scaettae* or *Thielaviopsis paradoxa*) are considered the most serious diseases affected date palm trees and off-shoot (Abdalla *et al.*, 1992; Barakat *et al*., 1992; Rashed 1998; El-Zawahry *et al.*, 2000; El-Deeb *et al.*, 2006; Arab *et al*., 2007 and El-Morsi *et al.*, 2007 b and c).

Successful control of such diseases has been obtained by using the fungicides Benlate, Rizolex-T, Topsin M_{70}, Bavistin, Tilt 250, Dithan M_{45}, Ridomil MZ, Trimeltox forte, Cuprous, Kocide 101, Ridomil plus, Score, Kemazed, Actazime, Hista, Cornazol and Dorado 200 (Abdalla *et al.*, 1992; Mubarak *et al.*, 1994; Sabet *et al*., 1995; Rashed 1998; Kararah and Ammar, 2003; Kamhawy *et al*., 2006; El-Morsi *et al*., 2007 b and c).

The present work was planned to survey fungal diseases affecting date palm off-shoot and trees in New Valley region, Egypt, and to determine susceptibility of certain cultivars to such diseases and to chemical control of the diseases in nurseries of date palm.

Materials and Methods

1- Survey of fungal diseases:

Survey of fungal diseases affecting date palm was carried out in El-Kharga, Paris, El-Dakhla and El-Farafrah Oases in New Valley Governorate during two successive years (2010 and 2011). Percentages of disease incidence and severity with fungal diseases of date palm off-shoot and trees of var. Saidy were recorded during growing seasons in nurseries and orchards. Diseased samples were also collected from infected rachides and spathes for isolation trials. The disease severity (D.S.) was calculated on naturally infected date palm off-shoot and trees by using the following formula:

$$\text{Disease severity (\%)} = (\sum (n \times v)/ 4N) \times 100$$

Whereas, (n) = the number of rachises or spathes of off-shoot and trees per category, (v) = category number, N = total number of infected rachises or spathes of off-shoot and trees.

Disease severity was assessed on date palm off-shoot and trees exhibited symptoms typical of fungal diseases. Foliar symptoms were evaluated on a scale of 0-4 based on the percentage of the affected foliage as follows: 0 = healthy off-shoot or trees, 1= > 0 to 25% infection; 2= > 26 to 50 % infection; 3= > 51 to 75% infection; 4= > 76% infection (El-Morsi *et al*., 2007 b).

2- Isolation and identification of the causal fungi:

The collected diseased samples were thoroughly washed under running tap water, cut into small pieces (1 cm), and surface sterilized with dipping in 0.1% mercuric chloride solution for 2 minutes, then washed in several changes of sterile distilled water. The surface sterilized pieces were blotted dry on sterilized filter paper and transferred individually to Petri dishes, each containing sterilized 20 ml potato dextrose agar (PDA) medium, then incubated at 25°C for 5 days then inspected for fungal growth. The developed fungal colonies were purified using hyphal tip or single spore techniques. The purified fungi were identified according to fungal morphological and microscopical characteristics as described by Barnett and Hunter (1986) and Booth (1977) and confirmed by Botany Department, Faculty of Science, Assiut University. Obtained isolates were maintained on PDA slants and kept in refrigerator at 5°C for further study. Frequency of isolated fungi was calculated for each sample.

3- Pathogenicity tests and varietal reaction to the causal fungi:

Pathogenic capabilities of isolates of *Botryodiplodia theobromae* and *Thielaviopsis paradoxa* were tested on attached rachises of date palm off-shoot of var. Saidy. Off-shoots (3-year-old) employed in pathogenicity testes were grown in the Experimental Farm of Agricultural Research Station of El-Kharga, New Valley Governorate. Rachises were surface sterilized before inoculation with the tested fungal isolate with a piece of cotton moistened with 70% ethanol and then washed several times with sterilized water. Inoculation was carried out by toothpick technique according to Hooker (1957). Three pricks about 5 mm. deep was made into rachises tissues with aid of a sharp flamed needle, which was then inoculated by toothpicks carrying fungal growth taken from 7-day-old cultures of the tested isolates grown on PDA medium at 30°C. The inoculated rachises were covered with polyethylene bags to maintain high relative humidity necessary for infection. The bags were removed after 3 days. Toothpicks free from fungi were used for control test and five replicates were used in each test. One month after inoculation, the rachises were cut and the necrotic area on infected rachides was measured (length x width of spots in mm).

In case of inflorescences rot disease, the pathogenicity of four different isolates of *Thielaviopsis paradoxa* was detected on spathes of date palm both sexes. Inocula of *T. paradoxa* were prepared by growing the tested isolates on PDA medium at 27°C for 7 days. Spore suspension was prepared by adding 20 ml sterilized distilled water to the surface of each culture plate. The collected spore suspensions from 10 plates, representing each of the four tested isolates were used as inocula for pathogenicity tests. Spore concentrations were quantified microscopically using a haemocytometer slide and adjusted to be $6x10^6$ spores/ml. Five detached and opened healthy spathes were surface sterilized before inoculation with the tested fungus with a piece of cotton moistened with 70% ethanol and then washed several times with sterilized water. The upper external surface of the spathes was removed so that the flowers and strands were exposed to the atmosphere. The detached spathes were inoculated by spraying the inoculation sites (flowers and strands) with 20 ml of fungal spore suspension or sterilized distilled water (control) using an

atomizer. Inoculated spathes were kept in plastic boxes with moistened cotton (sterilized water) to maintain high humidity and incubated at 25°C**.** Spathes were examined for lesions after 5 days of incubation and the diameter of rotted areas on infected spathes was measured (length x width in cm).

Reaction of Higazi, Saidy and Tamr date palm varieties to the infection by (El-Kharga isolates) with leaf base rot (*B. theobromae*) and black scorch (*T. paradoxa*) were conducted by using healthy (3-year-old) off-shoot rachises of the tested varieties. However, susceptibility to inflorescences rot (*T. paradoxa*) was conducted by using healthy 10-year-old trees female spathes of the tested varieties. The aforementioned methods for inoculation with the tested fungi and assessment of diseases severity in pathogenicity tests were also adopted in this study. Re-isolation was carried out from infected tissues showing disease symptoms and the isolated fungus was compared with the original culture used.

4- Chemical control of diseases under field conditions:

During year of 2010, highly naturally infected date palm off-shoot (3-year-old) and trees (10-year-old) of var. Saidy by leaf base rot, black scorch and inflorescences rot and located at El-Kharga Agriculture Research Station were selected for this experiment. Recommended concentrations of the tested fungicides (Table 1) were used.

Table 1. Trade name, common name, active ingredient and recommended doses of the used fungicides

Trade name	Common name	Active ingredient (%)	Recommended dose in field
Kemazed	Carbendazim	50% WP	3 gm/l
Kocide 2000	Copper hydroxide	53.8% DF	3 gm/l
Ridomil Gold Plus	Metalaxyl + copper	42.5% WP	2 gm/l
Rizolex -T	Tolclofosm methyl + Thiram	50% WP	3 gm/l
Score	Difenconazole	250 EC	0.5 cm^3/l
Topsin M_{70}	Thiophanate methyl	70% WP	1.5 gm/l

Disease severity due to natural infection was recorded before any treatment. The selected date palm off-shoot or trees were sprayed twice at 20 days intervals with the recommended dose of the tested fungicides. Control treatments were sprayed with water only. Six replicates were used for each treatment. Percentage disease severity (DS) and decrease in disease incidence (PD) were calculated after 40 days from each treatment as follows: PD = (Ds_1 – Ds_2 / Ds_1) x 100. Whereas, PD= Decrease (%) in disease incidence, Ds_1= Disease severity before treatment (zero time) and Ds_2= Disease severity after a given treatment.

Statistical analysis:

Data were subjected to statistical analysis using analysis of variance and means were compared using L.S.D. test (Steel and Torrie, 1980).

Results

1- Survey of fungal diseases:

Data presented in Tables (2 and 3) indicate that leaf base rot, black scorch and inflorescences rot diseases affected date palm off-shoot and trees of var. Saidy in surveyed areas at New Valley Governorate. Percentage of disease incidence and severity of all of diseases differed by locality.

Data in Table (2) indicate that the highest disease incidence and severity percentages of leaf base rot disease on date palm off-shoot were recorded in El-Kharga area (47.6-40%), followed by El-Dakhla and Paris areas (44.6-37 and 39.4-35%, respectively), while the lowest percentage of disease incidence and severity (36.7-30%) was observed in El-Farafrah area. Data also show that the highest disease incidence and severity percentages of black scorch disease were recorded in El-Dakhla area (44.3-20%), followed by El-Kharga and El-Farafrah areas (38.8-18 and 33.7-15%, respectively), while the lowest percentage of disease incidence and severity (31.4 -13%) was observed in Paris area.

Table 2. Survey of fungal diseases affected date palm off-shoot of var. Saidy in New Valley Governorate during 2010-2011

Locality	Leaf base rot		Black scorch	
	Incidence	Severity	Incidence	Severity
El-Dakhla	44.6	37	44.3	20
El-Farafrah	36.7	30	33.7	15
El-Kharga	47.6	40	38.8	18
Paris	39.4	35	31.4	13
Mean	42.1	35.5	37.1	16.5

Data in Table (3) indicate that the highest disease incidence and severity percentages of leaf base rot disease on date palm trees were recorded in El-Dakhla area (30.8-15%), followed by El-Kharga area (28.3-13%), while the lowest percentage of disease incidence and severity (20.4-10%) was observed in El-Farafrah area. Data also show that the highest disease incidence and severity percentages of black scorch disease were recorded in El-Kharga area (47.4-22%), followed by El-Dakhla and Paris areas (38.4-20 and 41.4-19%, respectively), while the lowest percentage of disease incidence and severity (28.8-12%) was observed in El-Farafrah area. Data also show that the highest disease incidence and severity percentages of inflorescences rot disease were recorded in El-Dakhla area (54.8-28%), followed by El-Farafrah and El-Kharga areas (51.6-25 and 48.4-22%, respectively), while the lowest percentage of disease incidence and severity (40.0-18%) was observed in Paris area.

Table 3. Survey of fungal diseases affected date palm trees of var. Saidy in New Valley Governorate during 2010-2011

Locality	Leaf base rot		Black scorch		Inflorescence rot	
	Incidence	Severity	Incidence	Severity	Incidence	Severity
El-Dakhla	30.8	15	38.4	20	54.8	28
El-Farafrah	20.4	10	28.8	12	51.6	25
El-Kharga	28.3	13	47.4	22	48.4	22
Paris	24.4	11	41.4	19	40.0	40.0
Mean	26.0	12.3	38.9	18.3	48.7	23.2

2- Fungi isolated from naturally infected samples:

Results of isolation procedures are shown in Table (4). *Alternaria alternate*, *Botryodiplodia theobromae*, *Fusarium equiseti*, *F. moniliforme*, *F. oxysporum* and *F. solani* were the most frequently isolated fungi from rachises of date palm off-shoot which showing typical symptoms of leaf base rot disease collected from different localities. Frequency of the isolated fungi varied from locality. In general, *B. theobromae* was the most common pathogens in surveyed areas. *B. theobromae* was the most frequent (69.6%) on all localities followed by *F. moniliforme* (10.7%). While, the rest of isolated fungi recorded low frequencies.

Table 4. Frequency of fungi isolated from diseased samples of date palm off-shoot (var. Saidy) collected from different localities in New Valley Governorate

Disease	Isolated fungus	Locality				Mean
		El-Dakhla	El-Farafrah	El-Kharga	Paris	
Leaf base rot	*A. alternata*	5.9	4.8	4.7	5.2	5.1
	B. theobromae	70.4	70.0	72.4	65.7	69.6
	F. equiseti	4.8	4.1	3.7	5.7	4.6
	F. moniliforme	10.0	10.0	10.5	12.5	10.7
	F. oxysporum	4.5	4.8	5.3	5.1	4.9
	F. solani	4.7	6.3	3.4	5.8	5.0
Black scorch	*A. alternata*	6.6	5.4	6.9	6.4	6.3
	T. paradoxa	61.0	60.1	65.4	64.8	62.8
	F. equiseti	7.3	9.1	4.4	5.3	6.5
	F. moniliforme	12.1	10.5	13.8	13.6	12.5
	F. oxysporum	5.5	6.7	3.6	3.8	4.9
	F. solani	7.5	8.2	5.9	6.1	6.9

Data also show that *A. alternate*, *Thielaviopsis paradoxa*, *F. equiseti*, *F. moniliforme*, *F. oxysporum and F. solani* were the most frequently isolated fungi from rachises of date palm off-shoot which showing typical symptoms of black scorch disease collected from different localities. Frequency of the isolated fungi varied from locality. In general, *T. paradoxa* was the most common pathogens in surveyed areas. *T. paradoxa* was the most frequent (62.8%) in all localities followed by *F. moniliforme* (12.5%). While, other isolated fungi recorded low frequencies.

Data in Table (5) indicate that *A. alternate*, *B. theobromae*, *F. equiseti*, *F. moniliforme*, *F. oxysporum* and *F. solani* were the most frequently isolated fungi from rachises of date palm trees which showed typical symptoms of leaf base rot disease collected from different localities. Frequency of the isolated fungi varied from locality. In general, *B. theobromae* was the most common pathogens in areas. *B. theobromae* was the most frequent (52.8%) on all localities followed by *F. moniliforme* (14.5%). While, the rest of isolated fungi recorded low frequencies.

Table 5. Frequency of fungi isolated from diseased samples of date palm trees (var. Saidy) collected from different localities in New Valley Governorate

Disease	Isolated fungus	Locality				Mean
		El-Dakhla	El-Farafrah	El-Kharga	Paris	
Leaf base rot	*A. alternata*	7.7	6.8	5.0	7.3	6.7
	B. theobromae	54.5	49.0	60.1	47.8	52.8
	F. equiseti	7.1	9.1	5.6	9.0	7.7
	F. moniliforme	14.3	13.8	14.6	15.3	14.5
	F. oxysporum	7.5	10.3	7.8	8.4	8.5
	F. solani	8.9	11.0	6.9	12.2	9.7
Black scorch	*A. alternata*	5.1	6.2	4.0	4.7	5.0
	T. paradoxa	49.1	47.9	55.0	45.8	49.4
	F. equiseti	6.4	8.7	6.4	8.2	7.2
	F. moniliforme	13.9	10.8	10.8	12.5	12.0
	F. oxysporum	7.7	8.0	7.7	8.7	8.0
	F. semitiectium	6.6	6.5	5.1	7.7	6.5
	F. solani	5.1	6.3	6.2	6.9	6.1
	Nigrospora oryzae	5.1	5.6	4.8	5.5	5.2
Inflorescences rot	*T. paradoxa*	100	100	100	100	100

Data also show that *T. paradoxa*, *A. alternate*, *F. equiseti*, *F. moniliforme*, *F. oxysporum*, *F. semitectum*, *F. solani and N. oryzae* were the most frequently isolated fungi from rachises of date palm trees which showing typical symptoms of black scorch disease collected from different localities. Frequency of the isolated fungi varied by locality. In general, *T. paradoxa* was the most common pathogens in tested areas. *T. paradoxa* was the most frequent (49.4%) on all localities followed by *F. moniliforme* (12.0%). While, the other isolated fungi were recorded at low frequencies.

Data also show that isolation trials from naturally infected inflorescences suffering from rot yielded four isolates of one fungus identified as *Thielaviopsis paradoxa*.

3- Pathogenicity tests:

Data presented in Table (6) show that the tested isolates of *B. theobromae* and *T. paradoxa* were able to cause leaf base rot and black scorch diseases, respectively, on rachises of date palm off-shoot (var. Saidy). Virulence of the tested isolates of *B. theobromae* and *T. paradoxa* was different. El-Kharga and El-Dakhla isolates of *B. theobromae* were the most virulent isolates, while Paris isolate was the least virulent one. Other tested isolates of the fungi were not pathogenic.

Data also show that isolates of *T. paradoxa* obtained from El-Dakhla, El-Kharga, and El-Farafrah areas were the most virulent isolates, while Paris isolate was the least virulent one. Other tested isolates of the fungi were not pathogenic.

Data also show that the tested isolates of *T. paradoxa* were able to cause inflorescence rot disease on date palms. The spathes inoculated with spore suspensions of *T. paradoxa* developed clear inflorescence rot symptoms after 5 days of incubation and showed that infection spread rapidly on the panicles then turned yellowish-brown to dark brown and covered with the black growth of the fungus spores. The inflorescence turned into a mass shrivelled, dark brown after 7 days. Male and female inflorescences were equally infected approximation. Virulence of the tested isolates of *T. paradoxa* was significantly differed. El-Dakhla isolate was the most virulent one, followed by El-Farafrah and El-Kharga isolates of *T. paradoxa*, while Paris isolate was the least virulent one. Reisolation from infected tissues yielded the same fungi originally inoculated.

Table 6. Pathogenicity tests of isolated fungi from diseased samples collected from date palm trees and off-shoot (var. Saidy)

Disease	Inoculated organ	Locality / Fungus	Disease severity				Mean
			El-Dakhla	El-Farafrah	El-Kharga	Paris	
Leaf base rot	Rachis	*B. theobromae*	36.2	33.8	41.0*	32.8	36.0
Black scorch	Rachis	*T. paradoxa*	58.9	50.8	55.5	48.0	53.3
Inflorescences rot	Male spathe	*T. paradoxa*	67.0	62.0	56.0	46.0	60.0
	Female spathe	*T. paradoxa*	63.0	59.0	50.0	42.0	53.5
Control			0.0	0.0	0.0	0.0	0.0
L.S.D. at 0.05: Fungi (F) = Localities (L) = F × L =			2.21 2.21 4.40				

* Mean of infected area $(mm)^2$.

4- Varietal reaction:

Susceptibility of off-shoot of date palm cvs. Higazi, Saidy and Tamr to leaf base rot, black scorch and inflorescence rot diseases was tested. The pathogenic fungal isolates of El-Kharga locality were used in this study.

Results in Table (7) indicate that the three tested date palm varieties were susceptible at various levels to the tested diseases. Generally, var. Saidy was the highly susceptible one to leaf base rot disease, followed by var. Higazi which was also the highly susceptible one to black scorch and inflorescence rot disease followed by var. Saidy. Meanwhile, var. Tamr was the least susceptible one to all tested diseases.

Table 7: Susceptibility of three date palm varieties to tested fungal diseases

Disease	Inoculated organ	Variety / Fungus	Disease severity (%)		
			Higazi	Saidy	Tamr
Leaf base rot	Rachis	*B. theobromae*	37.5*	41.0	23.0
Black scorch	Rachis	*T. paradoxa*	65.1	55.5	26.0
Inflorescences rot	Female spathe	*T. paradoxa*	68.2	50.0	42.7
Control			0.0	0.0	0.0
L.S.D. at 0.05: Fungi (F) =			2.9		
Varieties (V) =			2.9		
F × V =			5.1		

* Mean of infected area $(mm)^2$.

5- Effects of certain fungicides in controlling fungal diseases under field conditions:

Results (Table 8) show that all tested fungicides reduced incidence of leaf base rot, black scorch and inflorescence rot diseases on date palm off-shoot of var. Saidy. Efficiency of the tested fungicides in controlling of the tested diseases was different.

In case of leaf base rot disease, Topsin M_{70} gave the least disease severity and highest decrease in disease incidence, followed by Rizolex-T, Score and Kemazed, while, Kocide 2000 and Ridomil gold plus gave the least decrease in disease incidence.

In case of black scorch disease, Topsin M_{70} and Rizolex-T gave the least disease severity and highest decrease in disease incidence, followed by Score, Kemazed and Ridomil gold plus, while, Kocide 2000 gave the least decrease in disease incidence.

In case of inflorescence rot, Topsin M_{70} gave the least disease severity and highest decrease in disease incidence, followed by Score, Rizolex-T and Kemazed gave the least decrease in disease incidence, while, Kocide 2000 gave the least decrease in disease incidence.

Generally, Topsin M_{70}, Rizolex-T, Score, Kemazed and Ridomil gold plus gave the best results to control leaf base rot, black scorch and inflorescences rot diseases.

Table 8. Effect of certain fungicides on disease severity of tested fungal diseases in the field

Fungicide	Leaf base rot			Black scorch			Inflorescence rot		
	Disease severity (%)		Decrease in disease incidence (%)	Disease severity (%)		Decrease in disease incidence (%)	Disease severity (%)		Decrease in disease incidence (%)
	Before treatment	40 day after treatment		Before treatment	40 day after treatment		Before treatment	40 day after treatment	
Kemazed	62.0	12.5	79.8	61.0	8.3	85.4	61.0	11.7	80.8
Kocide 2000	57.8	15.2	73.7	53.8	9.2	82.9	52.0	25.3	51.3
Ridomil Gold Plus	60.0	13.7	77.2	54.8	8.7	84.1	62.0	18.4	70.3
Rizolex T	64.0	8.6	86.6	62.0	5.7	90.8	65.0	10.5	83.8
Score	67.0	10.6	84.2	60.0	7.5	87.5	61.0	8.6	85.9
Topsin M_{70}	65.5	5.6	91.4	52.0	3.7	92.9	60.0	5.0	91.7
Control	70.6	78.4	-	71.6	80.5	-	75.2	84.6	-
L.S.D at 0.05:									
Fungicides (A) =	2.90			3.18			3.39		
Treatment time (B)=	1.71			1.83			1.95		
A x B =	4.20			4.50			4.79		

Discussion

Date palm is subjected to attack by many fungal diseases during its growth in New Valley Governorate. Survey of such diseases in different localities of New Valley Governorate was conducted during years 2010 and 2011. Results reported herein indicated that leaf base rot, black scorch, and inflorescences rot are considered the most important fungal diseases in New Valley Governorate, since they cause a major problem on date palm off-shoot and trees. Occurrence of one or more of such diseases on date palm trees and off-shoot in different countries has been reported by many researchers (Abdalla *et al.,*1992; Barakat *et al*., 1992; Gariani *et al.,* 1994; Edongali, 1996; Rashed, 1998; El-Zawahry *et al.,* 2000; El-Alwani and El-Ammari, 2001; Al-Sharidi and Shahwan, 2003; El-Deeb *et al.,* 2006; Arab *et al*., 2007 and El-Morsi *et al.,* 2007b and c).

Results also indicated that, locality and plant age affected incidence and severity of such diseases. Since, the highest percentage of disease incidence and severity with black scorch and inflorescences rot diseases was recorded on date palm trees (var. Saidy) in orchards. However, the highest percentage of disease incidence and severity with leaf base rot disease was recorded on date palm off-shoot in nurseries. The recorded differences in the occurrence of fungal diseases on date palm trees or new off-shoot of var. Saidy in different nurseries and orchards of New Valley areas may be due to differences that existed among environmental factors and management porticos followed in surveyed areas as well.

Pathogenic ability of isolated fungi was tested on date palm rachises, male and female spathes of var. Saidy. *Botryodiplodia theobromae* proved to be the causal fungus of leaf base rot, however, *Thielaviopsis paradoxa* is the cause of black scorch and inflorescences rot diseases of date palm off-shoot and trees in New Valley Governorate. Such results are in accordance with those reported by many researchers (Abdalla *et al.*, 1992; Barakat *et al.,* 1992; Gariani *et al.,* 1994; Mubarak *et al.*, 1994; Rashed, 1998; Al-Sharidi and Shahwan, 2003; El-Deeb *et al.,* 2006 and Arab *et al*., 2007). Variation existed in pathogenic capabilities of the tested isolates of fungi were previously mentioned by El-Zawahry *et al*. (2000) and El-Morsi *et al.* (2007a, and c).

Varietal reaction of date palm off-shoots varieties Higazi, Saidy and Tamr on the tested diseases indicated that var. Saidy was the highly susceptible date palm to leaf base rot disease, followed by var. Higazi. Whereas, var. Higazi was the highly susceptible one to black scorch and inflorescence rot diseases, followed by var. Saidy, while, var. Tamr was the least susceptible one to all tested diseases. Such results are in harmony with those of many researchers (Abdalla *et al.,* 1992; Sabet *et al*., 1995; Rashed, 1998; El-Zawahry *et al.,* 2000; Al-Sharidi and Shahwan, 2003; Kararah and Ammar, 2003; Arab *et al*., 2007). Variation in susceptibility of the tested date palm varieties to diseases may be due to the physiological and/or anatomical and/or genetical variation existed among the tested date palm varieties which affect the host-parasite-interaction.

Efficiency of the tested fungicides for controlling fungal diseases of var. Saidy date palm off-shoots was different. Topsin M_{70}, Rizolex-T, Score, Kemazed and Ridomil gold plus were the best of tested fungicides to control leaf base rot, black scorch and inflorescences rot diseases. Such results are in agreement with those reported by many researchers (Abdalla *et al.*, 1992; Mubarak *et al.*, 1994; Sabet *et al*., 1995; Rashed, 1998; Kararah and Ammar, 2003; Kamhawy *et al.,* 2006 and El-Morsi *et al*., 2007 b and c). Variation in efficiency of the tested fungicides in controlling the tested diseases may be due to differences in the tested pathogens and mode of action of the tested fungicides.

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دراسات مرضية على الأمراض الفطرية لنخيل البلح بمحافظة الوادى الجديد

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اجريت هذة الدراسة خلال عامين ٢٠١٠/٢٠١١ بغرض حصر الأمراض الفطرية التى تصيب فسائل وأشجار نخيل البلح للصنف الصعيدى الأكثر انتشارا فى مشاتل وحقول الواحات الخارجة والداخلة والفرافرة بمحافظة الوادى الجديد، والتعرف على الفطريات المسببة لها، وكذلك دراسة قابلية أصناف نخيل البلح المنتشرة بالمحافظة للإصابة بهذه الأمراض.

ولقد تبين من الدراسة تواجد أمراض عفن قواعد الأوراق ، واللفحة السوداء ، وعفن النورات على فسائل وأشجار نخيل البلح فى المشاتل والبساتين بدرجات متفاوتة فى المناطق التى شملها الحصر ، حيث اختلفت نسبة الإصابة وشدة المرض بتلك الأمراض على الفسائل والأشجار المصابة ، وتم عزل العديد من الأنواع لأجناس فطرية مختلفة من العينات المصابة لكل مرض ، واختلف التوزيع التكرارى لتلك الفطريات تبعا لاختلاف أجناسها والمواقع والأجزاء المعزولة منها.

أثبتت اختبارات القدرة المرضية للفطريات المعزولة على صنف النخيل الصعيدى تحت ظروف المشتل والعدوى الصناعية أن الفطر بوتريودبلوديا ثيوبرومى هو المسبب لمرض عفن قواعد الأوراق ، والفطر ثيلافيوبسيس بارادوكسا هو المسبب لمرضى اللفحة السوداء ، وعفن النورات على فسائل وأشجار نخيل البلح فى محافظة الوادى الجديد.

تم اختبار قابلية إصابة ثلاث أصناف من نخيل البلح المنتشرة بالمحافظة وهى (حجازى ، وصعيدى ، وتمر) لتلك الأمراض الفطرية وكان الصنف الصعيدى أكثر الأصناف حساسية للإصابة بمرضى عفن قواعد الأوراق ، يليه الصنف الحجازى ، بينما كان الصنف حجازى أكثر الأصناف حساسية للإصابة بمرضى اللفحة السوداء ، وعفن النورات يليه الصنف صعيدى بينما كان الصنف تمرأقل حساسية للإصابة بتلك الأمراض.

كما أظهرت المبيدات الفطرية المختبرة كفاءة متباينة فى مكافحة الأمراض المختلفة على فسائل نخيل البلح (للصنف الصعيدى) فى المشتل ، وكانت أفضل المبيدات الفطرية المختبرة علي التوالي هي : توبسين م٧٠ ، وريزولكس تى ، سكور، وكيمازد ، وريدميل جولد بلس فى مكافحة أمراض عفن قواعد الأوراق ، واللفحة السوداء وعفن النورات.