J. Agric. Sci. Mansoura Univ., 31 (12): 7589 - 7604, 2006

EVALUATION OF SOME PEANUT CULTIVARS FOR THE SUSCEPTIBILITY OF INFECTION BY DAMPING –OFF, ROOT AND POD ROT DISEASES AND OCCURRENCE OF AFLATOXIGENIC FUNGI

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ABSTRACT

Under greenhouse and field conditions all peanut cvs. tested varied in their susceptibility to infection by damping - off, and peanut root rots, Ismailia I and R 92 cvs. were the most resistant against infection by damping -off, and peanut root rot diseases and gave the highest percentage of survived plants, while Giza 5, Giza 4 and Gorgia cvs. were the highly susceptible cultivars to infection by damping-off and peanut root rot. Varietal reaction showed that pod rot diseases were common on all cultivars and the nine cultivars tested differed greatly in their reaction to the diseases, also no one of these cvs. showed completely resistance to aflatoxin production and invasion with aflatoxigenic fungi. *Aspergillus flavus* was more invasive than *Aspergillus parasiticus* and often dominated in peanut seeds than shells. Giza 4, Gorgia and Giza 5 cvs. were the highest susceptible one to pod rot diseases and recorded at the same time the highest frequency of aflatoxigenic fungi and content of aflatoxin. While, R 92 and Ismailia 1 cvs. appeared high resistance in this respect.

INTRODUCTION

Peanut, (*Arachis hypogaea* L.) is one of the most export and locally consumed crops in Egypt. Pod rot, damping – off, wilt and root rot diseases are among the most destructive fungal diseases attacking peanut in Egypt (Al-Ahmer *et al.,* 1989). They cause serious quantitative and qualitative losses in peanut yield; therefore growing peanuts in these soils becomes unprofitable (Hilal *et al.,* 1994 and Hassan and Frederick, 1995). Meanwhile preharvest aflatoxin contamination is one of the most challengers facing the peanut producers (Payne, 1998). *Aspergillus flavus and A. parasiticus* were the predominant fungi infected peanut before harvest and causing contaminations with aflatoxin (Wilson and Payne, 1994, Xue *et al.,* 2003 and Mahmoud, 2004).

Peanut cultivars were found to be differ greatly in their reaction to damping–off; wilt, root rot and peanut pod rot diseases (Hilal *et al.,* 1994, Mehan *et al.,* 1995 Marei 2000 and Hussin, 2005). Hilal *et al., (*1994) noticed that cv. Giza 5 followed by cvs. Local–235 and Local–262 were the least susceptible cultivars to damping–off and root rot diseases. Where, Giza 4 cv. followed by Local–226, Local–406 Local–415 cvs. were the highest susceptible ones. While, Abd- El-Moneem *et al.,* (2003) found that cv. Giza 4 was moderately susceptible to *F. oxysporum* and susceptible to *S. rolfsii* and Giza 5 was moderately resistant to both pathogens. Meanwhile Hussin, (2005) found that, cvs Ismaillia 1 and R 92 were the most resistant against

infection by damping – off, wilt and peanut root rot diseases while cvs. Gorgia, NC 9, Giza 5 were the highest susceptible ones.

Under field conditions of Ismaillia governorate, local and Intrnational. 323 cvs. were the least susceptible to pod rot diseases, where the Giza 4 and Giza 5 cvs. showed the highest percentage of peanut pod rot (El-Deeb and Ibrahim, 1998). Also, Marei (2000) found that, pod rot diseases were common on all cultivars. Pods having dry brown lesions appeared on all cultivated cvs. while, the percentage of pink discoloration was low in all cultivated cvs. Giza 5 cv. was recorded the highest percentage of the diseases incidence.

There are no cultivars were completely resistant to aflatoxin production after seed invasion achieved with aflatoxigenic fungi, while there were a differed significance in their ability to allow invasion and aflatoxin production (Naguib *et al.*, 1989, Verma *et al.*, 1996, Javed *et al.*, 1998 and Hasan *et al.*, 2002). In this respect, Naguib *et al.*, (1988, 1989) stated that, Giza 4 cv. was the highest cultivar in colonized with aflatoxigenic fungi and aflatoxin contaminations. These results supported by Hasan *et al.*, (2002) who tested twelve peanut cvs. under greenhouse and field conditions for their reaction to aflatoxigenic fungi and indicated that Intr. 19 and N 7 were the least susceptible cvs. whereas Giza 4 and Giza 5 cvs. showed the highest percentage of infection by aflatoxigenic fungi.

The aim of this research is an attempt to study the reaction of some peanut cultivars to infect by peanut root rots and pod rots diseases as well as determined occurrence of aflatoxigenic fungi and aflatoxin contaminations.

MATERIALS AND METHODS

1. Isolation of causal organisms:

The fungal isolates which used throughout this study were previously isolated by the authors from diseased peanut plants or pods and their pathogenic capabilities were confirmed also.

2. Preparation of fungal inoculum:

(A): Inocula of *Fusarium solani*, *Fusarium oxysporium*, *Fusarium moniliforme*, *Macrophomina phaseolina*, *Rhizoctonia solani*, *Sclerotium rolfsii* were prepared using sorghum - coarse sand - water (2:1:2 v/v) medium. The ingredients were mixed, bottled and autoclaved for 2 hours at 1.5 atm. The sterilized medium was inoculated using agar discs, obtained from the periphery of 5-day-old colony of each of the fungi. The inoculated media were incubated at 28°C for 15 days before used for soil infestation.

(B): Inocula of aflatoxigenic fungi, *i.e. Aspergillus flavus* and *A. parasiticus* were prepared, as described by Salah *et al.*, (1999), by growing each isolate on potato dextrose agar (PDA) medium for 7 days at 27°C. Fungal spores were collected in 0.1% plain agar solution to prepare spore suspension of 4 X 10^6 spores/ml for artificial infestation of soil.

3. Soil Infestation:

Two different methods for soil infestation with the pathogens tested were used throughout this study:

(A): Mixture of *F. solani, F. oxysporium, M. phaseolina, R solani* and *S. rolfsii* for root rots disease and mixed of *F. moniliforme*, *M. phaseolina*, *R.*

solani and *S. rolfsii* for studying pod rots complex diseases, the inocula were mixed thoroughly with soil surface of each pot, at the rate of 2% w/w, and were covered with a thin layer of sterilized soil. Infested pots were irrigated and kept for 7 days until sowing.

(B): Each Kg of Soil was infested with 10 ml conidial suspension ($4x10^4$ spore/ml) of separately and mixed isolates of *Aspergillus flavus* and *A. parasiticus*, 30 days after sowing for study the effect of aflatoxigenic fungi and aflatoxin contaminations.

4. Disease assessment

(A) Disease assessment was measured as percentages of pre- and post-emergence damping-off after 15 and 30 days from sowing, respectively. Percentages of pre- and post-emergence damping-off were calculated using the following formula:

$$\% \text{ Pre- emergence} = \frac{\text{Number of non germinated seeds}}{\text{Number of sown seeds}} X\,100$$

$$\% \text{ Post- emergence} = \frac{\text{Number of dead seedlings}}{\text{Number of sown seeds}} X\,100$$

(B) Percentages of infected plants by root-rot and survived healthy plants were estimated after uprooting (120 days from sowing) as follows.

$$\% \text{ Root – rot} = \frac{\text{Number of plants with root - rot}}{\text{Number of total standing plants}} X\,100$$

$$\% \text{ Healthy plants} = \frac{\text{Number of survivrd healthy plants}}{\text{Number of total standing plants}} X\,100$$

(C) At harvest, percentage of pod rot was recorded. Four categories for apparent symptoms of pod rots beside the healthy pods were adopted according to Satour *et al.*, (1978): a) Rhizoctonia rot, pods with dry brown lesion, b) Fusarium rot, pods with pink discoloration and c) complex rot pod with general breakdown resulting from many fungi.

(D) Aflatoxigenic fungi, which associated with the four categories, were isolated after harvesting according to Garren and Porter (1970). Two seeds fruits were shelled and $1cm^2$ pieces of shell and seed were surface-disinfested for three minutes in 1% sodium hypochlorite and plated on potato dextrose agar (PDA) medium (4 plates in 4 replicates, 5 seeds or shell pieces per dish). Plates were examined after 7 days of incubation at 27 °C, for fungal ptopagules. Identification of the isolates was carried out based on taxonomic criteria for these fungi as described by Maren and Johan (1988).

5. Oil content:

Oil extraction was carried out according to A.O.A.C. (1998). Dried seeds were prepared to be extracted using hexane as a solvent in a soxhelt apparatus for 16 hours. Hexane was then evaporated; residue was dried for 20-30 minutes at 70-80°C, cooled and weighed. Drying and weighing alternately to constant weight.

6. Extraction of aflatoxin:

The extraction of aftatoxins was conducted according to A.O.A.C (1998). The samples were blended with 250ml methanol -water (55:45, v/v) and 100ml hexane for 1 min. at high speed. The mixture was transferred to the centrifuge tube and centrifuged for 5 min. at 2000 rpm. An aliquot from the aqueous methanol phase (25 ml) was taken into separator contained chloroform. The separator funnel was shaken (30-60 sec.); the bottom layer (chloroform) was separated and concentrated using rotary evaporator. The residue was quantitatively transferred using small volumes of chloroform. The solvent was completely removed under nitrogen flew.

7. Determination of aflatoxin:

Aflatoxins were determined according to Singh *et al.*, (1991) using thin layer chromatographic technique as follows; the dried film representing the aflatoxins in the samples was dissolved in a known amount of chloroform. The aflatoxin standards were spotted along with the samples. The plates were developed using a mixture of acetone-chloroform (1:9, v/v), the chromatoplates were detected under UV lamp at 365nm. The concentration of aflatoxin was calculated using the formula:

$$\mu g / Kg = (S.Y.V.)/ (X.W)$$

Where:

S= volume of aflatoxin standard, in µL of equivalent intensity of sample.
Y= concentration of aflatoxin standard in µg/ml.
V= volume of solvent required to dilution final extract in µL.
X= volume of sample extract in µL required to give fluorescence intensity comparable to that of S µL of standard.
W= weight of original sample in gram contained in the final extract.

8. Greenhouse experiment:

Nine peanut cultivars, namely Giza 4, 5, and 6, Georgia, Ismailia 1, NC 7, NC 9, NC 12 and R 92, were evaluated for their reaction to root and pod rot diseases, occurrence of aflatoxigenic fungi and aflatoxin contaminations under artificial inoculation in greenhouse. Ten seeds of each peanut cultivar were planted in 50 cm diameter-disinfested plastic pots, which containing sterile sandy clay soil 2:1 previously autoclaved for 2 hours. Four replications were used for each treatment and allocated in the greenhouse following a complete randomized block design.

8.1. Reaction of peanut cultivars to root rots disease:

The above described soil infestation technique (A) was used in this study. Healthy seeds of eight peanut cultivars were sown in potted soil (50 cm. diameter) containing manually prepared mixture of *F. solani, F. oxysporium, M. phaseolina, R solani* and *S. rolfsii.* Ten seeds of each cultivar were surface sterilized and sown separately. Disease assessment was accomplished as described before.

8.2. Reaction of peanut cultivars to pod rots disease:

Apparently healthy seeds of eight peanut cultivars were sowing in potted soil (50 cm) containing inoculum about 100g (2% w/w) of a manually

mixture of *R. solani, S. rolfsii, F. moniliforme,* and *M. phaseolina*. Ten seeds of each cultivar were planted separately with surface sterilized and the number of plant reduced to 5 after forty days from sowing. Disease assessment was accomplished as described before.

8.3. Reaction of peanut cultivars to aflatoxigenic fungi:

Artificial inoculation of peanut plants by *Aspergillus flavus* and *A. parasiticus* separately and their mixtures were prepared according to (Salah *et al.*, 1999). Spore suspension was used for artificial inoculation of peanut pots after 30 days from planting as shown before. The frequency of invasion by aflatoxigenic fungi were recorded in each pod and the content of aftatoxins were determined in apparent healthy pods, 5 days after harvest, as previously described.

9. Field experiment:

Field experiments were carried out during 2004 and 2005 seasons, in naturally infested field soil, at Ismailia Experimental Station of Agriculture Research Center (ARC). The soil type was sandy loam (77% sand, 11% silt and 12% clay; pH 7.98). Peanut seeds, cvs Giza 4, 5, and 6, Georgia, Ismailia 1, NC 7, NC 9, NC12 and R 92, were used for sowing throughout this study. Seeds were sown on the first week of May with 10 cm spacing between plants. The experimental unit area was 10.5 m^2 (1/400 fed.). Each plot include six rows; 3.5m in length and 50 cm widths. The experiment was arranged in a completely randomized block design with four replicates. Cultural practices such as fertilization, irrigation and pest control were carried out as usually.

Disease assessment was recorded as percentages of pre- and post-emergence damping-off after 15 and 30 days from sowing, respectively. Percentages of root rot and survived plants at harvest time were calculates as mentioned before. Plants in individual plots were dug (harvested) and inverted based on an optimum maturity index. Pods were threshed, air-dried for three days and weighted for pod yield calculation and percentage of pod rots were recorded as shown before.

The frequency of invasion by aflatoxigenic fungi were recorded in each pod rot type and the content of aflatoxins were determined in apparent healthy pods 5 days after harvest, as previously described.

10. Statistical analysis:

The data were statistically analyzed by analysis of variance (ANOVA) using the Statistical Analysis System (SAS Institute, inc, 1996). Means were separation by Duncan's Multiple Range Test at P = 0.05 level.

RESULTS

1. Reaction of peanut cultivars to damping - off and root rots:

1.1. Greenhouse experiment:

Data presented in Table (1) indicated that, Gorgia followed by Giza 4, Giza 5 and NC 9 peanut cultivars were the highest susceptible to pre-emergence damping-off while cvs. Ismailia 1 and R 92 recorded the lowest infections (%), Giza 4 followed by both of Giza 5 and NC 7 recorded the

highest percentages of infections by post-emergence damping-off, while cvs R 92 and Ismailia 1 gave the lowest one. Regarding to root rot disease, R 92 and Ismailia 1 cvs recorded the least disease incidence while cv. Giza 5 was the highest susceptible one. In general cvs. R 92 followed by Ismailia 1 gave the highest percentage of survival plants while Giza 5 and Giza 4 were the most susceptible when recorded the lowest percentage.

Table (I): Reaction of some peanut cultivars to damping-off and root rots infection under greenhouse conditions in artificially infested soil [y].

Cultivars	Damping-off (%)		Root rot (%)	Survival (%)
	Pre-	Post-emergence		
Giza 4	14 ab [z]	14 a	18 abc	54 d
Giza 5	14 ab	12 ab	22 a	52 d
Giza 6	10 bc	IO abc	16 bcd	64 bc
Gorgia	16 a	IO abc	18 abc	56 cd
Ismailia 1	8 c	8 bc	14 cd	70 ab
NC 7	12 abc	12 ab	20 ab	56 cd
NC 9	14 ab	IO abc	18 abc	58 cd
NC 12	10 bc	IO abc	20 ab	60 cd
R 92	8 c	6 c	12 d	74 a

y) Five replicates for each treatment, soil in each pot was infested with a mixture of pathogenic fungi at the rate of 2% (w/w).

z) Means in each column with the same letter are not significantly different according to Duncan's Multiple Range Test (P = 0.05).

1.2. Field experiment:

The cultivars tested (Table 2) varied in their susceptibility to infection by root diseases under field condition during two growing seasons (2004 and 2005). In this respect, cvs Ismailia 1 and R 92 were the most resistant against infection by pre- and post-emergence damping-off, and root rot diseases and gave the highest percentages of survived plants in both seasons. Gorgia cv. was the highest susceptible to infection by pre- emergence, while cv. Giza 4 recorded the highest percentages of post-emergence and cv. Giza 5 recorded the highest root rot infection in both growing seasons.

2. Reaction of peanut cultivars to pod rot diseases and occurrence of aflatoxigenic fungi:

2.1. Greenhouse experiment:

2.1.1 Reaction of peanut cultivars to pod rot incidence:

Giza 4 and Gorgia cvs. (Table 3) were the highest susceptible cultivars to all categories of pod rot incidence. R 92 and Ismailia 1 cvs recorded the lowest percentages of dry brown lesion pods, general breakdown and pods with pink discoloration. However, R 92 cv. followed by Ismailia 1 cv. recorded the highest percentage of apparent healthy pods.

Table (2): Reactions of some peanut cultivars to damping-off and root rot infection under field conditions during 2004 and 2005 seasons [y].

Season 2004				
Cultivars	Damping-off (%)		Root rot (%)	Survivals (%)
	Pre-emergence	Post-emergence		
Giza 4	10.88 b [z]	11.57a	12.19 bc	65.39 cd
Giza 5	9.33 bcd	9.09 ab	18.30 a	63.28 d
Giza 6	6.80 cd	6.00 b	11.47 bcd	75.73 ab
Gorgia	14.29 a	6.98 b	12.82 b	65.92 bcd
Ismailia 1	4.63 e	5.89 b	9.10 cd	80.38 a
NC 7	9.91 bc	7.20 ab	11.31 bcd	71.58 abcd
NC 9	9.82 bc	8.10 ab	12.14 b	69.94 bcd
NC 12	7.23 cde	6.18 b	13.23 b	73.36 abc
R 92	6.39 de	5.00 b	8.71 d	79.90 a
Season 2005				
Cultivars	Damping-off (%)		Root rot (%)	Survivals (%)
	Pre-emergence	Post-emergence		
Giza 4	9.90 b	11.55 a	16.55 ab	62.00 c
Giza 5	11.28ab	9.21 ab	18.04 a	61.47 c
Giza 6	9.09 bc	8.00 b	12.86 c	70.05 bc
Gorgia	14.11 a	8.00 b	14.40 bc	63.49 c
Ismailia 1	6.17 c	6.29 b	7.95 d	79.59 a
NC 7	11.32 ab	8.80 ab	14.85 bc	65.03 c
NC 9	10.31 b	9.16 ab	16.45 ab	64.08 c
NC 12	10.31 b	9.00 ab	12.40 c	68.29 c
R 92	8.98 bc	6.00 b	6.80 d	78.22 ab

y) Four replicates were used for each treatment; the area of field plot was 10.5 *ml.*

z) Means in each column with the same letter are not significantly different according to Duncan's Multiple Range Test (P = 0.05).

Table (3): Evaluation of some peanut cvs. for pod rots incidence under greenhouse conditions in artificially infested soil [y].

Cultivars	Disease incidence (%)			Apparent healthy (%)
	Dry brown lesion	Pink discoloration	General breakdown	
Giza 4	18.64 [z]	4.14 a	22.42 a	54.80 e
Giza 5	15.60 bc	2.90 c	18.06 b	63.44 c
Giza 6	15.21 c	2.08 d	15.56 cd	67.15 b
Georgia	18.10a	3.57ab	18.28 b	60.04 d
Ismailia 1	12.04 d	I.I0 e	13.69 e	73.17 a
NC 7	14.33 c	1.97d	14.49 de	69.21 b
NC 9	17.85 a	3.21 bc	17.10 bc	61.78 cd
NC 12	17.54 ab	3.00 bc	16.55 bc	62.91 c
R 92	11.48 d	1.01 e	13.04 e	74.47 a

y) Five replicates for each treatment, soils in each pot were infested with mixture of fungi at the rate of 2% (w/w),

z) Means in each column with the same letter are not significantly different according to Duncan's Multiple Range Test (P = 0.05).

2.1.2 Reaction of peanut cultivars to occurrence of aflatoxigenic fungi and aflatoxin content:

Aspergillus flavus recorded higher frequency than *A. parasiticus* in all peanut cvs. whether was infested separately or in mixture (Table 4).

Table (4): Evaluation of some peanut cvs. for occurrence of *Aspergillus flavus, A. parasiticus* and aflatoxin content in shells and seeds under artificial inoculation conditions.

Cultivars	Pod	*Aspergillus flavus*			*Aspergillus parasiticus*			*A. flavus + A. parasiticus*			
		A. flavus (%)	Content of aflatoxin (ppb)		*A. parasiticus* (%)	Content of aflatoxin (ppb)		*A. flavus* (%)	*A. parasiticus* (%)	Content of aflatoxin (ppb)	
			B_1	B_2		B_1	B_2			B_1	B_2
Giza 4	Shell	15	80	50	10	50	20	20	10	81	53
Giza 5		10	30	0.0	5	0.0	0.0	15	5	30	20
Giza 6		10	0.0	0.0	5	0.0	0.0	10	5	0.0	0.0
Georgia		15	75	30	10	20	15	20	10	65	40
Ismailia 1		5	0.0	0.0	0.0	0.0	0.0	10	5	0.0	0.0
NC 7		10	0.0	0.0	5	0.0	0.0	5	0.0	0.0	0.0
NC 9		10	0.0	0.0	5	0.0	0.0	10	5	0.0	0.0
NC12		10	0.0	0.0	5	0.0	0.0	15	5	0.0	0.0
R 92		0.0	0.0	0.0	0.0	0.0	0.0	10	0.0	0.0	0.0
Giza 4	Seed	20	195	120	15	120	70	30	20	305	153
Giza 5		15	110	35	10	65	20	20	10	210	34
Giza 6		10	66	0.0	10	0.0	0.0	20	10	99	20
Georgia		15	130	60	15	85	45	25	10	234	85
Ismailia 1		5	10	10	0.0	0.0	0.0	10	5	20	10
NC 7		10	10	0.0	10	0.0	0.0	25	20	22	14
NC 9		10	20	0.0	10	0.0	0.0	20	20	30	15
NC 12		10	135	42	5	48	25	20	15	171	51
R 92		5	10	0.0	5	0.0	0.0	10	5	15	0.0

***Each value is mean of four replicates (4 plates / replicate , five seeds or shell pieces per dish) were incubated on PDA medium for 7 days at 27 °C**

With all infestation treatments R 92 followed by Ismailia 1 cvs. gave the lowest frequency of aflatoxigenic fungi in shells and seeds while, the highest frequency in this respect recorded with cvs. Giza 4, Gorgia and Giza 5.

Data also indicate that, aflatoxin was detected in seed of all tested cultivars while in shell detected in cvs. Giza 4, Giza 5 and Gorgia. In general aflatoxin B_1 was higher than B_2 whether in shell or seed in all tested cultivars. The highest contamination from aflatoxin B_1 and B_2 in all tested cultivars recorded with Giza 4 followed by Gorgia whether in shell or seed in all infested treatments. In seeds the lowest contamination from aflatoxin B_1 recorded with R 92 cv. followed by Ismailia I cv. while, from B_2 recorded with cv. Ismailia I and cv. R 92 came free.

2.2. Field experiment:

2.2.1. Reaction of peanut cultivars to pod rot incidence:

Results clearly indicate that, cultivars varied in their susceptibility to infection with pod rot under field condition during 2004 and 2005 growing seasons (Table 5).

Table (5): Evaluation of some peanut cvs. for pod rots incidence, pod yield, yield loss and oil content under field conditions during 2004 and 2005 growing seasons [y].

Season 2004						
Cultivars	Disease incidence (%)			Apparent healthy (%)	Pod yield (Ton/fed)	% of oil content
	Dry brown lesion	Pink discoloration	General breakdown			
Giza4	16.26a [z]	3.29 a	19.92 a	60.53 d	1.018 c	47.29 d
Giza5	13.55abc	2.05 abc	11.41 cd	72.98 b	1.063 bc	48.21 c
Giza6	12.62 bc	1.53 bc	11.21 cd	74.64 b	1.140 a	48.94 b
Gorgia	14.19ab	2.72 ab	15.56b	67.53 c	0.992 cd	50.20 a
Ismailia 1	10.41 cd	0.92 cd	7.05 c	81.62 a	1.081abc	50,23 a
NC7	11.58 bc	1.80 bc	13.96 bc	72.66 b	0.919 de	50.32 a
NC9	12.13 bc	1.47 bc	14.62 bc	71.80 bc	0.900 de	49.98 a
NC12	12.65 bc	2.10 abc	14.93 b	70.32 bc	0.896 e	50.17 a
R92	8.22 d	0.00 d	9.20 ed	82.59 a	1.120ab	49.88 a
Season 2005						
Cultivars	Disease incidence (%)			Apparent healthy (%)	Pod yield Ton/fed	% of oil content
	Dry brown lesion	Pink discoloration	General breakdown			
Giza4	14.36 a	3.43 a	17.41 a	64.80 e	1.065 cd	47.27 d
Giza5	9.71 b	2.00 ab	13.76b	74.53 bc	1.093 bc	48.46 c
Giza6	8.99 bc	2.22 ab	12.68 bc	76.11 b	1.153 a	49.36 b
Gorgia	13.59 a	2.67 ab	14.76 ab	68.98 d	1.008 de	50.20 a
Ismailia 1	6.50 cd	1.08 bc	9.82 cd	82.61 a	1.132 ab	50.38 a
NC7	13.22 a	1.83 ab	12.99 b	71.95 cd	1.011 de	49.91 a
NC9	12.47 a	2.02 ab	13.81 b	71.70 cd	1.000 de	49.98 a
NC12	12.27 a	2.37 ab	8.28 d	77.08 b	0.950 e	50.39 a
R92	6.29 d	0.00 c	8.01 d	84.06 a	1.130 ab	50.37 a

y) Four replicates for each treatment, the field plot was 3.0 x 3.5m (10.5 m =1/400 Fed.).
z) Means in each column with the same letter are not significantly different according to Duncan's Multiple Range Test (P = 0.05).

In this respect, R 92 and Ismailia 1 cvs. were the most resistant against infection with all categories of peanut pod rot diseases, while cvs. Giza 4 and Gorgia were the highest susceptible to all pod rots incidence categories during the two seasons. Also, peanut pod yield production significantly varied among the peanut cultivars tested.

The highest total peanut yield in the two seasons produced by Giza 6 cv. while NC 12 cv. produced the lowest yield. Data also indicate that, the percentage of oil content showed no significant differences between Gorgia, Ismailia 1, NC 7, NC12 and R 92 cvs. during the two seasons. Giza 4 cv. recorded the lowest percentage of oil content. Data also showed that, no clear relation between pod rot incidence and the percentage of seed oil content.

2.2.2. Reaction of peanut cultivars to occurrence of aflatoxigenic fungi and aflatoxin content:

A. flavus were more invasive to either pod shells or seeds than *A. parasiticus* and both fungi occurred at high frequency in seeds compared with pod shells. However, both aflatoxigenic fungi have occurred in high frequency in pods with dry brown lesion or general breakdown (Tables 6 and 7). Data also obtained that, Giza 4, Gorgia and Giza 5 cvs. were the highest susceptible cultivars to infection by aflatoxigenic fungi and recorded the highest frequency in all pod rot categories in shells or seeds during the two seasons. The lowest frequency of aflatoxigenic fungi in all pod rot categories were in R 92 and Ismailia 1 cvs. whether in shell or seed during 2004 and 2005 growing seasons. On shell, all cultivars came free from any aflatoxin contaminations except Giza 4, Gorgia and Giza 5 cvs during 2004 season and Giza 4, Gorgia, Giza 5 and Giza 6 cvs. during 2005 season.

On seed, Giza 4 and Gorgia followed by Giza 5 and Giza 6 cvs. gave the highest contaminations with aflatoxin B_1 and B_2 during the two seasons. The lowest value of aflatoxin B_1 was in NC 12 cv. during season 2004 and NC 9 cv. during season 2005 while, the lowest value of aflatoxin B_2 was in Giza 6 cv. during seasons 2004 and NC 9 cv. during seasons 2005. Ismailia 1 and R29 cvs. came free from any aflatoxin contaminations (B_1 and B_2) during the two growing seasons whether in shell or seed.

DISCUSSION

The present results demonstrate that all peanut cvs tested. varied in their susceptibility to infection by damping - off, and peanut root rot under greenhouse and field conditions. These results are in agreement with Al-Ahmer *et al.,* (1989), Hilal *et al.,* (1994) and Mehan *et al.,* (1995). In this respect, cvs Ismailia 1 and R 92 were the most resistant against infection with damping - off, and peanut root rot diseases and gave the highest percentage of survived plants. These results are similar to those reported by Hussin, 2005 who found that, cvs. Ismaillia 1 and R 92 were the most resistant against infection with damping - off, wilt and peanut root rot diseases. Giza 5, Giza 4 and Gorgia were the highly susceptible cultivars to infection by damping-off and peanut root rot. These results are an accordance with those of El-Deeb and Ibrahim, (1998), Abd-El-Moneem *et al.,* (2003) and Hussin (2005) This may be due to the different of root exudates contents of cultivars which inhibited or enhanced the pathogens to infect peanut roots, in this respect Abd- El-Moneem *et al.,* (2003) found that, the growth of *F. oxysporum* and *S. rolfsii in vitro* was inhibited by the root exudates of cv. Local 235 but was enhanced by the root exudates of cv. Giza 5.

Table (6):Evaluation of some peanut cvs. for occurrence of *Aspergillus flavus, A. parasiticus* and aflatoxin content in shells and seeds under field conditions during 2004 growing season.

Cultivars	Pod	Disease incidence						Apparent healthy		Content of aflatoxin (ppb)	
		Dry brown lesion		Pink discoloration		General breakdown					
		A.flavus	*A.parasiticus*	*A.flavus*	*A.parasiticus*	*A.flavus*	*A.parasiticus*	*A.flavus*	*A.parasiticus*	B_1	B_2
Giza 4	Shell	15	5	5	0.0	20	5	10	5	32	11
Giza 5		10	5	5	5	15	10	10	0.0	15	0.0
Giza 6		10	5	0.0	0.0	10	10	0.0	0.0	0.0	0.0
Gorgia		20	10	5	5	20	10	15	0.0	20	10
Ismailia 1		5	0.0	0.0	0.0	5	0.0	0.0	0.0	0.0	0.0
NC 7		10	5	10	5	10	5	5	0.0	0.0	0.0
NC 9		10	5	5	5	10	5	0.0	0.0	0.0	0.0
NC 12		5	0.0	5	5	10	0.0	10	5	0.0	0.0
R 92		0.0	0.0	0.0	0.0	10	0.0	0.0	0	0.0	0.0
Giza 4	Seed	20	10	10	5	35	15	25	15	150	144
Giza 5		20	10	5	5	20	10	10	10	100	52
Giza 6		15	5	5	0.0	20	10	10	10	68	41
Georgia		20	10	10	5	30	15	15	15	119	60
Ismailia 1		10	5	0.0	0.0	10	10	10	10	0.0	0.0
NC 7		15	5	10	0.0	15	10	5	10	0.0	0.0
NC 9		10	5	5	0.0	10	10	5	5	0.0	0.0
NC 12		20	10	5	5	20	15	15	15	38	0.0
R 92		10	0.0	0.0	0.0	10	5	5	5	0.0	0.0

*Each value is mean of four replicates (4 plates / replicate , five seeds or shell pieces per dish) were incubated on PDA medium for 7 days at 27 °C

Table (7): Evaluation of some peanut cvs. for occurrence of *Aspergillus flavus*, *A. parasiticus* and aflatoxin content in shells and seeds under field conditions during 2005 growing season.

Cultivars	Pod	Disease incidence						Apparent healthy		Content of aflatoxin (ppb)	
		Dry brown lesion		Pink discoloration		General breakdown					
		A.flavus	*A.parasiticus*	*A.flavus*	*A.parasiticus*	*A.flavus*	*A.parasiticus*	*A.flavus*	*A.parasiticus*	B_1	B_2
Giza 4	Shell	20	10	5	5	20	15	20	5	40	21
Giza 5		10	10	5	0.0	10	10	5	5	24	10
Giza 6		10	10	5	0.0	15	10	5	0.0	20	0.0
Gorgia		15	10	5	0.0	20	10	15	5	35	18
Ismailia 1		0.0	0.0	0.0	0.0	10	5	0.0	0.0	0.0	0.0
NC 7		10	5	10	5	10	10	5	0.0	0.0	0.0
NC 9		10	5	10	5	10	10	5	5	0.0	0.0
NC12		10	0.0	0.0	0.0	10	10	5	5	0.0	0.0
R 92		5	5	0.0	0.0	5	5	0.0	0.0	0.0	0.0
Giza 4	Seed	25	20	15	10	30	20	15	10	252	130
Giza 5		20	10	5	5	20	15	10	10	210	128
Giza 6		20	10	5	0.0	20	10	10	0.0	140	105
Georgia		20	10	10	5	10	10	10	10	230	135
Ismailia 1		10	5	0.0	0.0	10	0.0	5	0.0	0.0	0.0
NC 7		20	10	0.0	0.0	25	10	10	10	25	0.0
NC 9		20	20	0.0	0.0	10	10	15	15	20	20
NC 12		10	10	5	0.0	20	10	10	5	0.0	0.0
R 92		10	10	0.0	0.0	10	5	5	5	0.0	0.0

Each value is mean of four replicates (4 plates / replicate , five seeds or shell pieces per dish) were incubated on PDA medium for 7 days at 27 °C.

However, they found that, the root exudates of cv. Giza 5 had higher sugar and amino acid contents than that of cv. Local 235. Also, results demonstrate that all peanut cvs. tested varied in their susceptibility to infection by pod rot under greenhouse and field condition, these results are in agreement with Mehan *et al.*, (1995) and Hasan *et al.*, (2002). In this respect, R 92 and Ismailia I cvs were the most resistant against infection by peanut pod rot diseases while Giza 4, Gorgia and Giza 5 were the highest susceptible ones. In this respect El-Deeb and Ibrahim, (1998) and Marei (2000). Found similar results since they record that, pod rot diseases were common on all tested cultivars and the highest percentages of the diseases were in Giza 4 and Giza 5.

Regard to the occurrence of aflatoxingenic fungi and aflatoxin contaminations data showed that, *A. flavus* is more invasive than *A. parasiticus* and often dominated in peanut seeds than shells. Also aflatoxin contamination occurring before harvest and it was higher in seeds than in shells. These results are in harmony with Horn *et al.*, (1994) and Emara *et al.*, (2003). These results may be due to *A. flavus* more aggressive than *A. parasiticus*. (Horn *et al.*, 1994) and peanut seeds are a good substrate for its growth and subsequent aflatoxin production (Xue *et al.*, 2003). Also Giza 4, Gorgia and Giza 5 cvs. were the highest susceptible cultivars to infection by aflatoxigenic fungi and recorded the highest contaminations with aflatoxin whether in shells or seeds during greenhouse and field experiments. The present results coincide with Naguib *et al.*, (1988 & 1989) and Hasan *et al.*, (2002). The lowest frequency of aflatoxigenic fungi in all pod rot categories were with Ismailia I and R 92 cvs., which recorded the lowest content of aflatoxin in greenhouse experiment and came free from any aflatoxin in field experiment. These results are in harmony with those found by Verma *et al.*, (1996) Javed *et al.*, (1998) and Hasan *et al.*, (2002), who stated that there were no cultivar was completely resistant to aflatoxin production and invasion with aflatoxigenic fungi, while there were a differed significance in their ability to allow invasion and aflatoxin production.

The variable amount of aflatoxin present in contaminated peanut cultivars may be due to the environmental factors, nature of the fungal strains as well as composition of the substratum (Anderson *et al.*, 1995 and Saleha, 1996). Furthermore, the difference in concentration of aflatoxin extracted from various seed cultivars might be due to genetic and/or biochemical composition of the seed (Chiou, 1997 and Holbrook *et al.*, 2000).

REFERENCES

A.O.A.C. 1998. Official Method of Analysis of Official Analytical Chemists 16th ed. Kenneth Helrich edit. Published by the Association of Official Analytical Chemists Inc, Virginia, USA.

Abd-El-Moneem, K.M.; M.H. Moharam, and M.M. El-Sherif, 2003. Role of root exudates of certain peanut cultivars in resistance to root rot disease. Assiut. Journal, of. Agricultural Sciences, 34: 193 - 209.

Al-Ahmer, B.A; N.E. El-Mandoh,; A.A. El-Deeb, and L.A. El-Ghareeb, 1989. Reaction to root and pod rot diseases of peanut *(Arachis hypogaea L.)* Annals of Agric. Sci. Moshtohor, 27: 1577-1592.

Anderson, W.F; C.C. Holbrook; D.M. Wilson and M.E. Matheron, 1995. Evaluation of preharvest aflatoxin contamination in several potentially resistant peanut genotypes. Peanut Sci. 22: 29-32.

Chiou, R.Y.Y. 1997. Estimation of fungal infection of peanut kernels by determination of free glutamic acid content. Appl. and Environ. Microbiol. 63: 1083-1087.

El-Deeb, A.A. and E.M. Ibrahim, 1998. Integrated control of peanut root rot, pod rot diseases and their effects on nodulation and N-content of plants. Egypt. J. Appl. Sci.,13: 442-458.

Emara, M. F.; A.A. Abo-Hagar; A.A. El-Deeb and Akila S. Hamza, 2003.Detection of aflatoxin associated with *Aspergillus* spp. in some peanut growing areas in Egypt. J. Agric. Sci Maansoura Univ., 28: 8063-8072.

Garren, K.H. and D.M. Porter, 1970. Quiescent endocarp floral communities in cured mature peanuts from Virginia and Puerto Rico. Pnytopathology. 60: 1635-1638.

Hasan, S.A.; A.A. El-Deeb and M.A. El-Korashy, 2002. Chemical and biological control of yellow pod rot of peanuts with reference to nodulation, oil, N content and yield. Egypt. J. Appl. Sci., 17: 62-82.

Hassan, A.M. and M.S. Frederick, 1995. Peanut Health Management. The American Phytopathological Society Press., 117pp.

Hilal, A.A.; A.H Metwally; S.A. khaled. and A.A. El-Deeb, 1994 Evaluatuion of peanut cultivars, date of sowing and NPK as integrated control measurement against soilborne diseases. Zagazig J. Agric. Res., 21: 1151-1162.

Holbrook, C.C.; D.M. Wilson; M.E. Matheron; J.E. Hunter; D.A. Knauft and D.W. Gorbet, 2000. *Aspergillus* colonization and aflatoxin contaminations in peanut genotypes with reduced linoleic acid composition. Plant Dis. 84: 148-450.

Horn, B.W.; J.W. Dorner; R.L. Green; P.U. Blanhenship and R.J Cole, 1994 Effect of *Aspergillus parasiticus* soil inocula on invasion of peanut seeds. Mycopathologia, 125: (3) 179-191.

Hussin, N. Zeinab, 2005. Studies on peanut *(Arachis hypogaea)* root rot diseases in Egypt and Nigeria. M.Sc. Thesis, Institute of African Research and Studies, Cairo Univ. 123 pp.

Javed, M.S.; S. Abdul-Wahid; M. Idrees and A. Saleem, 1998. Seed-borne mycoflora of peanut Varieties/ Genetic stock in Punjab. Pakistan Journal of Phytopathology, 10: 53-55.

Mahmoud, E.Y. 2004. Integrated control of pod rot diseases of peanut. Ph.D. Thesis, Fac. Of Agric, Ain - Shams Univ. 154 pp.

Marei, T.A. 2000. Studies on pod rots of peanut. Ph.D. Thesis Fac. Agric. Moshtohor, Zagazig Univ., 143 pp.

Maren, A.K. and I.P. Johan, 1988. A laboratory guide to the common *Aspergillus* species and their teleomorph. Commonwealth Scientific and Industrial Res. Org. Division of Food Processing. 116 pp.

Mehan, V.K.;C.D. Mayee; T.B. Brenneman and D. McDonald, 1995. Stem and pod rot of groundnut. ICRISAT information Bulletin 1995 No. 44, 23 pp. (C.F. CAB Abstracts 2000).

Naguib, K.; M.M. Naguib; M.M. Diab; A.M. Sahab and H. Amra, 1988 Occurrence of aflatoxin in several groundnut cultivars infested with *Aspergillus flavus*. Egypt. J. Phytopathol. 20: 99-106.

Naguib, K.; M.M. Naguib; M.M. Diab; A.M. Sahab; H. Amra and D. McDonald, 1989 Occurrence of aflatoxin and aflatoxin-producing strains of *Aspergillus flavus* in groundnut cultivars in Egypt. Aflatoxin Contaminations of Groundnut Proceedings of the International Workshop, 6-9 Oct. 1987, ICRISAT Conter, India. 1989, 311-315.

Payne, G.A. 1998. Process of contaminations by aflatoxin producing fungi and their impacts on crops. In Mycotoxins in Agricultural and Food Safety, ed. K.K. Sinha D. Bhatnagar. New York; Marcel Dekker.

Saleha, N. 1996. Drought stress and preharvest seed invasion of selected groundnut genotype by *Aspergillus flavus* and aflatoxin contamination. Indian Phytopathol., 49:52-56.

SAS Institute, Inc., 1996. SAS/STAT Users Guide, Version 6, 12th Ed. Volume 2, 846 pp. SAS Institute, Inc. Cary, North Carolina USA.

Satour, M.M.; M.A. Abd-El-Sattar; A.A. El-Wakil; E.A. El-Akkad and L.A. El-Ghareeb, 1978. Fungi associated with stem and pod rot diseases of peanut in Egypt. 10th Annual Meeting of American Peanut Res. Educ. Assoc. (APREA), Gainesville, Florida (Abstract.).

Singh, K.; J.C. Frisvard; U. Thrane and S.B. Mathur, 1991. An illustrated manual on identification of some seedborne Aspergilli, Fusaria, Penicillia and their mycotoxins. Danish Government Institute of Seed Pathology for Developing Countries, Copenhagen, Denmark.

Verma, R.J.; A.S. Kolhe and H.C. Dube, 1996. Aflatoxin contamination in different varieties of peanuts. Indian Phytopathol. 49:42-66.

Wilson, D.M. and G.A. Payne, 1994. Factors affecting Aspergillus group infection and aflatoxin contaminations of crops. M.Sc. Thesis, Auburn Univ. Auburn, AL. (C.F. CAB Abstracts 2000).

Xue, H. Q.; T. G. Isleib; G. A. Payne; R. F. Wilson and W. P. Novitzky, 2003. Comparison of aflatoxin production in normal- and high-oleic backcross-derived peanut lines. Plant Dis, 87: 1360-1365.

Youssef, S. E.; M.E. Mahmoud and A.A. Mounir, 1999. Effect of chemical treatments on aflatoxin contaminations and biochemical changes of peanut kernels caused by *A. parasiticus*. Egypt. J. Appl. Sci., 14: 40-52.

تقييم قابلية بعض أصناف الفول السوداني للإصابة بموت البادرات وأعفان الجذور والثمار ومدى تواجد الفطريات المفرزة للأفلاتوكسين

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أظهر إختبار أصناف الفول السوداني لمدي قابلية إصابتها بأمراض موت البادرات وأعفان الجذور في تجارب الصوبة والحقل أنها تختلف إختلافا كبيراً فيما بينها في قابليتها للإصابة. ولقد وجد أن صنفي إسماعلية ١ و R 92 أعلى مقاومة لموت البادرات وأعفان الجذور كما أنهما أعطيا أعلي نسبة من النباتات السليمة، بينما الأصناف جيزة ٥ و جيزة ٤ وجورجيا كانوا الأعلي قابلية للإصابة. أظهر إختبار تسعة أصناف من الفول السوداني لمدى إصابتها بأعفان الثمار أنها تختلف إختلافا كبيراً فيما بينها في درجة مقاومتها ولم يظهر منها أي مقاومة تامة لفطريات الأفلاتوكسين وكذلك عملية الإفراز للأفلاتوكسين. كان فطر *Aspergillus flavus* الأكثر قدرة علي إحداث الإصابة عن فطر *A. Parasiticus* وكان تواجده أكثر في البذرة عنه في القشرة. كانت الأصناف جيزة ٤ وجورجيا و جيزة ٥ أكثر الأصناف قابلية للإصابة كما سجلوا أعلى نسبة تكرار لعزل فطريات الأفلاتوكسين وكذلك أعلى محتوى تلوث بالأفلاتوكسين، بينما أظهر صنفي إسماعلية ١ و R 92 أعلي مقاومة.