SURVEY OF SEED BORNE MYCOFLORA OF PEANUT AND THEIR CONTROL

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Abstract

Eighteen fungi were isolated from peanut seeds (*Arachis hypogea* L). *Fusarium oxysporum, Fusarium solani, Sclerotium rolfsii, Macrophomina phaseolina and Rhizoctonia solani* were the most frequently isolated fungi and had the highest percentages of incidence. During the two seasons of 1995 and 1996, five fungicides were tested against root rot and wilt of peanut, as seed dressing and soil treatments. Rizolex T 50% was the best fungicide in reducing disease infection in both seasons, under greenhouse and field experiments, followed by soil treatment with chlorotosep and Amconil. The lowest total yields were obtained with Topsin M which was the least efficient in reducing the percentage of disease infection in peanut seedling. Moreover, Vitavax Thiram and Rizolex T were the more efficient to reduce the percentage of pod rot infection against all the tested isolates under both artificial and natural infections.

INTRODUCTION

Peanut (*Arachis hypogea* L.) is one of the important annual legume and oil crops in Egypt. Several diseases could be recorded during the growig season, causing great losses in pod yield. Soil and seed borne fungi could attack seeds and pods causing qualitative and quan:itative damages beside increaasing soil infestation. Therefore, continuous growing of peanut plants in these soil subjected the crop to infection with these pathogens under favorable environmental conditions.

Abou-Arkoub (1973). reported that the disease was successfully controlled by different seed dressing fungicides such as Brassicol 75, Arasan, Orthocide 75, Demosan, Spergon, Benomyl or Vitavax which gave almost 70% to 100% seedling emergence. Pod infection during fruiting stage caused by *Rhizoctonia solani* and *Sclerotium rolfsii* could be controlled by using the fungicides, Benlate and Vitavax, as seed dressing or as soil spray around the fruiting zone.

Zaher *et al.* (1984). found that the percentage of pod-infection in the presence of *Rhizoctonia solani* was much higher than *Fusarium oxysporum* or *Sclerotium rolfsii.* Using certain fungicides gave the best results in controlling these pathogens, and Carboxin was the most effective. The yield components/plant were significantly de-

creased by the three tested fungi, while using fungicides improved the yield component.

Harrison (1963), Jackson (1963) and Yehia *et al.*, (1979) found that fungicides, particularly Benlate, were effective in reducing damping-off and root rot of peanut, when applied as seed treatments.

Seoud *et al.*, (1982). reported reduction of the disease and increase of pod yield by soil treatment with Daconil 2787, when combined with seed treatment with Vitavax/Captan or Orthocide 75.

El-Deeb *et al.*, (1985) reported that certain fungicides reduced the pre and post emergence damping-off and increased survivals. Benlate as seed dressing combined with Benlate and Daconil 2787, as soil treatment, were the best for disease control.

Ismail (1989) found that *Fusarium oxysporum, Rhizoctonia solani* and *Macrophomina phaseoli* were the most frequently isolated pathogens from diseased peanut roots in the surveyed locations of Sharkia and Ismailia Governorates. Moreover, the most effective fungicides for decreasing the percentage of fungi frequency isolated from peanut seeds were Vitavax-Captan followed by Vitavax-Thiram and Rizolex T 50%.

El-Deeb *et al.* (1990) showed that Bavistin and Sumisclex gave the most reduction in pre and post emergence damping off, whereas Benlate followed in efficiency.

The aim of the present work was to survey peanut seed mycoflora in Sharkia and Giza Governorates and to evaluate some fungicides as seed and soil treatments for controlling damping-off and root rot of peanut.

MATERIALS AND METHODS

Isolation, purification and identification of the pathogenic fungi from peanut seeds:

Peanut seed samples were collected from several localities of Sharkia and Giza Governorates in 1995 season. The blotter technique was used (Anonymous, 1960). The isolated fungi were purified and identified according to Gilman (1957), Raper and Fennell (1965) and Booth (1977).

Greenhouse experiments:

During the two seasons of 1995 and 1996, 7 fungicides (4 seed dressing and 3 soil treatments) were tested to determine their effectiveness against the most frequently isolated fungi from peanut seeds causing damping off, root rot and pod rot diseases. Trade names, common names and % active ingredients and rate of application of these fungicides are shown in Table (1). The experiment was carried out under greenhouse conditions at Giza (Temperature 25 ± 3°C).

Table 1. Trade name, common name and % of active ingredients and rate of application of the investigated fungicides and biocides.

	Trade name	Common name and % of active ingredient	Rate of application
1	Benlate 50% W.P.	50% Benomyl	2 gm/Kg seeds
2	Topsin M 70	70% Methyl thio-phanate	3 gm/Kg seeds
3	Rizolex T 50%	20% Tolcolofos-methyl+30% Thiram	3 gm/Kg seeds 5 kg/Fed. soil treatment
4	Chlorotosep	Chlorothalonil 75%	5 kg/Fed. soil treatment
5	Amconil	Chlorothalonil 75%	5 kg/Fed. soil treatment
6	Vitavax-Thiram	37.5% Carboxin+37.5% Thiram	250 cm/100 L. water
7	Plant Guard	30Million/cm3 of T.harazianum spores	

Plastic pots (25 cm in diameter) were used in this study. Pots were sterilized by immersing in 5% formalin solution for 15 minutes and left several days before being used, then filled with (1: 1 v/v) sand and clay soil, previously autoclaved at 121°C for one hour. Surface sterilized seeds of peanut (c.v. Giza 4) were planted, at the rate of 5 seeds per pot, and the pots were arranged in a completely randomized block design with ten replications/treatment.

1. Inoculum preparation : The investigated fungi were grown on oat grains medium for 15 days at 25°C, then added to the sterilized pots filled with autoclaved soil at the rate of 2% of the soil weight (w/w) (Ismail,1989). The pots were irrigated for one week before sown.

2. Addition of fungicides: The tested fungicides and biocides (Table, 1) were applied by two methods as follows:

   A. Seeds were treated, 24-48 hours prior to sowing with the tested fungicides at the recommended doses.

B. The soil was treated with the tested fungicides at the recommended doses immediately before sowing.

Assessment of disease severity:

The data were recorded as damping-off and root rot, 60 days after sowing, according to Emara (1995), and pod rot disease was disease was estimated after harvesting, according to El-Deeb *et al.* (1985).

Field experiment:

Field experiments were conducted at two farms in Sharkia (Abo-Hammad) and Giza (El-Saff) Governorates, during the seasons of 1995 and 1996. Giza 4 cultivar was used and the expriments were arranged in a completely randomized block design with four replications. The plot size was 21 m^2 (8 row x 25 plant = 200 plant).

All agricultural practices (irrigation and fertilization) were carried out as usual and the tested fungicides were added to the soil or for seed treatment as shown in the greenhouse experiments. Plants were left for natural infection. Control treatments did not receive any fungicides. Percentage of disease severity and yield were recorded for each treatment.

Statistical analysis:

Statistical analysis were conducted according to Daniel (1987). Least Significant Differences (LSD) at 5% was used for comparing means.

RESULTS AND DISCUSSION

Survey of peanut seed-borne mycoflora:

Data presented in Table (2) show the frequency and percentage of incidence of the isolated fungi from peanut seeds at both localities (Giza and Sharkia Governorates). The pathogenic fungal species include *Rhizoctonia solani, Sclerotium rolfsii, Macrophomina phaseolina, Fusarium solani* and *F.oxysporum* were the most frequently isolated, at frequencies of 6.08, 9.82, 9.49, 14.49 and 7.72%, respectively, at Sharkia Governorate, while their frequencies were 7.26, 10.06, 10.06, 17.60 and 12.29%, respectively, at Giza Governorate. *Fusarium solani, Sclerotium rolfsii* and *Macrophomina phaseolina* had the highest percentage of incidence in both Governorates. Differences in disease distribution from Governorate to another was

Table 2. Percentage of incidence and frequency of seed mycoflora isolated from peanut seeds (c.v. Giza 4) at the two localities, Sharkia and Giza governorates.

Isolates	Sharkiya		Giza	
	% incidence	% Frequency	% incidence	% Frequency
Fusarium oxysporum	5.50	7.72	7.33	12.29
Fusarium solani	10.33	14.49	10.50	17.60
Fusarium moniliforme	4.83	6.78	4.17	6.99
Sclerotium rolfsii	7.00	9.82	6.00	10.06
Aspergillus niger	4.83	6.78	3.67	6.15
Aspergillus flavus	5.66	7.94	0.17	0.28
Botryodiplodia theobromae	1.33	1.87	1.50	2.51
Curvularia spp.	1.50	2.10	1.33	2.23
Macrophomina phaseolina	6.76	9.49	6.00	10.06
Espicoccum spp.	0.83	1.16	0.83	1.39
Alternaria alternata	3.67	5.15	2.83	4.74
Penicillium spp.	3.83	5.37	4.83	8.10
Drechslera spicifer	0.67	0.94	0.17	0.28
Rhizopus nigricans	6.00	8.44	2.17	3.64
Nigrospora oryzae.	1.33	1.87	1.17	1.96
Rhizoctonia solani	4.33	6.08	4.33	7.26
Caladoporium spp.	1.50	2.10	1.33	2.23
Myrothecium spp.	1.67	2.34	1.33	2.23

also reported by Abd El-Al (1973). In addition, the isolates of *Peicillium* sp. and *Aspergillus* sp., associated with pod rot of peanut, were moderate in their incidence and frequencies at the two localities in Sharkia and Giza.

Greenhouse experiments:

Data presented in Tables (3 and 4) indicate that all tested fungicides resulted in significant decrease in disease severity with all tested fungi compared with the control treatments in the two seasons of 1995 and 1996. Rizolex T 50%, in 1995, (Table 3) was the best fungicide in reducing the disease severity caused by *Rhizoctonia solani, Sclerotium rolfsii, Macrophomina phaseolina, Fusarium solani* and *F.oxysporum*, where the efficiencies reached 76.06, 73.83, 73.32, 77.36 and 78.13% respectively, or with the mixture of the these pathogens (75.78%). Soil treatment with Chlorotosep showed efficiencies of 72.48, 71.64, 70.42, 73.74 and 72.23%, respectively for the above fungi. With Amconil, the efficiencies were 73.15, 72.28, 70.73, 73.99 and 72.26%, respectively.

On the other hand, with Topsin M 70 the efficiencies were 58.58, 58.56, 61.74 65.19 and 64.94%, respectively. Similar trends were obtained in the second season of 1996 (Table 4).

Yehia *et al.* (1979) and El-Deeb *et al.*, (1985) showed that Daconil 2787 and Benlate 50% W.P. were superior in controlling the disease. Such fungicides, when covering seed surfaces, prevented the fungi from attacking the seeds and protected the emerging seedlings against the causal organisms.

Data in Table (5) show the effect of some fungicides as soil treatments to control pod rot of peanut under artificial infestation in the greenhouse. Vitavax-Thiram and RizolexT were the most efficient, with no significant difference, in reducing the percentage of pod rot infection against all the tested isolates, while Plant Guard was the least and gave higher percentage of infection when compared with other tested fungicides. In a similar study, Abd El-Al (1973) reported that the seed dressing fungicides, Vitavax and Benlate, were the most effective against *Rhizoctonia solani* and *S.rolfsii* or both together, while Thiram and Topsin M 70 were also effective fungicides; however, inferior to the former groups.

Field experiments:

Data shown in Table (6) indicate that there were significant differences between all tested fungicides compared with the control treatment in both seasons. Also, data show that seed dressing with Rizolex T 50 % was the best treatment in

Table 3. Effect of some fungicides as seed dressing to control damping-off and root rot disease of peanut with artificial infection under greenhouse conition, Giza, 1995.

Fungicides	*S.rolfsii*		*M.phaseolina*		*F.solani*		*F.oxysporum*		*R.solani*		*mixture*	
	Disease severity	% Efficiency	Disease severity	% Efficiency	Disease severity	% Efficiency	Disease severity	% Efficiency	Disease severity	% Efficiency	Disease severity	% Efficiency
Belnate 50%	18.50	65.42	16.17	68.80	12.83	73.99	13.50	71.88	13.17	74.43	14.33	73.30
Topsin M70	22.17	58.56	19.83	61.74	17.17	65.19	16.83	64.94	21.33	58.58	21.17	60.55
RizolexT50%	14.00	73.83	13.83	73.32	11.17	77.36	10.50	78.13	12.33	76.06	13.00	75.78
Chlorotosep	15.17	71.64	15.33	70.42	13.00	73.74	13.33	72.23	14.17	72.48	14.50	72.98
Amconil	14.83	72.28	15.17	70.73	12.83	73.99	13.17	72.26	13.83	73.15	14.33	73.30
Control	53.50	-	51.83	-	49.33	-	48.00	-	51.50	-	53.67	-
LSD at 5%	1.46		1.63		1.13		1.46		1.42		1.56	

Table 4. Effect of some fungicides as seed dressing to control damping-off and root rot disease of peanut with artificial infection under greenhouse conition, Giza, 1996.

Fungicides	*S.rolfsii*		*M.phaseolina*		*F.solani*		*F.oxysporum*		*R.solani*		*mixture*	
	Disease severity	% Efficiency	Disease severity	% Efficiency	Disease severity	% Efficiency	Disease severity	% Efficiency	Disease severity	% Efficiency	Disease severity	% Efficiency
Belnate 50%	14.33	71.44	12.83	73.99	11.17	75.08	12.67	70.31	11.17	79.19	13.83	74.47
Topsin M70	19.17	61.79	17.33	64.69	14.50	67.66	14.67	65.62	20.17	62.42	19.67	63.69
RizolexT50%	12.50	75.08	10.62	77.83	9.17	79.54	11.17	73.82	12.32	77.03	11.83	78.16
Chlorotosep	16.00	68.19	14.67	70.26	13.50	69.89	13.17	69.14	15.67	70.80	15.87	71.99
Amconil	15.33	69.44	14.83	69.54	13.33	70.26	13.67	67.96	15.50	17.12	16.13	68.93
Control	50.17	-	49.33	-	4.83	-	42.67	-	53.67	-	54.17	-
LSD at 5%	1.34		1.17		1.12		2.13		1.98		2.24	

Table 5. Effect of some fungicides as seed dressing to control damping-off and root rot disease of peanut with artificial infection with pod rot pathogens or their mixture.

Fungicides	*R.solani*		*M.phaseolina*		*F.moniliform*		*Aspergillus spp.*		*Penicillum sp.*		*mixture*	
	Disease severity	% Efficiency	Disease severity	% Efficiency	Disease severity	% Efficiency	Disease severity	% Efficiency	Disease severity	% Efficiency	Disease severity	% Efficiency
Topsin M70	15.97	69.09	12.00	73.03	13.17	71.51	12.33	72.67	10.16	75.88	15.83	69.56
RizolexT50%	12.17	76.45	9.33	79.03	10.33	77.65	11.50	74.51	8.67	79.42	12.50	75.97
Chlorotosep	12.18	75.17	9.17	79.39	9.94	78.50	11.67	73.14	8.50	79.82	12.67	75.64
Amconil	19.83	61.62	17.67	60.29	20.27	56.15	21.75	51.80	15.33	63.61	20.22	61.12
Control	51.67	-	44.50	-	46.23	-	45.12	-	42.13	-	52.01	-
LSD at 5%	1.32		1.61		1.74		2.01		1.98		2.07	

reducing damping-off and root rot disease severity with efficiencies of 74.12 and 74.86% in 1995 and 80.42 and 80.75% in 1996 under natural infection at sharkiya Giza, respectively. Benlate 50% W.P. showed control efficiencies of 73.28 and 72.71% in 1995 and 77.86 and 77.45% in 1996, respectively. Soil treatment with Amconil and Chlorotosep resulted in comparable efficiencies. However, Topsin M 70 was the least efficient fungicide, where the efficiencies reached 65.00 and 68.65% in 1995 and 68.52 and 67.62% in 1996 in the two localities of Sharkiya and Giza, respectively, compared with all tested fungicides.

Variations among fungicides with respect to severity of infection was greater in 1996 than in 1995.

As a result of variation in disease severity, yields also varied. The lowest yields were obtained with Topsin M 70 at Abo Hammad, Sharkiya and El saff, Giza (0.995 and 1.110 Ton/fed.), respectively, in 1995 and 1.015 and 1.110 Ton/Fed., respectively, in 1996. This may be due to, the fact that Topsin M 70 is less efficient to protect the seeds from the causal pathogens.

In general, results presented in Table (7) indicate that, all tested fungicide treatments decreased the infection of pod and increased the total yield. Rizolex T was the most efficient to reduce the percentage of infection of peaut pod rot disease and increased the total yield followed by Vitavax - Thiram at the two localities Sharkiya and Giza, when compared with the control treatments. These results are in agreement with those obtained by Abd El-Al (1973).

The differences in fungicides reaction might be attributed to the genetic differences in tested pathogenic fungi which affected their metabolism, and activtives as well as cell permeability. However, the different active ingredients of the fungicides would have different mode of action which affect the extent of toxicity and consequently save or kill the pathogen (Sharvelle, 1961).

Table 6. Effect of some fungicides as seed dressing treatments to control damping-off and root rot disease of peanut under natural infection at two localities, Giza and Sharkia, in 1995 and 1996.

Fungicides	1995								1995							
	Sharkia				Giza				*Sharkia*				Giza			
	Root rot and damping-off		Yields		Root rot and damping-off		Yields		Root rot and damping-off		Yields		Root rot and damping-off		Yields	
	Disease severity	% increase	Ton/ Fed.	% increase	Disease severity	% increase	Ton/ Fed.	% increase	Disease severity	% increase	Ton/ Fed.	% increase	Disease severity	% increase	Ton/ Fed.	% increase
Belnate 50%	11.20	73.28	1.245	69.39	11.95	72.71	1.275	70.00	8.67	77.86	1.255	64.05	9.17	77.45	1.275	54.55
Topsin M70	14.67	65.00	0.995	35.35	13.73	68.65	1.110	48.00	12.33	68.52	1.015	32.68	13.17	67.62	1.110	34.55
RizolexT50%	10.85	74.12	1.295	76.19	11.01	74.86	1.325	76.67	7.67	80.42	1.290	69.28	7.83	80.75	1.315	59.39
Chlorotosep	11.65	72.21	1.215	65.31	12.23	72.07	1.280	70.67	11.33	71.07	1.185	54.90	12.50	67.62	1.215	47.27
Amconil	11.55	72.45	1.220	65.99	11.81	73.03	1.285	71.33	11.17	71.48	1.173	53.33	13.17	66.39	1.224	48.36
Control	41.92	-	0.735	-	43.79	-	0.750	-	39.17	-	0.765	-	40.67	-	0.825	-
LSD at 5%	1.01		0.062		0.89		0.059		1.97		0.078		2.83		0.069	

Table 7. Evaluation of some fungicides as soil treatment to control pod rot of peanut under natural infection condition at two localities Sharkia and Giza, season 1996.

Fungicides	*Sharkia*				Giza			
	Root rot and damping-off		Yields		Root rot and damping-off		Root rot and damping-off	
	Disease severity	% Efficiency	Ton/ fed.	% increase	Disease severity	% Efficiency	Disease severity	% increase
Topsin M70	11.67	70.82	1.142	32.18	12.83	68.78	1.157	31.18
Vitavax-Thiram	7.33	81.68	1.315	52.20	8.79	78.17	1.361	54.30
Rizolex T	7.17	82.08	1.345	55.67	9.17	77.68	1.364	45.65
Plant Guard	7.50	81.25	1.081	25.12	19.94	51.47	1.064	20.63
Control	40.00	-	0.864	-	41.09	-	0.582	-
LSD at 5%	1.37		0.038		1.19		0.042	

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حصر للفطريات المنقولة ببذور الفول السوداني ومقاومتها

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تم عزل العديد من الفطريات الممرضة لبذور الفول السوداني وكان من أكثرها تكرارا وأعلاها نسبة في الظهور الفطريات فيوزاريوم أوكسيسبورم وفيوزاريوم سولاني وسكليروشيم رولفسيياي والماكروفومينا فاصولينا والريزوكتونيا سولاني. وذلك خلال موسمي الزراعة ١٩٩٥ و ١٩٩٦ تم اختبار ٧ مبيدات فطريه لتقدير مدي كفاءتها في مقاومة أمراض الذبول وأعفان الجذور والقرون في الفول السوداني كمعاملة بذور أو معاملة التربه وتأثير ذلك علي المحصول.

أظهرت النتائج أن المبيد ريزولكس تي ٥٠٪ كان أفضل المبيدات في تقليل الاصابه بأعفان الجذور والذبول في كلا الموسمين تحت ظروف العدوي الصناعيه في الصوبه أو التجارب الحقليه تحت ظروف العدوي الطبيعية ثم يليه كلا المبيدين كلوروتوسيب والأمكونيل عند إستخدامهم كمعاملة التربه. كما أوضحت النتائج أن المبيد توبسين إم ٧٠ أقل المبيدات المختبره كفاءة في تقليل شدة الإصابه بأمراض الذبول وأعفان الجذور وفي زيادة وكمية المحصول الكلي في الفول السوداني. وأوضحت النتائج ايضا ان كلا المبيدين فيتافاكس – ثيرام والريزولكس من أكثر المبيدات كفاءة في تقليل النسبه المئوية للاصابه باعفان القرون من كل المبيدات المختبره.