EXPERIMENTAL RESULTS

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I-Isolation, purification and identification of fungi associated with cotton seeds before and after delinting.

Isolation trials from cotton seeds (before and after delinting, testa and cotoyledons) and rotten roots resulted in several fungi belonging to 5 genera and 11 species. The isolated fungi were purified and identified as *Alternaria alternata* (Fr.) Keissler, *Aspergillus niger* van Tieghem, *Fusarium dimerum* (Penz.) v. Arx, *Fusarium moniliforme,* J. Sheld, *Fusarium nivale* (Fr.) Samuels & Hallett, *Fusarium roseum* Link emend. Snyder & Hansen, *Fusarium semitectum Berk & Rav, Fusarium tricinectum*, (Corda) Sacc. *Fusarium solani* (Mart.) Sacc. emend. Snyder & Hansen, *Penicillium spp* and *Rhizoctonia solani* Kuehn in addition to some unidentified fungi.

The obtained data **(Table, 2-a)** reveal that the total fungal isolates obtained from cotton seeds of cvs. Giza-86 and Giza-89 before delinting were 85 and 90 isolates, respectively. Out of them, *R. solani* produced the highest number of colonies (62 and 42 isolates) with the highest frequency being 72.9 and 46.7% followed by *Fusarium moniliforme* and *Fusarium roseum* from seeds of cvs Giza-86 and Giza-89, respectively. Meanwhile, *Fusarium semitectum,* and *Fusarium nivale* were more frequent from seeds of cv. Giza-89 than on cv.Giza-86. Generally, all isolated fungi from cv Giza-86 except, *R. solani* were lesser in their frequency from than on Giza-89 when isolation was carried out before delinting. Also, *Aspergillus niger, Fusarium roseum* and *Penicillium spp* were not recorded on seeds of Giza-86 while *Fusarium tricinectum* was not recorded from seeds of Giza-89.

Whereas, *F. dimerum* was not isolated from both undelinted cotton cvs seeds.

As for the isolated fungi after delinting, the total isolated fungi were 44 and 57 isolates from Giza-86 and Giza-89, respectively. Out of them, *Fusarium moniliforme* and *R. solani* were the highest frequent fungi within the seeds of cvs. Giza-86 where their frequency recorded 43.2 and 40.9%, respectively. Meanwhile, *R. solani* was only the highest frequent one from seeds of cv. Giza-89 after delinting where its frequency was 50.9%. On the other hand, *F. dimerum* was recorded only from seeds of cv. Giza-89 after delinting. However, it is pronounced from the results that many of the isolated fungi from seeds whether before or after delinting such as *Alternaria alternata,*

Table (2-a): Occurrence and, % of the isolated fungi from cotton seeds (before and after delinting).

Isolated fungi	Occurrence and, % of the isolated fungi from cotton seeds									
	Before delinting				Mean of Freq.%	After delinting				Mean of Freq.%
	Giza-86		Giza-89			Giza-86		Giza-89		
	No.	F.	No.	F.		No.	F.	No.	F.	
A.. alternata	2	2.4	3	3.3	2.8	-	-	2	3.5	1.8
A.. niger	-	-	2	2.2	1.1	-	-	-	-	-
F. dimerum	-	-	-	-	-	-	-	8	14.0	7.0
F.moniliforme	8	9.4	12	13.3	11.4	19	43.2	6	10.5	26.9
F. nivale	4	4.7	9	10.0	7.4	2	4.6	4	7.0	5.8
F. roseum	-	-	10	11.1	5.6	-	-	8	14.0	7.0
F.semitectum	5	5.9	9	10.0	7.9	5	11.4	-	-	5.7
F.tricinectum	4	4.7	-	-	2.4	-	-	-	-	-
Penicillium spp	-	-	3	3.3	1.7	-	-	-	-	-
R. solani	62	72.9	42	46.7	59.8	18	40.9	29	50.9	45.9
Unknown	-	-	-	-	-	-	-	-	-	-
Total	85	100	90	100		44	100	57	100	

No. = Number of isolates F.= Frequency % of the isolated fungi

Aspergillus niger, Penicillium spp and *Fusarium semitectum* were isolated in low frequencies from seeds of cvs.Giza-86 and Giza-89. Also, it is clear that the total number of isolates obtained from the two cvs of cotton seeds after delinting were lesser than those isolated before delinting. In all cases, *R. solani* was mostly the dominant.

Data in **Table (2-b)** show the associated fungi obtained from the inner surface of cotton seed testa and cotoyledons. In this respect, the total fungal isolates obtained from the inner cotton seed testa of cvs. Giza-86 and Giza-89 were 69 and 43 isolates, respectively. Out of them, *R. solani* was the highest frequent fungus on both testa of cotton cvs. seeds where its frequency was 30.5 and 30.2%, respectively followed by *Fusarium nivale* (30.2%) from seed testa of cv. Giza-89, *Fusarium semitectum* (28.9 %) and *Fusarium moniliforme* (24.6%) in respect to the seed testa of cv.Giza-86. On the other hand, *Alternaria alternata, Fusarium solani, Fusarium tricinectum, Penicillium spp* and *Aspergillus niger* were not isolated or isolated in low numbers from cotton seed testa of both cvs. Giza-86 or Giza-89. As for the isolated fungi from cotoyledons, the total fungal isolates i.e., 14 and 19 were isolated from the cotoyledons of cvs. Giza-86 and Giza-89 respectively. Out of them, *Fusarium roseum* showed the highest frequency fungus (28.5 and 31.5%) from cotoyledons of both cotton cvs. seeds followed by *Fusarium moniliforme* from cvs Giza-86 and

Giza-89 (21.3 and 15.8%) respectively. Meanwhile, *Fusarium solani* was not recorded from cotoyledons of seeds of both cotton cvs. However, *Penicillium spp., Alternaria alternata* and *A. niger* as well as, some others fungi were isolated at low frequencies. In general, the total number of isolated fungi from the cotoyledons was greatly low comparing with those isolated from seed testa for both cotton cvs tested.

Regarding the isolated fungi from rotten roots of cotton seedlings, data in **Table (2-c)** show that 6 fungal isolates were obtained from the rotten roots of cv. Giza-86, two of them were o *R. solani*. Meanwhile, 14 isolates were obtained from the rotten roots of cv. Giza-89, 5 isolates of them were belonging to *R. solani*. It is clear that *R. solani* was the most frequent fungus followed by *Fusarium moniliforme* and *Aspergillus niger*. However *Penicillium spp.* and *Fusarium tricinectum* recorded the lowest frequency.

Table (2-b): Occurrence and, % of the isolated fungi from testa and cotoyledons of cotton seeds.

Isolated fungi	Frequency and percentages of isolated fungi									
	Testa				Mean of F..%	Cotyledons				Mean of F.%
	Giza-86		Giza-89			Giza-86		Giza-89		
	No.	F.	No.	F.		No.	F.	No.	F.	
A.alternata	-	-	2	4.7	2.3	-	-	2	10.5	5.3
A. niger	1	1.5	-	-	0.7	2	14.3	1	5.3	9.8
F.moniliforme	17	24.6	4	9.3	16.9	3	21.3	3	15.8	18.6
F. nivale	10	14.5	13	30.2	22.5	2	14.3	1	5.3	9.8
F. roseum	-	-	8	18.6	9.3	4	28.5	6	31.5	30.0
F.semitectum	20	28.9	2	4.7	16.8	1	7.2	1	5.3	6.3
F. solani	-	-	1	2.3	1.2	-	-	-	-	-
F.tricinectum	-	-	-	-	-	1	7.2	3	15.8	11.5
Penicillium spp.	-	-	-	-	-	1	7.2	-	-	3.6
R. solani	21	30.5	13	30.2	30.3	-	-	-	-	-
Unknown	-	-	-	-	-	-	-	2	10.5	5.3
Total	69	100	43	100		14	100	19	100	

No.=Number of isolate fungi F.= Frequency % of the isolated fungi

Table (2-c): Occurrence and, % of the isolated fungi from cotton rotten roots

Isolated fungi	Frequency and percentages of isolated fungi from cotton rotten roots				
	cv. Giza-86		cv. Giza-89		Mean of F.%
	No.	F.	No.	F.	
A. niger	1	16.67	2	14.29	15.48
F.moniliforme	1	16.67	3	21.43	19.05
F.tricinectum	1	16.67	1	7.14	10.42
Penicillium spp.	-	-	2	14.29	7.14
R. solani	2	33.32	5	35.71	34.52
Unknown	1	16.67	1	7.14	11.90
Total	6	100	14	100	

No. = Number of isolate fungi F.= Frequency % of the isolated fungi

II- Pathogenicity tests:

Data in **Table (3)** indicate that *R. solani* was the highest pathogenic fungus among all of the tested fungi where it caused the highest infection of pre-emergence damping-off when the first three inoculum levels *i.e.,* 1, 2, 3% were used on both cotton cvs.Giza-86 and Giza-89. In this respect, *R. solani* caused the highest pre-emergence damping–off percentage followed by *F. semitectum, F. moniliforme* and *F. roseum.* Also, increasing the inoculum levels from 1-3% increased gradually the percentage of pre–emergence damping–off where the highest pre-emergence was recorded at 3% inoculum for all tested pathogens.

Regarding, the post emergence damping-off, it is clear that the post infection ranged from 3.3 to 12.2 % in case of cotton cv. Giza-86 and 3.3-15.5 % in case of cv. Giza-89. *R.solani* and *F. semitectum* were the most virulent pathogens at this disease stage meanwhile, *F. roseum* was the least virulent one. However, increasing inoculum level of each pathogen from 1 -3% increased gradually post infection to reach its maximum at 3% inoculum level.

As for the plant survival, the results indicate that increasing inoculum level from 1 to 3 % gradually decreased the percentages of survived cotton plants. In this respect, the least survival % was at 3% inoculum level in case of cv. Giza-86 infection with *R. solani* while the highest survival % was at 1% inoculum level in case of cv. Giza-89 infection with *F. roseum.* Also, it is clear from the results that the means of survived cotton plants indicate that *R. solani* followed by *F. semitectum* were the

highly pathogenic fungi at most tested inoculum levels whereas *F. roseum* was the least one in this respect onto both the tested cotton cvs.

Table (3): Pathogenicity test of some isolated fungi from cotton seeds at different levels on two cotton cvs.Giza-86 and Giza-89.

Disease parameters	Tested fungi	Disease index at different inoculum levels									
		cv.Giza-86				M.	cv.Giza-89				M.
		0	1	2	3		0	1	2	3	
Pre-%	*R. solani*	00.0	23.4	26.7	36.7	21.7	00.0	10.1	16.7	43.4	17.5
	F. semitectum	00.0	13.4	20.1	30.1	15.9	00.0	6.7	10.1	20.1	9.2
	F.moniliforme	00.0	16.7	23.4	23.4	15.9	00.0	6.7	13.4	13.4	8.3
	F .roseum	00.0	10.1	16.7	23.4	12.6	00.0	3.4	13.4	13.4	7.5
Mean		00.0	15.9	21.7	28.4	16.5	00.0	6.7	13.4	22.6	10.7
Post-%	*R. solani*	00.0	3.3	10.0	12.2	6.4	00.0	3.3	10.0	15.5	7.2
	F. semitectum	00.0	3.3	8.9	12.2	6.1	00.0	3.3	8.9	11.1	5.8
	F.moniliforme	00.0	3.3	7.7	10.0	5.3	00.0	3.3	6.6	11.1	5.3
	F .roseum	00.0	3.3	6.6	7.7	4.4	00.0	3.3	5.5	7.7	4.1
Mean		00.0	3.3	8.3	10.5	5.5	00.0	3.3	7.8	11.4	5.6
Survival %	*R. solani*	100.0	73.3	63.3	51.1	71.9	100.0	86.6	73.3	41.1	75.3
	F. semitectum	100.0	83.3	71.1	57.7	78.0	100.0	90.0	81.1	68.8	85.0
	F.moniliforme	100.0	80.0	68.6	66.6	78.8	100.0	90.0	80.0	75.5	86.4
	F .roseum	100.0	86.6	76.7	68.9	83.1	100.0	93.3	81.1	78.9	88.3
Mean		100.0	80.8	69.9	61.1	78.0	100.0	90.0	78.9	66.1	83.8

Where Natural of un–germinated seeds in Pre–emergence damping–off stage (control) = *(16.7%)
Natural of dead seedling in Post-emergence damping–off stage (control) =** (23.3%)

III-Chemical changes in some plant constituents of cotton detached leaves due to infection with root rot pathogens.

1- Sugars and phenols changes:

Data in **Table (4-a)** indicate that infestation the soil with root rot pathogens increased the reducing, non-reducing and total sugars in leaves of cotton plants of both cvs (Giza-86 and Giza-89). The highest increase in reducing and non-reducing sugars in cotton leaves of cvs Giza-86 and Giza-89 were recorded in case of infestation the soil with *F. moniliforme* followed by each of *R .solani* and *F. semitectum,* respectively, while the lowest amount of reducing sugars was recorded when the soil was infested with *F. roseum* comparing to un-infested soil (control). On the other hand, total sugars were also high in cotton leaves of both cvs. (Giza-86 and Giza-89) in case of infestation the soil with *F. moniliforme* followed by *R.solani* and *F. semitectum.* While the least increase was in case of infestation the soil with *F .roseum.*

Regarding phenols, it is clear from data **(Table, 4-b)** that infestation the soil with root rot pathogens affected positively the content of total, free and conjugated phenols in leaves of cotton plants cvs, Giza-86 and Giza-89. In this respect, the lowest amount of phenols as mg/g fresh weight (total, free and conjugated phenols) of both cvs.(Giza-86 and Giza-89) was recorded in case of infestation the soil with *F .roseum* comparing with the other tested soil borne pathogens. Meanwhile, the highest increase in the amount of determined phenols as mg/g fresh weight (total, free and conjugated phenols) of both cvs. (Giza-86 and Giza-89) was recorded in the case of infestation the soil with *R. solani* followed by *F. moniliforme* and *F.*

semitectum, respectively. It is clear also that all the determined phenols (total, free and conjugated phenols) were higher in cv. Giza-89 than those determined in cv. Giza-86.

Table (4-a): Chemical constituents in cotton detached leaves of cotton cvs. Giza-86 and Giza-89, 21 days post sowing in soil infested with root-rot pathogens.

Tested fungi	Sugars (mg/g fresh weight)					
	Reducing		Non-reducing		Total	
	cv.Giza-86	cv.Giza-89	cv.Giza-86	cv.Giza-89	cv.Giza-86	cv.Giza-89
R.solani	6.77	6.77	13.47	14.25	20.24	21.02
F.moniliforme	7.55	7.16	14.24	15.41	21.79	22.57
F.roseum	5.84	6.07	11.28	11.83	17.12	17.90
F.semitectum	6.77	6.15	12.69	14.09	19.46	20.24
Control	5.37	5.60	10.20	11.75	15.57	16.35

Table (4-b): Chemical constituents in cotton detached leaves of cotton cvs. Giza-86 and Giza-89, 21 days post sowing in soil infested with root-rot pathogens.

Tested fungi	Phenols (mg/g fresh weight)					
	Free		Conjugated		Total	
	cv.Giza-86	cv.Giza-89	cv.Giza-86	cv.Giza-89	cv.Giza-86	cv.Giza-89
R.solani	9.27	13.53	3.23	4.71	12.50	18.24
F.moniliforme	8.53	12.06	3.09	4.18	11.62	16.24
F.roseum	7.65	8.53	2.79	3.09	10.44	11.62
F.semitectum	8.53	10.15	2.80	3.68	11.33	13.83
Control	5.59	6.62	2.06	2.35	7.65	8.97

2- Changes of chlorophyll (A), (B) and carotenaids.

Data in **Table (5)** reveal that infestation the soil with the tested root rot pathogens *i.e., R. solani, F. moniliforme, F. semitectum,* and *F. roseum* before sowing cotton seeds affected

negatively the content of chlorophyll when determined in leaves of cotton seedlings as mg/g fresh weight of both the tested cvs after 21 days post sowing. In this respect, all the tested root rot pathogens decreased the content of chlorophyll A and B and the total chlorophyll in cotton leaves comparing with uninfested soil (control) of both the two cvs Giza-86 and Giza-89. The highest decrease in chlorophyll A and B as well as total chlorophyll was recorded in case of infestation the soil with *F. moniliforme, F. semitectum, F. roseum* and *R. solani* respectively comparing with uninfested soil (control) of both the two cultivars.

The results also indicate that infestation the soil before sowing with any of the root rot pathogens do not affect clearly the carotenoids content in the leaves of grown cotton plants of both tested cotton cvs. comparing with un-infested soil (control) where all the determined carotenoids contents were ranged from 0.91 to 0.93 mg/g fresh weight.

Table (5): Changes of chlorophyll and carotenoids content in the leaves of cotton cvs. Giza-86 and Giza-89, 21 days post sowing in infested soil with root-rot pathogens.

Tested fungi	**Chlorophylls** (mg/g fresh weight)						**Carotenoids** (mg/g fresh weight)	
	A		**B**		**Total**			
	Giza-86	**Giza-89**	**Giza-86**	**Giza-89**	**Giza-86**	**Giza-89**	**Giza-86**	**Giza-89**
R.solani	2.801	3.000	1.476	1.554	4.291	4.554	0.93	0.92
F.moniliforme	1.946	2.033	1.380	1.548	3.326	3.581	0.91	0.94
F.roseum	2.613	2.611	1.440	1.483	4.053	4.094	0.91	0.92
F.semitectum	2.425	2.523	1.362	1.316	3.787	3.839	0.93	0.92
Control	4.254	4.468	2.380	2.695	6.634	7.163	0.93	0.93

3 – Changes in electrophoretic protein patterns:

Data in **Table (6) and Fig. (1)** show the variation in fractionated protein patterns in leaves of two cotton cultivars (Giza-86 and Giza-89) as a result of infection with *Rhizoctonia solani* and *Fusarium* spp. The results of exhibited protein bands ranged from 208.6 to 10.5 KDa. The obtained results suggest that the infection with pathogens increased the number of fractionated protein bands comparing with control treatment (un-infected).

In this respect, the infected cotton plants (cv. Giza-86) with *R. solani* revealed 15 protein bands comparing with control plants (11 band), some of them are similar in their molecular weight to as in control while some others were newly formed corresponding to infection with the pathogen like, 100.0, 82.9, 40.1, 29.8, 17.5, 14.6 and 10.5 KDa. Meanwhile, infection with *F .moniliforme* revealed 12 protein bands; some of them are new formed like 100.0, 47.7, 40.1 and 16.1 KDa. Also, the inoculated plants cv. (Giza-86) with *F. roseum* revealed 12 bands, among them the new protein bands were 192.6, 148.4, 93.1 and 16.1 KDa. On the other hand, the inoculated cotton plants cv. (Giza-86) with *F. semitectum* revealed 16 protein bands comparing with the un-inoculated ones (11 band), among them, the new formed bands were 192.6, 148.4, 116.2, 93.1, 47.7, 40.1, 28.9 and 16.1 KDa. The results indicate also that the inoculated cotton plants cv. (Giza-86) with *F. roseum* and *F. semitectum* revealed typical protein bands at 192.6, 148.4, 93.1 and 16.1 KDa, as well as they were differed completely from protein bands of *R. solani* infection, meanwhile they were partially similar to those

produced when plants were inoculated with *F. moniliforme* at 16.1 KDa. Moreover, The inoculated cotton plants cv. (Giza-86) with each of *R. solani* and *F. moniliforme* produced typical bands in response to infection at 100.0, 40.1 and 17.5 KDa. These appeared protein bands differed in their condense, where some of them were clear faint and some others appeared intensive although, they have the same molecular weight.

As for cotton cv.Giza-89, results show clear variation in the fractionated protein patterns which resulted in the leaves as a result of infection with each of *Rhizoctonia solani* and *Fusarium* spp. These exhibited protein bands ranged from 208.6 to 11.9 KDa. The obtained results clearly indicate that the infection with *R. solani* and *F. roseum* revealed protein bands lesser in their number comparing with control treatment (un-infected) meanwhile, only the infected plants with *F. semitectum* revealed protein bands more than in control treatment. On the other hand, all infected cotton plants (cv. Giza-89) produced few of new bands in response to infection with root rot pathogens such as 17.5 KDa in case of *R. solani*; 20.1 KDa with *F. moniliforme*; 82.9 and 21.6 KDa with *F. roseum* as well as, 130.9, 99.5, 96.3, 46.4, 36.3, 30.4 ,16.1 and 13.8 KDa in case of *F. semitectum*. On the other hand, the inoculated cotton plants (cv. Giza-89) with *F. roseum* and *F. semitectum* revealed typical protein band at 21.6 KDa.

Table (6): Molecular weight of formed protein patterns in leaves of cotton plants sown in soil previously inoculated with root rot pathogens.

Bands No.	Cotton cvs.									
	cv. Giza-86					cv. Giza-89				
	C1	1	2	3	4	C2	1	2	3	4
1	208.6	208.6	208.6	208.6	–	208.6	–	–	–	–
2	–	-	–	192.6	192.6	192.6	192.6	192.6	192.6	192.6
3	–	–	–	148.4	148.4	148.4	148.4	148.4	148.4	–
4	130.9	130.9	–	–	–	–	–	–	–	130.9
5	–	–	–	–	116.2	116.2	116.2	116.2	116.2	–
6	–	100.0	100.0	–	–	–	–	–	–	–
7	–	–	–	–	–	–	–	–	–	99.5
8	–	–	–	–	–	–	–	–	–	96.3
9	–	–	–	93.1	93.1	93.1	93.1	93.1	93.1	93.1
10	–	–	–	–	–	–	–	–	91.9	–
11	88.1	–	–	88.1	88.1	88.1	88.1	88.1	88.1	88.1
12	–	82.9	–	–	–	–	–	–	82.9	–
13	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2
14	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4
15	51.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2
16	–	–	47.7	–	47.7	47.7	–	47.7	47.7	–
17	–	–	–	–	–	–	–	–	–	46.4
18	45.4	45.4	–	–	45.4	45.4	–	45.4	–	–
19	41.5	–	–	–	–	–	–	–	–	–
20	–	40.1	40.1	-	40.1	40.1	40.1	40.1	40.1	–
21	–	–	–	–	–	–	–	–	–	36.3
22	–	–	–	–	–	35.5	35.5	35.5	35.5	–
23	35.0	–	35.0	35.0	35.0	–	–	–	–	–
24	–	–	–	–	–	–	–	–	–	30.4
25	–	29.8	–	–	–	–	–	–	–	–
26	–	–	–	–	28.9	–	–	–	–	–
27	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6
28	–	–	–	–	–	22.1	22.1	22.1	–	–
29	–	–	–	–	–	–	–	–	21.6	21.6
30	–	–	–	–	–	–	–	20.1	–	–
31	–	17.5	17.5	–	–	–	17.5	–	–	–
32	–	–	16.1	16.1	16.1	–	–	–	–	16.1
33	–	–	–	–	–	15.1	15.1	15.1	–	15.1
34	–	14.6	–	–	–	–	–	–	–	–
35	–	–	–	–	–	–	–	–	–	13.8
36	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9
37	–	10.5	–	–	–	–	–	–	–	–
Total	**11**	**15**	**12**	**12**	**16**	**17**	**15**	**17**	**16**	**18**

C1= Control cv.Giza-86 C2= Control cv.Giza-89 1= infested soil with *R. solani* 2 = infested soil with *F. moniliforme* 3 = infested soil with *F. roseum* 4 = infested soil with *F. semitectum*

EXPERIMENTAL RESULTS

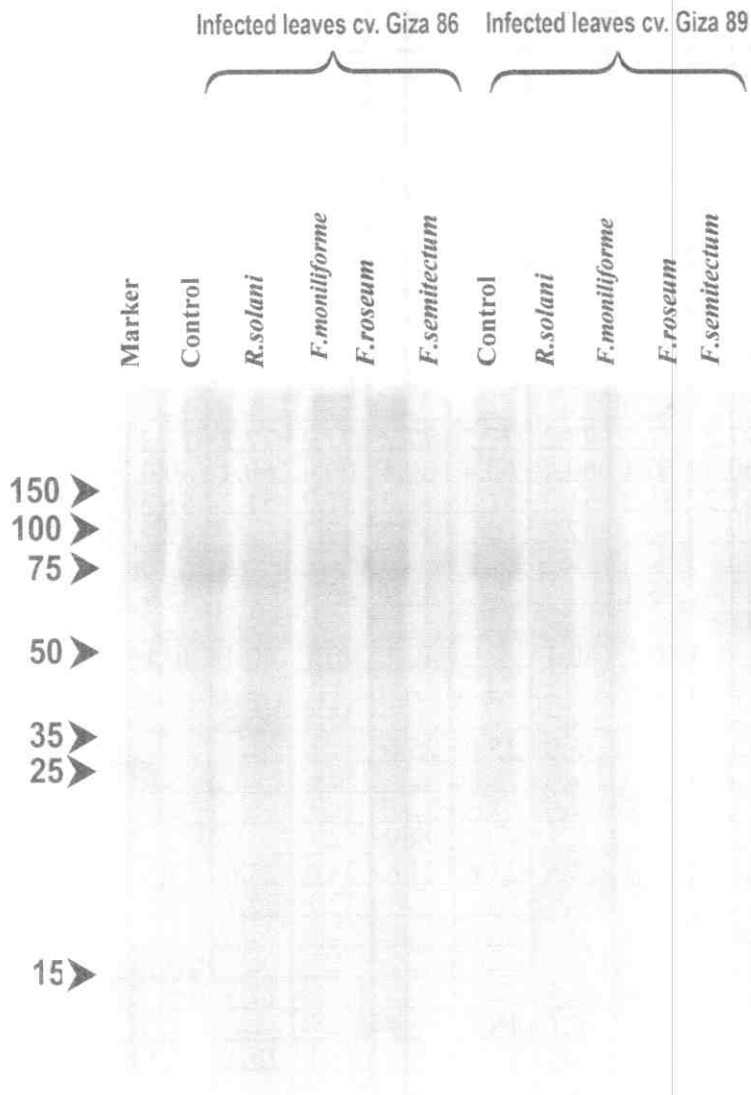

Figure (1): Electrophoretic protein patterns on SDS-PAGE in leaves of cotton cvs Giza-86 and Giza-89 previously planted in soil infested with root rot pathogens.

4-Changes in some electrophoretic isozyme related to resistance:

A- Esterase isozyme:

Data in **Table (7) and Fig. (2)** indicate clearly that infestation the soil with any of the tested root rot pathogens *i.e., R. solani, F. moniliforme, F. roseum* and *F. semitectum,* before sowing cotton seeds in this soil do not affect esterase isozyme content in cotton leaves of growing seedlings at 21 days post sowing in case of cv Giza-86 comparing to un-infested control. In this respect, all the protein patterns of esterase isozyme resulted due to any infestation treatment were equal to those appeared with the control treatment where they showed the same values of Rf except with *R. solani* which resulted a new protein band at 0.36.

As for cv. Giza-89, the same trend was also true except that the infestation treatment with *R. solani* where, five new protein bands of esterase isozyme were formed at Rf values 0.21, 0.36, 0.62, 0.71 and 0.79.

Table (7): The Rf values of esterase isozyme patterns in cotton leaves of cvs Giza-86 and Giza-89.

No.of band	cv.Giza-86.					cv.Giza-89.				
	Control	*R.solani*	*F.moniliforme*	*F.roseum*	*F.semitectum*	Control	*R.solani*	*F.moniliforme*	*F.roseum*	*F.semitectum*
1	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
2	0.093	0.093	0.093	0.093	0.093	0.093	0.093	0.093	0.093	0.093
3	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
4	-	-	-	-	-	-	0.21	-	-	-
5	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
6	-	0.36	-	-	-	-	0.36	-	-	-
7	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
8	-	-	-	-	-	-	0.62	-	-	-
9	-	-	-	-	-	-	0.71	-	-	-
10	-	-	-	-	-	-	0.79	-	-	-
Total	**5**	**6**	**5**	**5**	**5**	**5**	**10**	**5**	**5**	**5**

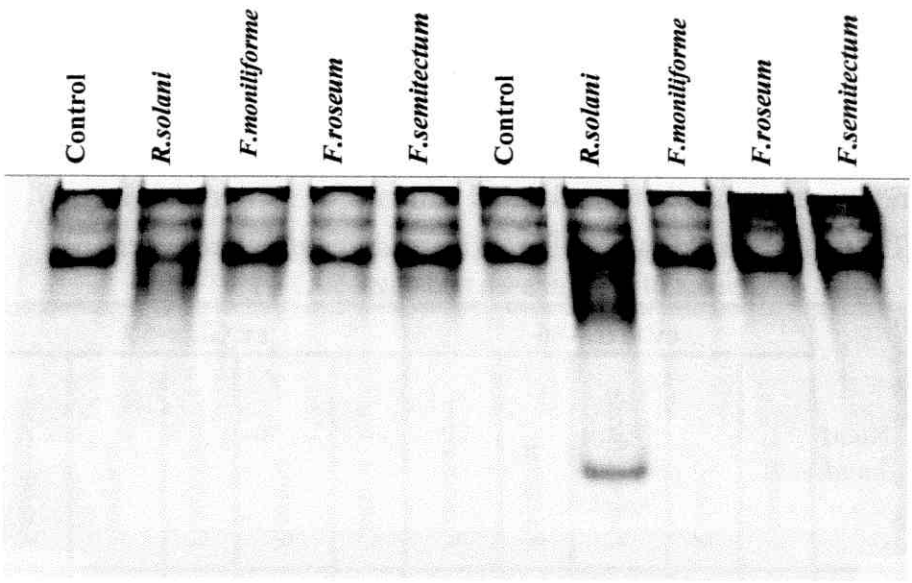

Fig. (2): Electrophoretic protein patterns of esterase isozyme in the leaves of cotton cvs Giza-86 and Giza-89.

B-Peroxidase isozyme:

Data presented in Table **(8)** and illustrated in **Fig. (3)** reveal that soil infestation with the tested root rot pathogens *i.e., R. solani, F. moniliforme, F. semitectum,* and *F. roseum* before sowing cotton seeds showed clear variations in peroxidase isozyme patterns of the two tested cotton cvs.

As for cv. Giza-86, the obtained results indicate that two new protein bands at Rf 0.10 and 0.12 were developed due to soil infestation with *R. solani* comparing with the control treatment (un-infested). Meanwhile, infestation with *F. moniliforme* did not reveal any new bands comparing with the control treatment (un-infested). Whereas, soil infestation with *F.*

semitectum, and *F. roseum* revealed only one new band of peroxides isozyme at Rf. 0.10.

Concerning cv. Giza-89, soil infestation with the tested root rot pathogens resulted in clear changes in formation of peroxidase isozyme where many protein bands were disappeared comparing to those of un-infested one (control), meanwhile, no new protein bands were formed with all infestation treatments.

Table (8): The Rf values of peroxidase isozyme patterns in cotton leaves of cvs.Giza-86 and Giza-89.

No.of band	cv.Giza-86					cv.Giza-89				
	Control	*R.solani*	*F.moniliforme*	*F.roseum*	*F.semitectum*	Control	*R.solani*	*F.moniliforme*	*F.roseum*	*F.semitectum*
1	-	0.10	-	0.10	0.10	0.10	0.10	-	-	0.10
2	-	0.12	-	-	-	0.12	-	-	-	-
3	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
4	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	-	-
5	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
6	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Total	**4**	**6**	**4**	**5**	**5**	**6**	**5**	**4**	**3**	**4**

mycotoxins, only *F. moniliforme* produced 200 and 300 ppb into the infected seeds of cvs Giza-86 and Giza-89, respectively. In addition, none of the four tested isolates was able to produce aflatoxins in to the infested cotton seeds, meanwhile aflatoxins were appeared only in naturally contaminated cotton seeds of both tested cvs.

Table (10): Mycotoxins produced by the isolated fungi in the infested cotton seeds with some pathogenic fungi

Tested fungi	Produced mycotoxins (ppb)					
	Zearlenone		Fumonisins		Aflatoxins	
	Giza-86.	Giza-89.	Giza-86.	Giza-89.	Giza-86.	Giza89.
R.solani	0.0	0.0	0.0	0.0	0.0	0.0
F.moniliforme	0.0	0.0	200.0	300.0	0.0	0.0
F.roseum	200.0	250.0	0.0	0.0	0.0	0.0
F.semitectum	600.0	200.0	0.0	0.0	0.0	0.0
Control	0.0	0.0	0.0	0.0	250.0	650.0

V- Laboratory studies

A- Effect of some fungicides on the growth of the tested fungi:

This experiment was conducted to study the effect of different concentrations of some fungicides on the linear growth of *R. solani, F. moniliforme, F. roseum* and *F. semitectum.*

Data in **Table (11-a)** indicate that all the tested fungicides affected the linear growth of *R. solani* to values ranged from 4 to 68 mm comparing with the un-treated one (control. In this respect, Premis, Maxim and Topsin-M were the best effective fungicides on growth of *R. solani*. It is clear also, that Topsin-M was the highest effective one at the concentrations 5-400ppm

where the resulted linear growth was only 9 mm followed by Premis at concentrations of 5-400ppm (13 to 9 mm) and Maxim at 10-400 ppm (10 mm).

Table (11-a): Effect of some fungicides on the linear growth (mm) of *R. solani*, 5 days post inoculation at 28°C.

Fungicides	The linear growth of *R. solani* (mm) at different concentrations (ppm)									Mean
	Co.	1	5	10	25	50	100	200	400	
Maxim	70	12	11	10	10	10	10	10	10	17.1
Premis	70	14	13	9	9	9	9	9	9	16.8
TopsinM70	70	54	9	9	9	9	9	9	9	20.7
RizolexT50	70	66	52	44	42	36	25	19	16	41.1
VitavaxT70	70	68	68	68	64	61	42	41	9	54.5
VitavaxT40	70	46	46	42	39	27	16	15	4	33.8
Mean	70.0	43.3	33.2	30.3	28.8	25.3	18.5	17.2	9.5	30.7

L.S.D. at 5 % for Concentration (C) 0.11 Fungicides (F) 0.09 C x F 0.27

On the other hand, Maxim and Premis were more effective than Topsin-M at concentration 1 ppm. Moreover, the least effective fungicide on the linear growth of *R. solani* was Vitavax-T70 especially at the tested concentrations ranged from 1 to 200 ppm where the average of the linear growth was 54.5 mm.. It is clear that increasing the concentration from 1 to 400 ppm increased gradually the effect of the tested fungicides in reducing the growth of *R. solani.*

Data in **Table (11-b)** indicate that Maxim and Premis were the best effective fungicides on linear growth of *Fusarium moniliforme* where the resulted linear growth was only 9 mm at all the tested concentrations which ranged between 1-400ppm Meanwhile, Topsin-M was also effective at the tested concentrations ranged from 5-400 ppm where its linear growth

was only 9 mm. On the other hand, Rizolex-T, Vitavax-T70 and Vitavax-T40 were less effective than the fist three fungicides especially at the tested concentrations ranged from 1-50 ppm. It is clear also that increasing the concentrations of the tested fungicides from 1 to 400ppm increased gradually the effect on the average of resulted linear growth. It is clear also that Vitavax-T40, Rizolex-T and Vitavax-T70 were the least effective fungicides on linear growth of tested *Fusarium moniliforme* respectively.

Table (11-b): Effect of some fungicides on the linear growth (mm) of *Fusarium moniliforme*, 5 days post inoculation at 28°C.

Fungicides	The linear growth of *Fusarium moniliforme* at different concentrations (ppm).									Mean
	Co.	1	5	10	25	50	100	200	400	
Maxim	70	9	9	9	9	9	9	9	9	15.8
Premis	70	9	9	9	9	9	9	9	9	15.8
Topsin-M70	70	31	9	9	9	9	9	9	9	18.2
RizolexT50	70	44	44	44	18	9	9	9	9	28.4
VitavaxT70	70	52	34	26	25	9	9	9	9	27.0
VitavaxT40	70	42	41	33	30	28	9	9	9	30.1
Mean	70	31.2	24.3	21.6	16.6	12.2	9	9	9	22.5

L.S.D. at 5 % for Concentration (C) 0.13 Fungicides (F) 1.1 C x F 0.32

Results in **Table (11-c)** indicate that Premis followed by Topsin-M were the highest effective fungicides on linear growth of *Fusarium roseum* where they gave the least average of linear growth (15.8 and 18.6 mm) respectively. Premis fungicide gave the least average of the linear growth (9 mm) at all the tested concentrations, *i.e.*, 1 to 400 ppm. Meanwhile, Topsin-M gave the same average of linear growth (9 mm) at the tested concentrations ranged from 5-400ppm. On the other hand,

Vitavax-T70 followed by Rizolex-T were the least effective fungicides on the linear growth of *Fusarium roseum*. Also, increasing the concentrations from 1-400 increased gradually the effect of tested fungicides.

Table (11-c): Effect of some fungicides on the linear growth (mm) of *Fusarium roseum*, 5 days post inoculation at 28°C.

Fungicides	The linear growth of *Fusarium roseum* at different concentration(ppm).									Mean
	Co.	1	5	10	25	50	100	200	400	
Maxim	70	53	52	47	42	40	35	31	9	42.1
Premis	70	9	9	9	9	9	9	9	9	15.8
Topsin-M70	70	35	9	9	9	9	9	9	9	18.6
Rizolex–T50	70	58	53	52	49	47	39	28	24	46.6
Vitavax–T70	70	64	64	62	53	52	32	18	16	47.8
Vitavax–T40	70	65	64	54	45	33	18	11	9	41.0
Mean	70	47.3	41.8	38.8	34.5	31.6	23.6	17.6	12.6	35.3

L.S.D. at 5 % for Concentration (C) 0.06 Fungicides (F) 0.05 C x F 0.15

Results in **Table (11-d)** reveal clearly that Premis followed by Topsin-M were the best effective fungicides on growth of *Fusarium semitectum in vitro* where they gave the least average of growth (20.7 and 22.0 mm) respectively. Meanwhile, Rizolex-T was the least effective one on the growth of *Fusarium semitectum*. Also, increasing the concentration from 1 to 400 ppm increased gradually the effect of the tested fungicides.

Table (11-d): Effect of some fungicides on the linear growth (mm) of *Fusarium semitectum,5* days post inoculation at 28°C.

Fungicides	The linear growth of *Fusarium semitectum* at different concentrations (ppm).									Mean
	Co.	1	5	10	25	50	100	200	400	
Maxim	70	29	29	29	29	28	28	25	9	30.6
Premis	70	25	24	22	10	9	9	9	9	20.7
Topsin-M70	70	46	28	9	9	9	9	9	9	22.0
Rizolex–T50	70	61	49	48	42	38	37	24	15	42.6
Vitavax–T70	70	45	46	46	43	33	9	9	9	34.4
Vitavax–T40	70	51	46	45	43	33	9	9	9	35.0
Mean	70	42.8	37.0	33.0	29.3	25.0	16.8	14.1	10.0	30.8

L.S.D. at 5 % for Concentration (C) 0.1 Fungicides (F) .08 C x F 0.24

B- Effect of some antagonists on the growth (mm) of the tested fungi:

Data in **Table (12)** show the effect of the tested bioagents in this study on the linear growth of all the tested root-rot pathogens. In this respect, Rizo-N was better than Plant Guard in its effect on growth of *R. solani*, *F. moniliforme* and *F. semitectum* as well as comparing to control treatment Meanwhile, Plant Guard was better only on its effect on growth of *F. roseum.*

Table (12): Effect of two antagonists on the linear growth (mm) of the tested root rot fungi, 5 days after incubation at 28° C

Bioagents	The linear growth of the tested pathogens.				
	R.solani	*F.moniliforme*	*F.roseum*	*F.semitectum*	Mean
Control	70	70	70	70	70.0
Rizo-N	43	45	39	47	43.5
Plant Guard	50	53	34	52	47.3
Mean	54.3	56.0	47.6	56.3	53.6

VI–Greenhouse studies

A- Effect of treating cotton seeds of Giza-86 and Giza-89 cvs. with some fungicides on the percentage of dead plants:

Data in **Table (13-a)** reveal that sowing cotton seeds cv Giza-86 in soil infested with any of the pathogenic fungi whether individually or in combination in the absence of any fungicidal treatment (control-2) resulted in high percentage of dead plants. In this respect, the highest percentage of dead plants was occurred in the case of soil infestation the with the combined inoculum **viz.,** *R. solani* x *F. moniliforme x F. roseum* followed by *R. solani* x *F. moniliforme* x *F. semitectum* and *F. moniliforme* x *F. semitectum*. The analogous percentages of dead plants were 80.0, 76.7 and 76.7%, respectively. Also, it is clear that infested soil with fungi whether individually or in combination gave over 50% dead plants with significant differences among most of the infestation treatments, whereas it was 40% in the un-infested soil planted with un-treated seeds with any of the tested fungicides.

On the other hand, treating the cotton seeds with fungicides before sowing in infested soil with fungi whether individually or in combination resulted in a clear reduction in percentage of dead plants where the percentage of dead plants ranged from 16.7 to 43.3%. Moreover, the highest effective fungicides in reducing the percentage of dead plants were respectively, Topsin-M, Premis and Maxim while, the least effective fungicide was Rizolex-T. Also, Topsin-M, Premis and Maxim fungicides were more effective in decreasing the percentage of dead plants than other tested fungicides in all soil

infestation treatments with clear significant difference between the tested fungicides in this respect. Also, treating cotton seeds with fungicides before sowing in the un-infested soil (control–1) resulted in the least percentage of dead plants with superiority of Premis and Maxim over Topsin-M, Vitavax-T70, Vitavax-T40 and Rizolex-T.

Table (13-a): Effect of treating cotton seeds cv.Giza-86 with some fungicides on the percentage of dead plants, 21 days post sowing.

Tested fungi at 3% inoculum	% of dead plants of cotton seedlings (Giza-86)							Mean
	Maxim	Premis	Topsin-M	Rizolex-T	Vitavax-T70	Vitavax-T40	**Co. (2)	
R. solani (1)	20.0	20.0	23.3	43.3	26.7	33.3	56.7	31.9
F. moniliforme (2)	23.3	23.3	20.0	36.7	26.7	30.0	56.7	30.9
F. roseum (3)	26.7	20.0	20.0	30.0	23.3	30.0	56.7	29.5
F. semitectum (4)	26.7	33.3	20.0	40.0	23.3	30.3	56.7	32.9
R. solani x (2)	23.3	23.3	23.3	36.7	36.7	36.7	67.7	35.4
R.solani x (3)	23.3	23.3	26.7	30.0	30.0	40.0	66.7	34.2
R. solani x (4)	16.7	16.7	26.7	40.0	30.0	33.3	73.3	33.8
F. moniliforme x (3)	26.7	26.7	20.0	33.3	36.7	30.0	73.3	35.2
F. moniliforme x (4)	26.7	23.3	23.3	33.3	36.7	30.0	76.7	35.7
F . roseum x (4)	26.7	23.3	20.0	33.3	30.0	30.0	66.7	32.8
R. solani x (2) x (3)	36.7	26.7	23.3	43.3	33.3	30.0	80.0	39.0
R. solani x (2) x (4)	36.7	26.7	23.3	43.3	33.3	30.0	76.7	38.5
R. solani x (3) x (4)	23.3	20.0	23.3	36.7	36.7	33.3	70.0	34.7
F.moniliforme(3)x (4)	23.3	26.7	20.0	30.0	30.0	33.3	70.0	33.3
R.solani x (2)x(3)x(4)	30.0	23.3	30.0	36.7	40.0	36.7	73.3	38.5
*Control (1)	16.7	16.7	20.0	26.7	20.0	23.3	16.7	20.0
Mean	25.4	23.3	22.7	35.8	30.8	31.8	64.8	33.5

*Control-1= Seeds treated with fungicides only without infestation
**Control – 2 = Infested soil with fungi without seed dressing.

L.S.D. at 5% for	Treatment = T	Fungi =F	T x F
	2.80	2.87	7.59

Data in **Table (13-b)** indicate that sowing cotton seeds cv. Giza-89 in soil infested with any of the pathogenic fungi whether individually or in combination in the absence of any fungicidal treatment (control-2) resulted in high percentage of dead plants ranged from 53.3 to 73.3%. In this respect, the high percentage of dead plants was occurred in the case of infestation the soil with the inoculum consisted of *R. solani* x *F. moniliforme x F. roseum x F. semitectum* (73.3%) followed by *R. solani* x *F. moniliforme, R. solani* x *F. roseum, R. solani* x *F. semitectum* and *R. solani* x *F. moniliforme x F. roseum* (66.7%). Also, it is clear that there were a clear significant differences between most of the infestation treatments.

Table (13-b): Effect of treating cotton seeds cv. Giza-89 with fungicides on the percentage of dead plants 21 days post sowing.

Tested fungi at 3% inoculum	% of dead plants of cotton seedlings (Giza-89)							Mean
	Maxim	Premis	Topsin-M	Rizolex-T	Vitavax-T70	Vitavax-T40	**Control (2)	
R. solani (1)	20.0	16.7	16.7	36.7	30.0	26.7	66.7	30.5
F. moniliforme (2)	30.0	20.0	23.3	36.7	30.0	30.0	53.3	31.1
F. roseum (3)	23.3	16.7	20.0	26.7	23.3	30.0	53.3	27.6
F. semitectum (4)	26.7	20.0	20.0	26.7	30.0	30.0	53.3	29.5
R. solani x (2)	40.0	23.3	20.0	33.3	30.0	33.3	66.7	32.3
R. solani x (3)	26.7	23.3	20.0	30.0	30.0	30.0	66.7	32.3
R. solani x (4)	26.7	20.0	20.0	30.0	26.7	33.3	66.7	31.8
F. moniliforme x (3)	20.0	20.0	23.3	30.0	30.0	30.0	63.3	30.8
F.moniliforme x (4)	23.3	20.0	23.3	30.0	30.0	30.0	53.3	29.8
F .roseum x (4)	23.3	23.3	23.3	30.0	33.3	26.7	56.7	29.5
R .solani x (2) x (3)	23.3	20.0	20.0	36.7	30.0	33.3	66.7	31.4
R.solani x (2) x (4)	33.3	20.0	20.0	36.7	30.0	33.3	60.0	33.3
R solani x (3) x (4)	26.7	23.3	23.3	30.0	30.0	36.7	60.0	31.4
F.moniliforme(3)x(4)	23.3	26.7	26.7	26.7	30.0	30.0	60.0	31.8
R.solani x (2) x (3) x(4)	26.7	26.7	26.7	30.0	40.0	30.0	73.3	36.2
*Control (1)	16.7	16.7	16.7	23.3	16.7	23.3	13.4	18.6
Mean	25.6	21.0	21.4	29.5	28.7	29.1	58.3	30.4

*Control-1= Seeds treated with fungicides only without infestation
**Control – 2 = Infested soil with fungi without seed dressing.

L.S.D. at 5% for	Treatment = T	Fungi =F	T x F
	2.12	2.89	7.64

On the other hand, treating cotton seeds cv. Giza-89 with fungicides before sowing in infested soil with fungi whether individual or in combination resulted in a clear reduction in the percentage of dead plants which ranged from 16.7 to 40.0%. Moreover, Premis and Topsin-M were the highest effective fungicides in reducing the percentage of dead plants where they

gave the lowest percentage of dead plants, being 21.0 and 21.4% followed by Maxim treatment (25.6%). Meanwhile, the least effective fungicides were in case of treating the seeds with Rizolex-T and Vitavax-T40. Also, Topsin-M, Premis and Maxim fungicides were more effective in decreasing the percentage of dead plants than the other tested fungicides in all cases of soil infestation with clear significant difference between the tested fungicides in this respect. Also, treating cotton seeds with fungicides before sowing in un-infested soil (control–1) resulted in the least percentage of dead plants with superiority of Maxim, Premis, Topsin-M, and Vitavax-T70 over Rizolex-T and Vitavax-T40 in this field.

B– Effect of treating cotton seeds cvs. Giza-86 and Giza-89 with antagonists on percentage of dead plants, 21 days after sowing.

Data in **Table (14)** show that treating cotton seeds of Giza-86 and Giza-89 cvs.with commercial antagonists (Rizo-N or Plant Guard) before sowing in infested soil with the pathogenic fungi whether individually or in combination decreased significantly the dead plants comparing with the highest percentages of dead plants in the soil infested only with the pathogenic fungi (control–2).

As for Giza-86, the dead cotton seedlings percentages were high in the infested soil with the pathogenic fungi whether used individually or in combination where they ranged from 56.7 to 80.0%. In this respect, the highest percentage of dead plants was due to infestation the soil with *R. solani* x *F. moniliforme* x *F. roseum* (80.0%) followed by *F. moniliforme* x *F. semitectum*

and *R. solani* x *F. moniliforme* (76.7%). Meanwhile, soil infestation with any of the pathogenic fungi alon resulted in 56.7% dead plants. On the other hand, treating cotton seeds cv Giza-86 with Rizo-N or Plant Guard antagonists reduced the infection of cotton seedlings 13.3 – 23.3% in the case of Rizo-N while it was 20.0 – 30.0% with Plant Guard treatment. Also, it is clear from the obtained results that treating cotton seeds with Rizo-N was better than Plant Guard in reducing infection of cotton seedlings where the average of dead plants were 19.0 and 23.0%, respectively.

Regarding Giza-89, the same trend was true where the infection of cotton seedlings were high in soil infested with any of the pathogenic fungi whether individually or in combination, being 53.3 – 73.3%. As well as, treating the seeds of cotton cv. Giza-89 with Rizo-N or Plant Guard antagonists gave similar results to those of Giza-86. In this respect, treating cotton seeds cv Giza-89 with Rizo-N was better than Plant Guard treatment in reducing the percentages of dead plants, being 23.7 and 27.5, respectively. It is clear also, that the percentage of dead plants was high in the un-infested soil (control-1) where it reached 40.0% in the case of Giza-86 and 36.7% in case of Giza-89. Meanwhile, using antagonists reduced these percentages to 13.3 and 16.7% for Giza-86 and 20.0 and 23.3% for Giza-89 in case of using Rizo-N and Plant Guard, respectively.

Table (14): Effect of treating cotton seeds cvs.Giza-86 and Giza-89 with antagonists on the percentage of dead plants, 21 days after sowing.

Tested fungi at 3% inoculum	% dead plants of cotton seedlings cvs.							
	Giza-86				Giza-89			
	Rizo-N	Plant Guard	Control (2)**	Mean	Rizo-N	Plant Guard	**Contro l (2)	Mean
R. solani (1)	16.7	20.0	56.7	31.1	23.3	33.3	66.7	41.1
F. moniliforme (2)	20.0	20.0	56.7	32.3	26.7	26.7	53.3	35.6
F. roseum (3)	13.3	20.0	56.7	30.0	20.0	26.7	53.3	33.3
F. semitectum (4)	16.7	20.0	56.7	31.1	20.0	26.7	53.3	33.3
R. solani x (2)	20.0	23.3	76.7	40.0	23.3	26.7	67.7	39.2
R. solani x (3)	20.0	20.0	66.7	35.6	26.7	26.7	66.7	40.0
R. solani x (4)	20.0	20.0	73.3	37.8	26.7	30.0	66.7	41.1
F. moniliforme x (3)	20.0	23.3	73.3	38.8	20.0	23.3	63.3	35.5
F.moniliforme x (4)	20.0	20.0	76.7	38.9	20.0	23.3	53.3	32.2
F .roseum x (4)	16.7	23.3	66.7	35.6	20.0	23.3	56.7	33.3
R .solani x (2) x (3)	23.3	26.7	80.0	43.3	26.7	30.0	66.7	41.1
R.solani x (2) x (4)	23.3	26.7	76.7	42.2	26.7	30.0	60.0	38.9
R solani x (3) x (4)	20.0	30.0	70.0	40.0	26.7	30.0	60.0	38.9
F.moniliforme x (3)x (4)	20.0	30.0	70.0	40.0	26.7	30.0	60.0	38.9
R.solani(2)x(3)x(4)	20.0	26.7	73.3	40.0	26.7	30.0	73.3	43.3
*Control (1)	13.3	16.7	16.7	15.6	20.0	23.3	13.4	18.9
Mean	19.0	23.0	65.5	35.7	23.7	27.5	58.4	36.5

*Control-1= Seeds treated with fungicides only without infestation

**Control – 2 = Infested soil with fungal without seed dressing.

L.S.D. at 5% for:	Bioagents (b)	Fungi (F)	b x F
cv. Giza-86	6.28	3.31	5.74
cv. Giza-89	3.82	4.24	7.35

C-Effect of treating cotton seeds cvs. Giza-86 and Giza-89 with some fungicides and commercial antagonists on some growth characters of cotton plants at 21 days old.

Data in **Table (15-a)** indicate clearly that treating cotton seeds (cv. Giza-86) with certain fungicides or antagonists before sowing increased significantly the shoot length of the most resulted seedlings at 21 days old. In this respect, the highest increase in the shoot length of the resulted seedlings was in case of treating seeds with Rizolex-T and Rizo-N and planted in soil infested with *F.moniliforme* where the resulted shoot lengths measured 21.7 and 21.2 cm, respectively. Also, treating the seeds with Topsin-M and Vitavax-T40 increased the shoot length in the same infested soil with *F.moniliforme*. Meanwhile, the least shoot length was recorded in case of planting seeds treated with Rizolex-T and Rizo-N in soil infested with *F. moniliforme* where the average shoot length reached 21.7 and 21.2 cm, respectively. Also, planting seeds treated with Topsin-M and Vitavax-T40 increased the shoot length. In case of treating the cotton seeds before sowing with Premis fungicide and Plant Guard bioagent in soil infested with *F.semitectum* and *R.solani*, the estimated shoot length of seedlings recorded 12.7 and 13.0 cm in case of Premis and 12.9 cm in case of Plant Guard in soil infested with *R. solani*. On the other hand, treating the cotton seeds with fungicides or antagonists before sowing in normal soil without infestation (control-2) with any of tested root rot fungi improved the shoot length of the resulted seedlings in case of Maxim, Vitavax-T40, Rizo-N and Plant Guard treatments more than other treatments and control.

Table (15-a): Effect of treating cotton seeds cv Giza-86 with some fungicides and commercial antagonists before sowing in infested soil with root rot fungi on some growth characters of cotton plants at 21 days old.

Seed treatments	Infestation treatment					
	R.sola	*F.monilifor*	*F.semitect*	*F.roseu*	**Co	Mea
Shoot length (cm)						
Maxim	19.8	19.3	18.4	19.3	20.6	19.5
Premis	13.0	18.0	12.7	17.6	16.4	15.5
Topsin-M	16.3	20.2	18.0	19.6	17.4	18.3
Rizolex-T	19.6	21.7	18.4	19.4	19.6	19.7
Vitavax-T70	17.8	16.9	18.8	19.5	19.3	18.4
Vitavax-T40	15.1	20.0	18.3	20.0	20.3	18.7
Rizo-N	17.2	21.2	15.3	20.7	20.1	18.9
Plant Guard	12.9	16.8	15.7	15.0	21.0	16.3
*Control-1	17.6	19.5	14.0	18.3	19.4	17.8
Mean	16.8	19.3	16.6	18.9	19.3	18.2
Root length (cm)						
Maxim	5.4	5.4	6.9	3.4	4.3	5.1
Premis	7.6	6.3	8.2	4.4	4.3	6.2
Topsin-M	4.6	5.3	3.4	5.1	4.6	4.6
Rizolex-T	6.9	3.3	4.5	4.7	3.7	4.6
Vitavax-T70	6.4	5.2	6.5	5.8	4.1	5.6
Vitavax-T40	7.0	6.0	4.4	5.0	4.2	5.3
Rizo-N	5.7	6.3	3.5	5.4	4.7	5.1
Plant Guard	5.4	4.8	5.3	4.0	3.3	4.6
*Control-1	7.1	7.6	5.8	4.7	3.0	5.6
Mean	6.3	5.6	5.4	4.7	4.0	5.2
Dry weight (g) of plantlets						
Maxim	1.1	0.63	0.42	0.62	0.71	0.69
Premis	1.1	0.51	0.50	0.70	0.71	0.70
Topsin-M	0.84	0.65	0.47	0.66	0.66	0.65
Rizolex-T	0.63	0.64	0.46	0.74	0.73	0.64
Vitavax-T70	0.47	0.50	0.62	0.67	0.73	0.59
Vitavax-T40	0.44	0.70	0.48	0.70	0.75	0.61
Rizo-N	0.47	0.50	0.47	0.77	0.67	0.58
Plant Guard	0.42	0.62	0.42	0.82	0.66	0.59
*Control-1	0.84	0.67	0.97	0.69	0.75	0.78
Mean	0.70	0.60	0.53	0.71	0.71	0.65

*Control – 1 = Infested soil with fungi without seed dressing.
**Control-2= Seeds treated with fungicides only and planted in uninfested soil

L.S.D.at 5% for:	Fungi (F)	Treatment(T)	(FxT)
Shoot length	0.0809	0.108	0.242
Root length	0.025	0.0.0081	0.077
Dry weight	0.006	0.0.008	0.0182

EXPERIMENTAL RESULTS

In general, the obtained results showed that Rizolex-T and Maxim were the best tested Fungicides in increasing the shoot lengths of the seedlings while, Premis and Plant Guard negatively affected the shoot lengths of cotton seedlings.

On the other hand, treating cotton seeds with fungicides or antagonists before sowing in soil infested with the tested pathogenic fungi reduced significantly the root length in most treatments. Meanwhile, some fungicides treatments increased the seedlings root length like Premis seed treatment in soil infested with *R.solani* (7.6 cm) and in soil infested with *F. semitectum*. As well as, there was a clear increase in root length in case of seed treatment Maxim, Vitavax-T70 and Plant Guard seed treatments before sowing in soil infested with *F.semitectum*. Also, treating cotton seeds with fungicides or antagonists before sowing in uninfested soil with any of the pathogenic fungi (control-2) improved the root length of the seedlings more than planting un-treated seeds in normal soil (control-1).

Concerning the dry weight, treating cotton seeds with selected fungicides or antagonists before sowing in infested soil with the tested pathogenic fungi reduced significantly the dry weight of the resulted seedlings in most treatments comparing with un-treated seeds planted in infested soil with the tested fungi (control-1) except, Maxim and Premis in soil infested with *R.solani* (1.1g) as well as, Plant Guard, Rizo-N and Rizolex-T in soil infested with *F. roseum*.

Results in **Table (15-b)** reveal also that treating cotton seeds cv Giza-89 with fungicides or antagonists before sowing in infested soil with the tested root rot fungi increased significantly

the shoot length of the seedlings in some cases and decreased it in some others comparing with the un-treated seeds in normal soil (control-1). In this respect, Rizo-N followed by Topsin-M were the best seed treatments for increasing the shoot length of cotton seedlings in growing soil infested with *R. solani.* While, Topsin-M and Vitavax-T70 treatments were the best in increasing the shoot lengths of seedlings growing in soil infested with *F.moniliforme*. Meanwhile, all other treatments reduced the shoot lengths which became lesser than those of control-1 treatment. Also, planting seeds treated whether with fungicides or antagonists in soil infested with *F.semitectum* reduced the shoot lengths of the seedlings in comparison with those of control-1 treatment. On the other hand, treating the seeds with Topsin-M, Vitavax-T70 or Rizo-N before sowing in soil infested with *F.roseum* was the best in increasing the shoot length of the seedlings more than other treatments and control-1, meanwhile, Plant Guard treatment was the least in this respect where it reduced the shoot length. In addition, treating the seeds with Rizo-N, Maxim and Vitavax-T70 before sowing in uninfested soil with the tested fungi (control-2) was the best in improving the shoot lengths of resulted seedlings more than those of other treatments and control-1. In general, Rizo-N, Topsin-M and Vitavax-T70 were the best seed treatments in this respect.

As for root length, treating the cotton seeds cv Giza-89 with Topsin-M fungicide before sowing in infested soil with *R.solani* or *F.moniliforme* only increased the root length of the resulted seedlings comparing with other fungicides or antagonists treatments which decreased the root length in most

cases compared with control-1 treatment. Meanwhile, all seed treatments with fungicides or antagonists before sowing in infested soil with *F.semitectum* decreased the root length of the resulted seedlings to values lesser than those of control-1 treatment. On the other hand, seed treatment with Rizolex-T was the best treatment in case of infested soil with *F. roseum* in increasing significantly the root length of the resulted seedlings comparing with other treatments and control. In the same time, treating the seeds of Giza-89 with fungicides or antagonists before sowing in uninfested soil (control-2) reduced the root lengths compared to control-1 treatment in this respect.

Regarding dry weight of resulted seedlings at 21 days old, treating the cotton seeds cv Giza-89 with any of the fungicides or antagonists before sowing in soil infested with *R.solani* decreased the dry weight of resulted seedlings comparing with control treatment. While seed treatment with any of the tested fungicides and antagonists before sowing in infested soil with *F. moniliforme* increased significantly the dry weight of the resulted seedlings comparing with control-1 treatment, where Vitavax-T40, Maxim, Premis and Topsin-M were the best seed treatments in this respect. Also, Rizo-N and Premis were the best seed treatments before sowing in soil infested with *F.semitectum* in increasing the dry weight of the resulted seedlings comparing with control-1 treatment whereas other seed treatments reduced significantly the dry weight of the resulted seedlings.

Table (15-b): Effect of treating cotton seeds cv. Giza-89 with some fungicides and commercial antagonists before sowing in infested soil with root rot fungi on some growth characters of cotton plants at 21 days old.

Seed treatments	Infestation treatment					Me
	R.sol	*F.monilif*	*F.semitec*	*F.rose*	**Co	
Shoot length (cm)						
Maxim	16.3	18.5	15.3	18.3	20.	17.7
Premis	14.3	18.7	14.2	18.0	16.	16.4
Topsin-M	17.2	21.2	18.7	20.2	17.	18.9
Rizolex-T	15.3	19.4	17.5	18.6	18.	17.8
Vitavax-T70	16.4	20.6	17.1	19.7	19.	18.7
Vitavax-T40	16.1	17.8	19.1	18.4	18.	17.9
Rizo-N	17.6	18.7	19.5	19.2	21.	19.3
Plant Guard	15.6	15.2	15.3	14.7	13.	14.9
*Control-1	15.4	20.0	20.0	17.7	18.	18.4
Mean	16.0	18.9	17.4	18.4	18.	17.8
Root length (cm)						
Maxim	6.3	6.2	3.6	7.2	4.5	5.6
Premis	6.2	5.5	4.5	6.5	4.3	5.4
Topsin-M	7.7	7.0	4.2	6.4	3.9	5.8
Rizolex-T	6.2	6.3	6.4	7.4	4.0	6.1
Vitavax-T70	4.4	3.7	5.0	7.1	3.1	4.7
Vitavax-T40	6.0	5.3	5.4	5.2	3.0	5.0
Rizo-N	6.0	5.0	5.1	3.6	3.6	4.7
Plant Guard	3.3	4.6	4.6	4.7	3.0	4.0
*Control-1	7.0	6.6	6.5	7.0	6.6	6.7
Mean	5.9	5.6	5.0	6.1	4.0	5.3
Dry weight (g) of plantlets						
Maxim	0.43	0.76	0.39	0.59	0.6	0.57
Premis	0.56	0.75	0.58	0.62	0.6	0.64
Topsin-M	0.47	0.73	0.47	0.65	0.6	0.59
Rizolex-T	0.42	0.60	0.47	0.75	0.6	0.57
Vitavax-T70	0.43	0.80	0.44	0.62	0.6	0.58
Vitavax-T40	0.41	0.62	0.50	0.67	0.7	0.59
Rizo-N	0.44	0.65	0.58	0.66	0.8	0.64
Plant Guard	0.66	0.61	0.44	0.47	0.4	0.53
*Control-1	0.86	0.51	0.54	0.76	0.6	0.66
Mean	0.52	0.67	0.49	0.64	0.6	0.59

*Control– 1 =Infested soil with fungi without seed dressing.
**Control-2= Seeds treated with fungicides only and planted in uninfested soil

L.S.D.at 5% for:	Fungi (F)	Treatment(T)	(FxT)
Shoot length.	0.156	0.209	0.469
Root length.	0..019	0.025	0.057
Dry weight.	0..0192	0.0258	0.0577

Meanwhile, seed treatments with the selected fungicides or antagonists before sowing in soil infested with *F. roseum* decreased the dry weight of the resulted seedlings at 21 days old comparing with control-1. On the other hand, Rizo-N and Vitavax- T40 were the best seed treatments before sowing in the uninfested soil (control-2) in increasing the dry weight of the resulted seedlings in un-infested soil comparing with control-1 (un-treated seeds).

VII– Field trials:

Effect of some fungicides and commercial bioagents:

1- Effect on disease incidence:

Data in **Table (16)** indicate that, all the tested fungicides and commercial bioagents affected positively disease incidence under field conditions. In this respect, Maxim was the most effective fungicide on reducing disease incidence of cotton plants where it gave the highest percentages of survived plants of cotton cvs. Giza-86 and Giza-89 during the both growing seasons of 2000 and 2001 being 76.7 & 78.0% and 80.7 & 82.0%, respectively.

Meanwhile, Topsin-M70 followed Maxim in this respect without significant differences. Slight difference was noticed between Vitavax-T70 and Maxim or Topsin-M7. Rizolex-T was the least effective fungicide, where the survived plants were 64.7 and 71.4% during 2000 growing season and 72.0 and 69.6% during season 2001 for both cvs. Giza-86 and Giza-89, respectively.

Table (16): Effect of some fungicides and commercial bioagents on damping off incidence of the two cotton cvs. Giza-86 and Giza-89, under field conditions during 2000- 2001 growing seasons.

Treatments	% Disease incidence and survived plants.																	
	cv.Giza-86									cv.Giza-89								
	Season2000			Season2001			Mean			Season2000			Season2001			Mean		
	Pre	Post	Sur.	Pre	Post	Sur.	Pre	Post	Sur.	Pre	Post	Sur.	Pre	Post	Sur.	Pre	Post	Sur.
Maxim	16.7	6.7	76.6	16.0	3.3	80.7	16.4	5.0	78.7	18.0	4.0	78.0	15.3	2.7	82.0	16.7	3.4	80.0
Topsin-M70	22.7	4.0	73.3	22.0	3.0	75.0	22.4	3.5	74.2	20.7	2.7	76.7	19.3	1.3	79.4	20.0	2.0	78.1
Rizolex-T	29.3	6.0	64.7	26.0	2.0	72.0	27.6	4.0	68.4	22.0	6.7	71.4	26.7	3.7	69.6	24.3	5.2	70.5
Vitavax-70	22.7	4.0	73.3	21.3	4.7	74.0	22.0	4.4	73.7	22.0	4.0	74.0	20.7	4.0	75.3	21.4	4.0	74.7
Vitavax-40	23.3	7.3	69.4	22.7	3.3	74.0	23.0	5.3	71.7	25.3	1.3	73.4	22.0	3.3	74.7	23.7	2.3	74.1
Rizo-N	28.0	5.0	67.0	26.7	2.0	71.3	27.4	3.5	69.2	24.7	4.7	70.6	23.3	3.3	73.4	24.0	4.0	72.0
Plantguard	27.3	8.0	64.7	26.0	5.3	68.7	26.6	6.7	66.7	26.7	5.3	68.0	25.3	4.0	70.7	26.0	4.7	69.4
Control	52.7	13.3	34.0	54.7	13.3	32.0	53.7	13.3	33.0	52.7	11.3	36.0	54.7	12.7	32.6	53.7	12.0	34.3
Mean	27.8	6.9	65.4	26.9	4.6	68.5	27.4	5.7	67.0	26.5	5.0	68.5	25.9	4.4	69.7	26.2	4.7	69.1

L. S .D .at 5% for:	cv.Giza-86.			cv.Giza-89.		
	Pre.	Post.	Survival.	Pre.	Post.	Survival.
Season2000	4.22	3.97	2.99	3.15	2.29	3.59
Season2001	2.54	2.39	3.08	5.43	2.64	6.11

Regarding the effect of some commercial bioagents under field conditions, data in **Table (16)** indicate that, the bioagent Rizo- N was the best for its effect on reducing disease incidence and increasing survived plants of cvs. Giza-86 and Giza-89 in both 2000 and 2001 growing seasons, being 67.0 & 70.6% and 71.3 & 73.4 % on the average, respectively.

2- Effect on plant height (cm):

Data in **Table (17)** indicate that treating cotton seeds with fungicides or commercial bioagents before sowing improved the plant height of cotton plants cvs Giza-86 and Giza-89 more than untreated ones (control). In this respect, Vitavax–T70 followed by Vitavax–T40 and Rizolex–T50 were the best effective fungicides in increasing cotton plant height during the two growing seasons (2000-2001) where they resulted in a remarkable increase over other treatments. On the other hand, the other tested fungicides were also more effective than the un-treated control in increasing the plant height of tested cotton plants. Moreover, Rizo-N and Plant Guard bioagents improved also the plant height of the tested cotton plants more than those of the un-treated control and sometimes better than some tested fungicides. Plant height in the case of Plant Guard treatment was higher than of those treated with Rizo-N treatment.

Data indicate also that the plant height of cotton plants cv. Giza-86 was higher than those of Giza-89 cultivar in both seasons under the effect of all tested treatments.

Table (17): Effect of some fungicides and commercial bioagents on plant height (cm) of cotton plants cvs.Giza-86 and Giza-89 during 2000 and 2001 growing seasons

Treatments	Plant height (cm)					
	Season 2000		Mean	Season 2000		Mean
	cv.Giza-86	cv.Giza-89		cv.Giza-86	cv.Giza-89	
Maxim	126.3	124.7	125.5	124.7	123.7	124.2
Topsin-M	128.7	117.7	123.2	128.0	117.7	122.8
Rizolex-T	1297	124.0	126.8	1287	123.3	126.0
Vitavax-T70	135.3	133.0	134.1	128.7	129.0	128.8
Vitavax-T40	133.7	129.3	131.5	128.7	127.7	128.2
Rizo-N	126.3	123.3	124.8	125.7	123.3	124.5
Plant Guard	127.3	125.0	126.2	127.0	123.3	125.2
Control	124.7	117.0	120.8	121.0	115.0	118.0
Mean	129. 0	124.3	126.6	126.6	122.8	124.7

L.S.D.at 5% for	Season 2000	Season 2001
Cotton cultivars = (C)	0.843	0.933
Treatments = (T)	1.690	1.87
C x T	2.386	2.64

3- Effect on fruiting branches of cotton plants:

Data in **Table (18)** show that treating cotton seeds cvs. Giza-86 and Giza-89 with fungicides and/or bioagents for controlling root rot pathogens increased also the number of fruiting branches on growing plants. In this respect, Vitavax-T70 followed by Vitavax-40 were the best effective fungicides in increasing the number of fruiting branches onto both cvs. Giza-86 and Giza-89 during the growing seasons 2000 and 2001. Also, treating the seeds before sowing was effective in increasing the number of fruiting branches of both cvs. Giza-86 and Giza-89 during the growing seasons 2000 and 2001 comparing with some other tested fungicides and untreated

control. Plant Guard and Rizo-N were more effective than many of the tested fungicides and control in this respect.

Table (18): Effect of some fungicides and commercial bioagents on fruiting branches of cotton plants cvs.Giza-86 and Giza-89 during 2000 and 2001 growing seasons

Treatments	Number of fruiting branches / plant					
	Season 2000		Mean	Season 2000		Mean
	cv.Giza-86	cv.Giza-89		cv.Giza-86	cv.Giza-89	
Maxim	12.0	12.3	12.2	11.3	12.0	11.7
Topsin-M	12.0	11.0	11.5	10.7	10.7	10.7
Rizolex-T	12.3	12.0	12.2	12.3	12.0	12.1
Vitavax-T70	15.3	14.3	14.8	12.7	14.0	13.4
Vitavax-T40	15.0	13.7	14.4	13.0	12.0	12.5
Rizo-N	12.7	11.7	12.2	12.7	11.0	11.5
Plant Guard	13.3	12.3	12.7	12.0	11.7	11.5
Control	11.3	10.3	10.8	10.7	9..0	9.8
Mean	13.0	12.2	12.6	11.9	11.6	11.7

L.S.D.at 5% for	Season 2000	Season 2001
Cotton cultivars = (C)	0.464	N.S.
Treatments = (T)	1.690	1.01
C x T	n.s.	n.s.

4- Effect on bolls number of cotton plants:

Data in **Table (19)** indicate that treating cotton seeds cvs.Giza-86 and Giza-89 with fungicides and/or bioagents for controlling root rot pathogens led to increasing the number of opened bolls/plant compared with control treatment (untreated seeds). Meanwhile, the only exception in this respect was Topsin-M70 treatment where it was less effective especially onto cv. Giza-86 during season 2000. Also, it is clear that the highest increases for both cotton cvs was produced by using Vitavax-T70 followed by Vitavax-T40 and Rizo-N, respectively. during

season 2000. Whereas, Vitavax-T70, Vitavax-T40, Plant Guard and Rizo-N were the most effective for treatment the seeds of both cotton cvs. Giza-86 and Giza-89 during the second season 2001.

Table (19): Effect of some fungicides and commercial bioagents on mature opened bolls of cotton plants cvs.Giza-86 and Giza-89 during 2000 and 2001 growing seasons

Treatments	Number of opened bolls/plant					
	Season 2000		Mean	Season 2000		Mean
	cv.Giza-86	cv.Giza-89		cv.Giza-86	cv.Giza-89	
Maxim	18.0	20.3	19.2	16.0	19.3	17.6
Topsin-M	14.3	20.0	17.2	14.3	19.3	16.8
Rizolex-T	17.3	19.0	18.2	15.3	17.3	16.3
Vitavax-T70	21.3	24.3	22.8	17.0	22.7	19.8
Vitavax-T40	21.3	23.0	22.2	21.3	21.7	21.5
Rizo-N	19.3	23.0	21.2	17.3	21.0	19.2
Plant Guard	18.3	21.0	19.6	18.3	20.0	19.2
Control	14.7	18.7	16.7	12.7	17.0	14.8
Mean	18.1	21.2	19.6	16.5	19.8	18.2

L.S.D.at 5% for	Season 2000	Season 2001
Cotton cultivars = (C)	0. 68	0.577
Treatments = (T)	1.36	1.154
C x T	n.s,	1.63

5- Effect on the weight of cotton yield:

Data in **Table (20)** indicate that treating cotton seeds cvs.Giza-86 and Giza-89 with fungicides and/or bioagents for controlling root rot pathogens also led to increasing the weight of yielded cotton for each boll. In this respect, Vitavax-T70 and Vitavax-T40 were the best for seed treatment in increasing the weight of yielded cotton for each boll during the two growing seasons for both tested cotton cvs. Giza-86 and Giza-89. Also, Rizo-N and Plant Guard were more effective than many

fungicides and the to un-treated control in increasing the weight of yielded cotton for each boll at the first and the second season specially for cv. Giza-89. Maxim and Rizolex fungicides followed by Vitavax-T70 and Vitavax-T40 in their effect during seasons 2000 and 2001 specially for cv. Giza-89. Also, treating cotton seeds cvs. Giza-86 and Giza-89 with fungicides and/or bioagents for controlling root rot pathogens increased also cotton yield (g)/plant of growing plants. In this respect, Vitavax-T70 followed by Vitavax-40 were the most effective fungicides in increasing the cotton yield (g)/plant for both cvs. Giza-86 and Giza-89 during 2000 growing season. Meanwhile, Vitavax-T40 followed by Rizo-N were the most effective treatments in increasing the cotton yield (g)/plant onto both cvs. Giza-86 and Giza-89 during season 2001. It is clear also, that Plant Guard and Rizo-N were more effective than many of the tested fungicides, i.e., Maxim, Topsin-M and Rizolex-T as well as the un-treated control in this respect.

It is clear also, that treating cotton seeds cvs. Giza-86 and Giza-89 with fungicides and/or bioagents for controlling root rot pathogens increased also the yield of cotton (kantar/feddan).

Table (20): Effect of some fungicides and commercial bioagents on cotton weight (g)/boll , yield of cotton (gram) per plant and cotton yield (kantar/feddan) of cotton plants cvs.Giza-86 and Giza-89 during 2000 and 2001 growing seasons.

Treatments	Season 2000		Mean	Season 2001		Mean
	cv.Giza-	cv.Giza-		cv.Giza-	cv.Giza-	
Cotton weight (g)/boll						
Maxim	2.2	2.3	2.3	2.2	2.3	2.3
Topsin-M	2.3	2.2	2.7	2.2	2.2	2.2
Rizolex-T	2.2	2.3	2.7	2.2	2.3	2.2
Vitavax-T70	2.4	2.6	2.5	2.2	2.5	2.4
Vitavax-T40	2.4	2.6	2.5	2.3	2.4	2.4
Rizo-N	2.2	2.4	2.3	2.2	2.4	2.3
Plant Guard	2.2	2.4	2.3	2.2	2.3	2.3
Control	2.2	2.2	2.2	2.1	2.1	2.1
Mean	2.3	2.4	2.4	2.2	2.3	2.3
Yield of cotton (gram) per plant						
Maxim	39.0	46.1	42.1	34.5	44.0	39.3
Topsin-M	32.6	44.7	38.7	31.8	42.7	37.3
Rizolex-T	38.3	43.7	41.0	33.3	39.5	36.4
Vitavax-T70	51.8	64.2	58.0	37.9	57.1	47.5
Vitavax-T40	50.2	58.9	54.5	48.6	52.1	50.4
Rizo-N	42.9	55.8	49.4	38.1	49.9	44.0
Plant Guard	41.1	49.5	45.3	40.5	45.0	42.7
Control	31.5	41.1	36.3	26.7	36.0	31.4
Mean	40.9	50.5	45.7	36.4	45.8	41.1
Cotton yield (kantar/feddan)						
Maxim	5.7	7.8	6.7	4.9	7.4	6.2
Topsin-M	4.5	7.4	5.9	4.5	6.5	5.5
Rizolex-T	6.4	9.4	7.9	4.8	7.4	6.1
Vitavax-T70	10.4	13.7	12.1	6.6	10.6	8.6
Vitavax-T40	9.5	12.3	10.9	8.5	9.9	9.2
Rizo-N	6.1	14.2	10.2	5.2	9.1	7.2
Plant Guard	6.2	9.2	7.7	5.9	7.0	6.5
Control	4.0	5.7	4.8	3.0	4.9	3.9
Mean	6.6	10.0	8.3	5.4	7.8	6.6

LSD at 5% for	Cotton cultivar = (C)		Treatments = T		Cx T	
	2000	2001	2000	2001	2000	2001
Cotton weight (g)/boll	0.051	0.023	1..36	0.046	n. s.	0.066
Yield of cotton (gram) / plant	5.534	4.974	1.374	2.689	n. s.	3.803
Cotton yield(kantar/feddan)	0.675	0.796	1.35	0.798	1.9	1.125

In this respect, Vitavax-T70 followed by Vitavax-T40 were more effective for seed treatment in increasing cotton yield (kantar/feddan) for cv. Giza-86 during season 2000 while,

Vitavax-T70 followed by Rizo-N and Vitavax-T40 were the most effective for treatment seeds of cv. Giza-89 during the same season. On the other hand, Vitavax-T40 followed by Vitavax-T70 were the best during season 2001 for Giza-86, meanwhile, the reverse was true for Vitavax-T70 followed by Vitavax-T40 which were the most effective fungicides in increasing the cotton yield of cv. Giza-89 during the same season.

6- Effect on the yield of cotton lint:

Data in **Table (21)** indicate that treating cotton seeds cvs.Giza-86 and Giza-89 with fungicides and/or bioagents for controlling root rot pathogens led to increasing the average yield of cotton lint (g)/plant compared with control treatment (untreated seeds). The only exception in this respect was Topsin-M treatment which was less effective for both cvs.Giza-86 and Giza-89 during the two growing seasons 2000 and 2001 comparing with the other tested fungicides. Also, it is clear that he highest increase for both cotton cvs. was produced by using Vitavax-T70 followed by Vitavax-T40 and Rizo-N, respectively during season 2000. Whereas, Vitavax-T40 and Plant Guard were the most effective treatments of Giza-86 while, Vitavax-T70 followed by Vitavax-T40 and Rizo-N were the best during season 2001.

Data in **Table (21)** show also, that treating cotton seeds cvs. Giza-86 and Giza-89 with fungicides and/or bioagents for controlling root rot pathogens increased also the yield of cotton lint (kantar/feddan). In this respect, seed treatment with each of Vitavax-T70 followed by Vitavax-T40 were more effective in

increasing the yield of cotton lint (kantar/feddan) for cv. Giza-86 during season 2000 while, Rizo-N followed by Vitavax-T70 and Vitavax-T40 were the most effective seed treatments for cv. Giza-89 during the same season. On the other hand, Topsin-M and Vitavax-70 showed the best effect in increasing the yield of cotton lint of cv.Giza-86 during season 2001.

Table (21): Effect of some fungicides and commercial bioagents on the yield of cotton lint (g)/plant and yield of cotton lint (kantar/feddan) for cotton plants cvs.Giza-86 and Giza-89. during 2000 and 2001 growing seasons.

Treatments	Season 2000		Mean	Season 2001		Mean
	Giza-86	Giza-89		Giza-86	Giza-89	
Yield of cotton lint (g)/plant						
Maxim	12.9	15.4	14.2	11.8	14.7	13.3
Topsin-M	10.8	14.8	12.8	10.6	14.2	12.4
Rizolex-T	12.8	14.6	13.7	11.1	13.2	12.2
Vitavax-T70	17.2	21.4	19.3	12.6	19.0	15.8
Vitavax-T40	16.7	19.6	18.2	16.0	17.3	16.6
Rizo-N	14.3	18.6	16.5	12.7	16.6	14.6
Plant Guard	13.7	16.5	15.1	13.5	15.0	14.3
Control	10.5	13.7	12.1	8.9	12.0	10.5
Mean	13.6	16.8	15.2	12.2	15.3	13.7
Yield of cotton lint (kantar/feddan)						
Maxim	5.7	7.8	6.8	5.4	7.9	6.7
Topsin-M	4.5	7.9	6.2	9.2	7.0	8.1
Rizolex-T	6.4	9.4	7.9	5.3	8.0	6.6
Vitavax-T70	10.4	13.7	12.0	7.0	11.3	9.2
Vitavax-T40	9.5	12.3	10.9	5.0	10.6	7.5
Rizo-N	6.1	14.2	10.2	5.9	9.8	7.8
Plant Guard	6.2	9.2	7.7	6.3	7.8	7.0
Control	4.0	5.7	4.8	3.3	5.3	4.3
Mean	6.6	10.0	8.3	5.9	8.5	7.2

LSD at 5% for	Cotton cultivar = (C)		Treatments =		Cx T	
	Season 2000	Seaso	Seaso	Seaso	Seaso	Seaso
Yield of cotton	1.8	1.682	N.S.	0.877	N.S.	1.241
Yield of cotton	1.9	1.096	0.675	0.387	1.35	0.776

Meanwhile, Vitavax-T70 followed by Vitavax-T40 and Rizo-N were more effective fungicides in increasing the yield of cotton lint of cv. Giza-89 during the same season.

7- Effect on the yield of cotton seeds (g)/plant and yield of cotton seeds (kg/feddan)

Data in **Table (22)** show that treating cotton seeds cvs.Giza-86 and Giza-89 with fungicides and/or bioagents for controlling root rot pathogens increased also the yield of cotton seeds (g)/plant. In this respect, Vitavax-T70 followed by Vitavax-T40 and Rizo-N were the best treatments during season 2000 on both tested cotton cvs.Giza-86 and Giza-89.While, Vitavax-T40 and Rizo-N were the best seed treatments during season 2001 in increasing the yield of cotton seeds of cv. Giza-86. Vitavax-T70 followed by Vitavax-T40 and Rizo-N were the best seed treatments for cv Giza-89 during the same season. Rizo-N was more effective than Plant Guard in increasing the yield of cotton seeds (g)/plant of both cotton cvs.Giza-86 and Giza-89 during the two growing seasons of 2000 and 2001.

Data indicate also, that treating cotton seeds cvs. Giza-86 and Giza-89 with fungicides and/or bioagents for controlling root rot pathogens increased also the yield of cotton seeds (kg/feddan). In this respect, using the tested fungicides and bioagents resulted in noticeable increase in yield of cotton seeds for both cotton cvs.Giza-86 and Giza-89 during the two growing seasons comparing with the un-treated control.

Table (22): Effect of some fungicides and commercial bioagents on the yield of cotton seeds (g) / plant and yield of cotton seeds (kg/feddan) of cotton cvs.Giza-86 and Giza-89 during 2000 and 2001 growing seasons.

Treatments	Season 2000		Mean	Season 2001		Mean
	Giza-86	Giza-89		Giza-86	Giza-89	
Yield of cotton seeds (g) / plant						
Maxim	26.0	30.7	28.4	22.7	29.3	26.0
Topsin-M	21.7	29.6	25.7	21.2	28.5	24.8
Rizolex-T	25.5	29.1	27.3	22.2	26.2	24.2
Vitavax-T70	34.6	42.8	38.7	25.3	38.0	31.7
Vitavax-T40	33.5	39.3	36.4	31.9	34.7	33.3
Rizo-N	28.6	37.3	33.0	27.0	33.2	30.1
Plant Guard	27.4	32.9	30.2	25.4	30.0	27.7
Control	20.9	27.4	24.2	17.8	24.0	20.9
Mean	27.3	33.6	30.4	24.2	30.5	27.3
Yield of cotton seeds (kg/feddan)						
Maxim	574.1	805.2	689.6	513.2	777.4	645.3
Topsin-M	470.3	803.9	637.1	447.1	673.9	560.5
Rizolex-T	647.1	936.8	791.9	493.2	759.5	626.4
Vitavax-T70	1065.5	1404.3	1234.9	685.8	1102.5	894.2
Vitavax-T40	966.1	1258.9	1112.3	881.0	1034.4	957.7
Rizo-N	614.1	1172.7	893.4	545.3	741.5	643.4
Plant Guard	630.9	925.1	778.0	601.9	772.1	686.9
Control	404.4	616.5	510.5	315.4	506.4	410.9
Mean	671.6	990.4	831.0	560.4	796.0	678.2

LSD at 5% for	Cotton cultivar = (C)		Treatments = T		Cx T	
	Season 2000	Season 2001	Season 2000	Season 2001	Season 2000	Season 2001
Yield of cotton seeds (g) /	3.735	3.241	2.703	1.835	N.S.	2.59
Yield of cotton seeds	48.0	63.35	69.0	126.69	135.8	n.s

Moreover, Vitavax-T70 and Vitavax-T40 were the most effective seed treatments for both tested cotton cvs during season 2000. On the other hand, Vitavax-T40 followed by Vitavax-T70 showed the best effect for cv.Giza-86 during season 2001 while,

Vitavax-T70 and Vitavax-T40 were the most effective seed treatments for cv. Giza-89 during the same season.

8- Effect on the fiber length:

Data in **Table (23)** reveal that treating cotton seeds cvs. Giza-86 and Giza-89 with fungicides and/or bioagents for controlling root rot pathogens improved also the fiber length of yielded cotton. In this respect, The tested fungicides and bioagents improved clearly the fiber length of yielded cotton for both cotton cvs. Giza-86 and Giza-89 during the two growing seasons comparing to un-treated seeds (control). Therefore, Vitavax-T70 followed by Vitavax-T40 were the most effective seed treatments in increasing the fiber length of the yielded cotton of the two cotton cvs during seasons 2000 and 2001.

Table (23): Effect of some fungicides and commercial bioagents on the fiber length (mm) of cotton cvs.Giza-86 and Giza-89.during 2000 and 2001 growing seasons.

Treatments	Fiber length (mm)					
	Season 2000		Mean	Season 2000		Mean
	cv.Giza-86	cv.Giza-89		cv.Giza-86	cv.Giza-89	
Maxim	31.7	32.1	31.9	31.6	32.2	31.9
Topsin-M	31.9	31.9	31.9	31.9	31.8	31.8
Rizolex-T	33.0	32.1	32.6	33.0	32.4	32.7
Vitavax-T70	33.9	33.2	33.6	33.7	33.1	33.4
Vitavax-T40	33.4	32.8	33.1	33.3	32.8	33.0
Rizo-N	32.9	32.2	32.6	32.8	32.1	32.5
Plant Guard	33.3	31.9	32.6	32.9	31.8	32.4
Control	31.2	31.5	31.4	31.2	31.4	31.3
Mean	32.7	32.2	32.5	32.6	32.2	32.4

L.S.D.at 5% for		Season 2000	Season 2001
	Cotton cultivar = (C)	0.304	0.294
	Treatments = T	0.61	0.588
	Cx T	n. s.	n. s.

9- Effect on the fiber strength:

Data in **Table (24)** reveal that treating cotton seeds cvs. Giza-86 and Giza-89 with fungicides and/or bioagents for controlling root rot pathogens improved also the fiber strength of the yielded cotton. In this respect, most the determined values of fiber strength (micron) were clearly different from the those of the un-treated one (control). Vitavax-T70, Vitavax-T40 and Plant Guard gave the best effect in improving the fiber strength of the yielded cotton over the other tested fungicides and bioagents during the two growing, i.e., seasons 2000 and 2001.

Table (24): Effect of some fungicides and commercial bioagents on the fiber strength of cotton cvs. Giza-86 and Giza-89. during 2000 and 2001 growing seasons.

Treatments	Fiber strength (micron)					
	Season 2000		Mean	Season 2000		Mean
	cv.Giza-	cv.Giza-		cv.Giza-	cv.Giza-	
Maxim	17.9	17.9	17.9	17.8	17.9	17.8
Topsin-M	17.9	18.1	18.0	17.8	18.1	17.9
Rizolex-T	18.2	17.9	18.0	18.2	17.8	18.0
Vitavax-T70	18.8	18.3	18.6	18.6	18.2	18.4
Vitavax-T40	18.7	18.2	18.5	18.4	18.2	18.3
Rizo-N	18.1	18.2	18.2	18.1	18.1	18.1
Plant Guard	18.5	18.0	18.3	18.4	17.9	18.1
Control	17.6	17.6	17.6	17.5	17.7	17.6
Mean	18.2	18.0	18.1	18.1	17.9	18.0

L.S.D.at 5% for	Season 2000	Season 2001
Cotton cultivar = (C)	0.110	0.108
Treatments = T	0.213	0.216
Cx T	0.302	0.306