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STUDIES ON THE OCCURRANCE OF SEEDLING BLIGHT, ROOT ROTS AND DISEASE SEVERITY OF SUGAR BEET PLANTS

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ABSTRACT

Survey of seedling blight, root rots, and disease severity of sugar beet plants were carried out on sugar beet fields of four northern and mid Nile Delta Governorates. This survey revealed that seedling blight and root-rots diseases were dominant in all surveyed Governorates with various degrees of spread, however Kafr El-Sheikh Governorate represented the first rank in this respect.

Sclerotium rolfsii followd by *Rhizoctonia solani* were the most frequent isolated fungi from diseased materials collected during such survey, while *Macrophomina phaseolina*, on the other hand, was the less frequent one. *Fusarium oxysporum*, *F. solani*, *F. moniliforme* and some other unidentified fungi were also recovered from infected roots.

Studying pathogenicity revealed that *S. rolfsii* followed by *R. solani* were the most destructive pathogens to the tested susceptible cultivar, cv. Kawmera under artificial infection. *M. phaseolina*, on the contrary, had the least capability to infect beet plants.

Studying the varietal resistance of 15 cultivars to infection with damping-off and root-rots caused by *S. rolfsii* and *R. solani* indicated that all the tested cultivars were susceptible with various degrees of susceptibility to these pathogens under greenhouse conditions. But, under natural infection, only som of them were susceptible to infection (giving more than 8% infection), while the majority exhibited moderate resistance against infection by the two pathogens (giving less than 8% infection). Clear negative corelation was found between infection percent and the root yield per plot.

Keywords: Sugar beet, damping-off, root-rot, disease severity, *Sclerotium rolfsii*, *Rhizoctonia solani*, *Macrophomina phaseolina*, *Fusarium oxysporum*, and *F. solani*.

INTRODUCTION

Sugar beet (*Beta vulgaris* L.) is one of the most important sugar crops in the world. Before 1982, sugar cane was only the main crop-producing sugar in Egypt. However, since 1982 sugar beet has been introduced as a new crop to be cultivated especially in Kafr El-Shiekh Governorate to face the increasing demand of sugars.

Sugar beet is known to be attacked by various diseases which affect its quantity and quality. Damping-off of seedlings and root-rot diseases were considered among the most destructive diseases which are caused by many serious soil borne pathogens namely, *Sclerotium rolfsii* Sacc. and

Rhizoctonia solani Kuhn, (*Thanatephorus cucumeries*) Frank, (El-Kholi, 1978; Singh, 1982; El-Zayat *et al.*, 1986; Ristaino *et al.*, 1991; El-Abyad *et al.*, 1988&1992; Abada, 1994; Sharma and Pathak, 1994; Awad, 1995; Mosa and El-Kholi, 1996; El-Kazzaz *et al.*, 1999&2000 and Esh, 2000). Several species of *Fusarium* and *Pythium* were also recorded by many invistigators, i.e., *Fusarium oxysporum* Schlech, Synder and Hans., *F. solani* (Mart.), *F. semitictum* Berk and Rau., *F. moniliforme, Pythium debaryanum, P. ultimum*, Hesse. and *P. aphanidermatum*, Meurfd. (El-Kholi, 1978; Hassan, 1981; Essa, 1993; Abada, 1994; Mansour *et al.*, 1995; Awad, 1995 and El-Kazzaz *et al.*, 1999 & 2000). *Phoma* (*Pleospora*) *betac*, (Berl) Nevodovsky (Bugbee and Soine, 1974 and El-Kholi, 1978) *Macrophomina phaseolina*, Tassi. (El-Kholi, 1978; Fahim *et al.*, 1981; Abada, 1994 and Awad, 1995).

Cultivar resistance may be limited to specific pathogen or races and it is hard to incorporate resistance for more than one pathogen. Resistance against plant diseases embraces a wide range of biological phenomena including true genetic resistance, tolerance and escape (Maloy, 1993). However, breeding for resistance to *Sclerotium* root rot was carried out by many workers (Waraitch, 1985). Sharma and Pathak (1990) tested 36 cultivars of sugar beet plants inoculated with *Sclerotium rolfsii*. They found that ten cultivars were resistant (Less than 10 % disease incidence) and the cultivar Virtus was the most resistant one (4% infection).

Polygenic or partialy dominant resistance to *R. solani* has been developed in germplasms in the USA (Hecker and Ruppel, 1977, 1988 & 1991). Several commercial cultivars with moderate level of resistance have been develcped by sugar company breeders throughout the use of these germplasm (Engelkes and Windels, 1994).

The objective of the present work is to study the prevalence of sugar beet diseases incited to roots from seedling to mature plants. Also, screening varietal resistance among the cultivated cultivars.

MATERIALS AND METHODS

The present work was carried out during 1996-2000 in the laboratory and greenhouse of Agricultural Botany Department, Faculty of Agriculture, Kafr El-Sheikh, Tanta University and the field of Sakha Agricultural Research Station, Kafr El-Sheikh.

1. Survey, Isolation and Identification of the causal organisms:

Several trips to sugar beet fields of four Governorates in northern and mid Delta of Egypt (Kafr El-Sheikh, Dakahliya, Gharbiya and Dameitta) were done during two successive growing seasons, *i.e.*,1996 & 1997 to survey seedling blight and root diseases. Two to seven districts with 3 fields from each one at the mentioned governorates were chosen for this work. Fields were inspected for diseases at different times covering the different stages of plant growth (from seedling to mature plants). This work was designed to visit sugar beet fields grown in each of the three planting dates of the crop, namely: early planting date (August,15), medium planting date

(September,15) & late planting date (October,15). Affected materials were collected and transferred to the Lab. for isolation and identification of the causal organisms.

Sugar beet samples showing symptoms of seedling damping-off and root-rots were washed with tap water to remove all soil-attached particles. Small pieces of the affected materials (about 0.5 cm long) were surface sterilized in 3% sodium hypochlorite solution for 3 minutes and rinsed in several changed-sterilized distilled water. Thereafter, samples were transferred onto potato dextrose agar medium (PDA) containing streptomycin sulphate (40 ppm) to avoid bacterial growth and incubated at 28°C. The isolated fungi were purified by using hyphal-tip technique (Dhingra and Sinclair, 1995). The purified fungi were transferred to slants of PDA medium and incubated at 28°C for 7 days.

The isolated fungi were identified at the Department of Agric. Botany, Faculty of Agriculture, Kafr El-sheikh as well as at the Department of Mycology and Plant Diseases Survey, Plant Pathology Research Institute, Giza Egypt, according to Gilman, (1957); Barnett, (1960); Booth, (1977) and Singh, (1982). The identified fungi were kept at 5°C for further studies.

2. Pathogenicity tests :

Pathogenicity tests of the isolated fungi was carried out under greenhouse conditions. They were tested against the sensitive sugar beet Kawmera cultivar.

To prepare inoculum; glass bottles of 500 ml capacity containing 190 gm clean moistened sand and 10 gm corn meal were autoclaved for 30 minutes at 1.5 atm., then infested with the tested fungus and incubated at 28-30°C for 15 days.

Soil infestation technique: Sterilized-35cm diameter pots were used in this experiment. Pots were filled with sterilized sandy-loam soil (1:2 w/w). Potted soil was infested with the fungal inoculum at the rate of 2% of the soil weight. Infested soil was mixed thoroughly and moistened with water every other day for one week before planting to ensure the distribution and uniformity of the pathogen.

Sugar beet seeds of Kawmera cultivar were surface strelized by immersing in 3% sodium hypochlorite solution for 3 minutes, followed by ethanol 70% for 2 minutes, then rinsed in three changes of sterilized water. Fifteen seeds were planted in each pot. Three replicates were employed for each isolate.

Disease incidence was recorded as percentage of pre-emergence damping-off 15 days after sowing. Post-emergence damping-off was calculated using the formula adopted by Abd El-Moity, (1986) as well as the survived plants, 45 days after sowing. Thereafter, plants were thinned to two plants per pot and left until maturity. Plants were uprooted and roots were checked for root-rotting after 150 days of sowing. The percentage of infected roots, disease severity and healthy plants were recorded. Disease severity index was estimated according to the 1-10 grades of Grainger Scal (Grainger, 1949).

3. Reaction of sugar beet cultivars to damping-off and root-rot infection

A number of 15 sugar beet cultivars were screened for their susceptibility to infection with the major virulent root-infecting pathogens in a greenhouse and in the field. The tested cultivars were, Fareida, Pamela, Del 939, Top, Oscar poly, Plino, Rass poly, Lola, Kawmera, Hi- poly, Gitan, Delmon, Alexa, Del 936 and Gloria. The vailable sugar beet cultivars were obtaind kindly from Delta Sugar Company at Giza , Egypt and Sugar Crops Research Institute (A.R.C.).

In the field experiment, beet cultivars were evaluated for their reaction to infection with root-rot under natural infestation at the farm of Agric. Res. Station of Sakha. The randomized complete blocks method in three replicate plots (1/400 feddan) was designed. Methods of sowing and cultural practices were carried out as usual. Disease readings were taken and recorded as percentage of infection and disease index at harvest time, 200 days of planting.

RESULTS AND DISCUSSIONS

1. Survey of seedling blight and root rot diseases of sugar beet:

Survey was conducted in sugar beet to determine the prevalence and distribution of seedling blight and root-rot diseases in north and mid of delta Governorates at the early, medium and late crop growing seasons in 1996-1997.

Data presented in Table (1) indicate that the highest percentage of seedling blight (6.25) was recorded in fields of Kafr El-Sheikh followed by Gharbiya and Dameitta Governorates. The highest degree of infection was also found at the late crop season followed by the early and medium seasons. It was also observed that infection percent was always higher at the northern districts comparable to the southern locations of the same Governorate.

Results of surveying for percentage of sugar-beet infection with root-rots and disease severity are presented in Table (2). Data indicated that the highest percentage of root-rot as well as disease severity were observed at Kafr El-Sheikh followed by Gharbiya, Dakahliya and Damietta Governorates. On the other hand, the least disease incidence with the least disease severity was found in the medium planting date if compared with the early or late seasons, generally, at all surveyed Governorates. Also, northern districts showed the highest degrees of infection with root-rots and disease severity comparable to the southern regions of the surveyed Governorates. These results are in accordance with the finding of El-Kazzaz *et al.*, 1999.

It is known that Kafr El-Sheikh ranks the first in terms of acreage and productivity of sugar beet allover the beet growing locations of the country (according to the Statistical data of Sugar Experts Association, December

2000). This show how this type of diseases may affect dramatically the production of sugar beet crop as well as sugar production.

Table 1. Occurrence of seedling blight of sugar beet plants at different locations during, 1996 season.

Governorate	District	Seedling blight			
		Early	Medium	Late	Mean
Kafr El-Sheikh	1- Kafr El-Sheikh	5.00 ad	2.67 ab	7.00 bcd	4.89 c
	2- Desouk	4.33 bcd	4.33 ab	6.33 ce	5.00 c
	3- El_Hamol	9.33 a	7.00 a	13 67 a	10.00 a
	4- Biala	3.33 cd	6.00 a	11.33 ab	6.89 bc
	5- Sidy-Salem	8.67 ab	6.00 a	10.67 abc	8.44 ab
	6- Qalen	1.33 d	0.67 b	3.33 d	1.78 d
	7- El-Ryad	7.00 abc	5.67 a	7.67 bcd	6.78 bc
Mean		**5.57**	**4.62**	**8.57**	**6.25**
Dakahliya	1- Belkass	8.00 a	3.33 a	7.67 a	6.33 a
	2- Sherbin	3.33 b	2. 67 ab	5.67 b	3.89 b
	3- Temy El-amdid	2.67 b	2.33 ab	5.33 b	3.44 b
Mean		**4.67**	**2.77**	**6.22**	**4.55**
Gharbiya	1- Qauttor	6.33 a	5.67 a	8.33 a	6.78 a
	2- El-Santa	3.67 b	2.33 b	5.67 b	3.89 b
Mean		**5.00**	**4.00**	**7.00**	**5.33**
Damietta	1- Kafr Saad	6.67 abc	3.33 bcd	5.67 de	5.22 ab
	2- Faraskour	2.33 d	2.33 cd	4.67 de	3.11 bcd
Mean		**4.50**	**2.83**	**5.17**	**4.59**
Total Mean		**4.89**	**3.56**	**6.74**	**5.18**

Means followed by the same letter are not significantly different at 5% level by DMRT.

2. Isolation and identification of sugar beet root-rot fungi :

Diseased materials collected from sugar beet growing areas in Northern region of the country were used to isolate the common root-infecting fungi. Results inTable (3) indicate that *Sclerotium rolfsii* was the most prevalent fungus giving the highest frequencies from samples of Kafr El-Sheikh.Gv. Whereas, *Rhizoctonia solani* was the most prevalent fungus appeared in samples of Dakahliya in higher frequencies *Fusarium* spp. Came in the third rank of frequency from all samples of the four Governorates. *Macrophomina phasiolina, Pythium debaryanum* and other unidentified fungi were isolated from most infected root samples indicating the involving of all or some of these organisms in producing the root-rot complex disease of sugar beet in nature.

It could be noticed from data presented in Table (3) that *F. oxysporum* & *F. solani* were appeared in a higher frequencies than the other fungi in samples collected from Gharbiya Governorate.

Root rots, in particular is the most destructive diseases on the crop productivity and sugar quality. Mukhopadhyay,(1971) and Tewari, (1971) reported that root rot incited by *Sclerotium rolfsii* causes extensive losses in the warmer regions.

Table 2. Occurrence of root rots and disease severity of sugar beet plants at different locations during,1996 season.

Governorate	District	Root rot				Disease severity			
		Early	Medium	Late	Mean	Early	Medium	Late	Mean
Kafr El-Sheikh	1- Kafr El-Sheikh	4.67 cd	3.67 cd	5.67 c	4.67	1.67 c	2.33 bc	3.00 cd	2.33
	2- Desouk	2.67 e	1.33 e	7.67 b	3.89	1.33 c	0.67 c	3.67 cd	1.89
	3- El_Hamol	7.33 b	6.67 ab	11.67 a	8.56	5.33 ab	5.67 a	7.67 a	6.22
	4- Biala	6.67 b	5.33 bc	9.00 b	7.00	3.67 b	2.67 b	2.33 cd	2.89
	5- Sidy-Salem	11.67 a	8.33 a	11.67 a	10.56	6.67 a	3.33 b	7.67 a	5.89
	6- Qalen	3.67 de	2.67 de	3.67 d	3.33	0.33 c	0.67 c	1.67 d	0.89
	7- El-Ryad	5.67 bc	4.33 cd	3.67 d	6.08	3.67 b	1.67 b	5.67 b	3.67
Mean		**6.05**	**4.62**	**7.57**	**6.08**	**3.24**	**2.43**	**4.52**	**3.40**
Dakahliya	1- Belkass	3.33 b	3.67 a	1.67 a	2.89	2.33 a	1.00 a	0.67 a	1.33
	2- Sherbin	4.33 b	3.33 a	2.67 a	3.44	1.33 a	0.67 a	0.67 a	0.89
	3- Temy El-amdid	6.67 a	3.67 a	3.33 a	4.56	2.67 a	1.67 a	0.67 a	1.67
Mean		**4.78**	**3.56**	**2.56**	**3.36**	**2.11**	**1.11**	**0.67**	**1.30**
Gharbiya	1- Qauttor	6.33 a	5.67 a	8.33 a	6.78	2.33 a	1.67 a	3.67 b	2.56
	2- El-Santa	3.67 b	2.33 b	5.67 b	3.89	3.67 a	0.67 a	1.33 a	1.89
Mean		**3.33**	**3.00**	**3.83**	**3.39**	**3.00**	**1.17**	**2.50**	**2.22**
Damietta	1- Kafr Saad	3.67 a	2.67 a	3.67 a	3.22	2.33 a	1.33 a	3.67 a	2.44
	2- Faraskour	2.33 a	1.67 a	2.67 a	2.33	1.67 ab	0.67 ab	2.33 ab	1.56
Mean		**3.17**	**2.00**	**3.17**	**2.77**	**2.00**	**1.00**	**3.00**	**2.00**
Total Mean		**4.33**	**3.32**	**4.28**	**3.96**	**2.58**	**1.63**	**2.67**	**2.23**

Means followed by the same letter are not significantly different at 5% level by DMRT.

Table 3. Frequency of the different isolated soil-borne pathogens from infected sugar beet plants collected from different locations during the disease survey throughout, 1996 season.

Governorate	District	Isolation frequency %									
		No. of Samples	*Fusarium* Oxysporum	Fusarium *Semitictum*	Fusarium *Solani*	Fusarium *Moniliforme*	*Rhizoctonia solani*	*Sclerotium rolfsii*	*Macrophomina phaseolina*	*Pythium debaryanum*	Others
Kafr El-Sheikh	1-Kafr El-Sheikh	26	7.69	7.69	7.69	7.69	11.54	11.54	0 0	7.69	38 46
	2-Desouk	10	10.0	10.0	0.0	0.0	10.0	20.0	0.0	10.0	40.0
	3-El_Hamol	21	9.5	4.46	9.52	0.0	9.52	19.05	4.76	9.52	33.33
	4-Biala	17	23.52	5.88	11.76	17 65	0.0	0.0	0.0	11.76	29.41
	5-Sidy-Salem	18	5.52	0.0	11.11	0.0	5.55	38.89	0.0	11.11	27.78
	6-Qalen	7	0.0	14.29	0 0	0.0	28.57	0.0	14.29	0.0	42.86
	7-El-Ryad	19	5.26	0.0	10.53	10 53	5.26	10.53	5.26	5.26	47.37
Mean			8.79	6.05	7.23	5.12	10.06	14.29	3.47	7 29	37.03
Dakahliya	1-Belkass	13	7.96	0.0	7.69	7 69	15.38	15.38	0.0	0.0	46 15
	2-Sherbin	6	0.0	16.67	0 0	16.67	16.67	0.0	16 67	0.0	33.33
Mean			3.85	8.24	3.85	12.18	16.03	7.69	8 34	0.0	39.74
Gharbiya	1-Qauttor	12	16.67	0.0	16.67	0.0	16.67	0.0	8 33	8.33	33.33
	2-El-Santa	9	11.11	0.0	11.11	0.0	0.0	22.22	0 0	0 0	44.44
Mean			13.89	0.0	13.89	0.0	8.34	11.11	4 17	4.17	38.88
Damietta	1-Kafr Saad	13	7.69	7.69	7.69	7.69	0.0	23.07	0 0	7.69	38.88
	2-Faraskour	6	16 67	0.0	16.67	0.0	16 67	0 0	0 0	0.0	50.0
Mean			12.18	3.85	12.18	3 85	8.34	11.53	0.0	3.85	44.23
Total Mean			9.67	4.56	9.29	6.57	10.10	11.16	3.99	5.40	39.97

Sclerotium rolfsii and *Rhizoctonia solani* were recorded as the most prevalent and destructive pathogens responsible for root rots of sugar beet as they infect plants at different stages of development (Fahim *et al.*, 1981; Sharma and Pathak, 1994; El-Kazzaz *et.al.*, 1999 and Esh, 2000). *Marcrophomina phasiolina, Pythium debaryanum, Fusarium* oxysporum, *F. solani* and other unidentified fungi were also isolated in low frequencies comparable to *S. rolfsii* & *R. solani* indicating that they may play an important role in root rotting of sugar beet. These fungi were identified by other investigators as components of root rot complex disease of sugar beet (El-Kazazz *et al.*,1999 and El- kholi, 2000).

The isolated fungi could be ranked in a descending order for all Governorates as follows: *S. rolfsii* (11.6%), *R. solani* (10.1%), *F. oxysporum* (9.67%) & *F. solani* (9.29%). Some other isolated pathogens were predominant in certain Governorates and absent in others, e.g.,.*M. phaseolina, F. moniliforme* & *P. debaryanum*.

3. Pathogenicity tests :

Pathogenicity tests of five isolates of each isolated fungi ,i.e., *S. rolfsii, R. solani, F. oxysporum, F. solani* & *M. phaseolina*. representing the geographic locations at the four Governorates were done under greenhouse conditions. Results in Table (4) show that all the five isolates of *S. rolfsii* were highly pathogenic causing pre- and post-emergence damping-off as well as root-rot to sugar beet plants. Isolate no. 21 (from Gharbiya) was the most virulent one in producing damping-off and root-rot as well, beside it gave the highest rot disease severity compared with the other isolates under study. Isolates no. 78 & 142, on the other hand, caused the least degrees of infection with both damping-off and root-rot diseases.

Data presented in Table (4) indicate also that all *R. solani* isolates were very aggressive, producing pre- and post-emergence damping-off and crown rots to sugar beet plants, in general. Isolate no.1 (from Kafr El-Sheikh) caused the highest infection percent with pre-emergence damping-off, whereas, it could not cause any sign of post-emergence damping-off to sugar beet plants. Isolate no. 14 caused the highest degree of infection with crown rot, but gave the least disease severity and the least degree of damping-off compared with the rest isolates.

All isolates of *M. phaseolina* (Table, 4) were pathogenic causing damping-off and root-rot to sugar beet plants. Isolate no.10 (from Kafr El-Sheikh) gave the highest infection percent of pre-emergence damping-off , but gave the least infection percent of root-rot compared with isolate no.102 (from Dakahliya) which produced the least infection with damping-off and moderate infection percent with root-rot. Isolate no. 27 (from Kafr El-Sheikh), on the other hand, caused the highest degree of infection with root-rot, but it gave the least disease severity to sugar beet plants if compared with the other isolates under study.

Fusarium oxysporum, as shown in Table (4) was also highly pathogenic to sugar beet plants, generally. Isolate no.26 (from Kafr El-Sheikh) was the most virulent race, producing pre- and post-emergence damping-off to sugar beet plants comparable with the other isolates. Isolate no.42 (from Kafr El-Sheikh), on the other hand, showed the least effect in producing pre-emergence damping-off and root-rot incidence and severity. Data in Table (4) also indicate that the highest level of infection with root-rot was obtained by isolate no.101 (from Gharbia).

Table 4. Virulance of *Sclerotium rolfsii, Rhizoctonia solani, Macrophomina phaseolina, Fusarium oxysporum* and *Fusarium solani* isolates on sugar beet susceptible cultivar Kawmera in a greenhouse, during 1997 season.

Governorate	Isolate no.	Damping-off		Surviving plants %	Root-rot		Healthy roots %
		Pre-emergence %	Post-emergence %		Diseases incidence %	Disease severity	
Sclerotium rolfsii							
Dakahliya	93	68.89 d	26.67 b	6.67 b	66.67 d	7.33 de	33.33 c
Kafr-ElSheikh	78	37.78 b	48.89 e	13.33 c	55.55 b	5.67 bc	44.67 e
Gharbiya	21	71.00 d	26.67 b	2.22 a	87.78 e	8.67 e	12.22 a
Kafr-ElSheikh	60	53.11 c	35.55 d	11.11 c	77.78 e	6.33 cd	22.22 b
Damietta	142	37.78 b	31.11 c	31.11 d	62.45 c	4.67 b	37.78 d
Control		0.00 a	0.00 a	100.0 e	0.00 a	0.00 a	100.0 f
Rhizoctonia solani							
Kafr-ElSheikh	1	93.33 d	0.00 a	6.67 a	84.45 c	2.67 c	15.55 c
Damietta	3	40.00 b	33.33 c	26.67 c	66 67 b	2.33 c	33.22 d
Kafr-ElSheikh	8	53.11 c	33.33 c	13.32 b	91.78 d	4.67 d	8.22 b
Gharbiya	14	40.00 b	20.00 b	40.00 d	97.78 e	1.33 b	2.22 a
Dakahliya	15	52.66 c	20.00 b	26.67 c	66.67 b	2.33 c	33.33 d
Control		0.01 a	0.00 a	100.0 e	0.00 a	0.00 a	100.0 e
Macrophomina phaseolina							
Kafr-ElSheikh	10	17.78 d	13.33 c	68 89 b	33.33 b	2.67 b	66.67 b
Dakahliya	102	6.67 b	4.45 b	88.89 d	37.78 c	2.33 b	62.22 b
Kafr-ElSheikh	27	15.55 d	37.78 d	46.67 a	60.00 e	1.33 ab	40.00 a
Gharbiya	18	11.11 c	15.55 c	80 00 c	55.55 d	4.33 c	44.45 a
Kafr-ElSheikh	82	8.89 bc	13.33 c	82.22 c	33.33 b	1.67 b	66.67 b
Control		0.00 a	0.00 a	100.0 e	0.00 a	0.00 a	100.0 c
Fusarium oxysporum							
Dakahliya	79	31.11 c	17.78 c	51.11 b	53.33 cd	2.67 b	46.67 b
Damietta	19	28.89 c	11.11 b	60.00 d	58.89 d	3.67 c	41.11 b
Gharbiya	101	35.55 d	14.00 b	55.55 c	75.33 e	5.67 d	24.67 a
Kafr-ElSheikh	26	46.67 e	22.22 d	31.11 a	48.69 c	4.33 c	51.11 c
Kafr-ElSheikh	42	15.55 b	17.78 c	66.67 e	35.55 b	2.67 b	64.45 d
Control		0.00 a	0.00 a	100.0 f	0.00 a	0.00 a	100.0 e
Fusarium solani							
Gharbiya	83	17.78 b	6.67 b	75.55 b	35.55 d	2.33 b	64.45 b
Kafr-ElSheikh	103	24.45 c	14.89 d	60.67 a	40.00 e	2.33 b	60.00 a
Kafr-ElSheikh	45	20.00 b	11.11 c	68.89 a	31.11 c	3.67 c	68.89 bc
Damietta	63	13.33 b	4.45 b	82.23 b	28.89 bc	2.33 b	71.11 cd
Dakahliya	37	17.78 b	6.67 b	75.55 b	26.67 b	2.67 b	73.22 d
Control		0 00 a	0.00 a	100.0 c	0.00 a	0.00 a	100.0 e

Means followed by the same letter (in the same column for each pathogen) are not significantly different at 5% level by DMRT.

Results in Table (4) show that all isolates of *F. solani* under study were pathogenic to sugar beet plants causing pre- and post-emergence damping-off and root-rot disease as well. Isolate no.103 (from Kafr El-

Sheikh) gave the highest degree of infection with pre- and post-emergence damping-off and root-rot incidence compared to the other isolates of the same species. On the other hand, isolate no. 63 (from Dameitta) was the least one in producing pre- and post-emergence damping-off to plants and isolate no. 37 (from Dakahliya) gave the least degree of infection with root-rot compared with the other isolates under study. These results are in agreement with those obtained by Abada (1980); Fahim *et al.* (1981); El-Abyad *et al.* (1992) and Awad (1995) who stated that *S. rolfsii* & *R. solani*, but not *M. phaseolina* are the most common and destructive pathogens to roots of sugar beet seedlings and adult plants.

Table 5. Reaction of fifteen sugar beet cultivars to dambing-off and root-rot diseases caused by *Sclerotium rolfsii* and *Rhizoctonia solani*, in a greenhouse, during 1998 season.

No.	Cultivar	Damping-off		Surviving Plants %	Root-rot		Healthy roots
		Pre-emergence %	Post-emergence %		Disease incidence %	Disease severity	
				Sclerotium rolfsii			
1	Fareida	75.56 e	15.55 bc	8.89 b	66.67 c	2.33 ab	33.33 c
2	Pamela	82.22 f	15.55 bc	2.22 a	77.78 d	5.17 e	22.22 d
3	Del 939	71.11 de	26.67 fgh	2.22 a	77.78 d	4.67 cde	22.22 d
4	Top	64.44 c	26.67 fgh	17.78 c	44.44 b	3.67 bcd	55.44 b
5	Oscar poly	66.89 cd	15.55 bc	26.67 d	66.67 c	2.50 ab	33.33 c
6	Pleno	51.11 ab	22.33 def	6.67 ab	33.33 a	1.33 a	66.67 a
7	Rass poly	64.45 c	28.89 gh	6.67 ab	77.78 d	4.33 cde	22.22 d
8	Lola	55.55 b	24.45 efg	20.07 c	66.67 c	3.33 bc	33.33 c
9	Kawmera	86.67 f	8.89 a	4.45 ab	88.89 e	7.33 f	11.11e
10	Hi-poly	64.45 c	17.78 bcd	17.78 c	33.33 a	3.67 bcd	66.67 a
11	Gitan	66.89 cd	31.11 h	6.67 ab	44.44 b	4.67 cde	55.56 b
12	Delmon	75.55 e	20.0 cde	4.45 ab	66.67 c	5.00 de	34.22 c
13	Alexa	71.11 de	20.0 cde	8.89 ab	72.67 cd	1.33 a	27.33 c
14	Del 936	86.67 f	13.33 b	6.67 ab	77.78 d	6.67 f	22.22 d
15	Gloria	48.89 a	24.45 efg	26.67 d	44.44 b	3.33 bc	55.56 b
				Rhizoctonia solani			
1	Fareida	42.22 c	17.78 bc	40.00 g	33.33 a	2.33 abc	66.67 d
2	Pamela	60.00 e	17.78 bc	22.22 d	66.67 d	2.67 bcd	33.33 a
3	Del 939	62.22 e	20.00 cd	17.78bc	62.22 cd	3.67 d	37.78 b
4	Top	31.11 b	13.33 a	55.55 h	33.33 a	1.67 ab	66.67 d
5	Oscar poly	48.89 d	17.89 bc	33.33 f	44.44 b	2.33 abc	55.56 c
6	Pleno	24.45 a	15.55 ab	60.00 l	44.44 b	1.33 a	55.56 c
7	Rass poly	68.89 f	15.55 ab	15.55 b	66.67 d	2.33 abc	33.33 a
8	Lola	48.87 d	22.22 d	37.78 g	33.33 a	1.67 ab	66.67 d
9	Kawmera	73.33 f	17.78 bc	8.89 a	66.87 d	4.67 e	33.44 a
10	Hi-poly	51.11 d	15.55 ab	33.33 f	55.56 c	2.33 abc	44.44 b
11	Gitan	46.67 cd	13.33 a	40.00 g	58.89 cd	3.33 cd	41.11 b
12	Delmon	57.78 e	20.00 cd	22.22 d	44.44 b	3.67 d	55.56 c
13	Alexa	51.11 d	20.00 cd	28.89 e	44.44 b	2.33 abc	55.56 c
14	Del 936	71.11 f	22.22 d	6.67 a	66.67 d	3.33 cd	33.33 a
15	Gloria	57.78 e	22.22 d	20.0 cd	55.67 c	2.67 bcd	44.44 b

Means followed by the same letter (in the same column for each pathogen) are not significantly different at 5 % level by DMRT.

Table 6. Evaluation of fifteen sugar-beet cultivars to root rot disease incidence, disease severity and yield/plot, grown in the field at Sakha during 1998-1999 1nd 1999-2000 seasons.

No	Cultivar	1998-1999 season			1999-2000 season		
		Root rot			Root rot		
		Disease incidence %	Disease severity	Yield/plot (kg)	Disease incidence %	Disease severity	Yield/plot (kg)
1	Fareida	4.67 c	2.67 c	57.67 f	3.67 a	2.67 fg	51.67 d
2	Pamela	8.33 f	2.67 c	34.33 i	8.33 e	2.00 de	57.83 bc
3	Del 939	10.00 g	3.33 d	60.33 e	9.33 e	1.33 bc	33.33 f
4	Top	4.67 c	0.83 a	60.33 e	6.33 d	0.67 a	54.17 cd
5	Oscar poly	5.33 d	1.33 ab	63.33 d	3.67 a	1.67 cd	59.00 b
6	Pleno	3.67 b	1.33 ab	76.00 a	3.67 a	0.83 ab	65.00 a
7	Rass poly	12.33 j	2.67 c	40.00 h	13.33 g	3.00 g	33.50 f
8	Lola	5.33 d	1.50 b	72.67 b	5.33 bcd	2.33 ef	54.17 cd
9	Kawmera	12.67 j	4.33 e	33.17 l	14.67 h	4.00 h	31.67 f
10	Hi-poly	4.33 c	1.33 ab	66.33 c	4.33 ab	0.50 a	57.67 bc
11	Gitan	2.67 a	0.83 a	63.33 d	3.67 a	0.67 a	55.33 bc
12	Delmon	11.00 h	3.67 d	33.17 l	5.00 bc	2.33 ef	34.67 f
13	Alexa	5.33 d	1.67 b	71.00 b	3.67 a	1.33 bc	40.50 e
14	Del 936	11.67 l	4.33 e	45.33 g	12.00 f	4.67 l	39.50 e
15	Gloria	6.00 e	1.33 ab	67.83 c	6.00 cd	0.83 ab	50.83 d

Means followed by the same letter are not significantly different at 5% level by DMRT.

However, results shown in Tables No. 3,4 indicate that *S. rolfsii* followed by *R. solani* were the most virulent and superior in causing damping-off and root-rots to sugar beet plants in the greenhouse, in general. Whereas, *M. phaseolina,* showed the least effective on sugar beet plants and *Fusarium.* spp. were moderate in this respect. Therefore, further studies were carried out throughout the present work using *S. rolfsii* & *R. solani.*

4- Varietal reaction toward infection with *S. rolfsii* or *R. solani:*

A number of 15 cultivated varieties were tested for their susceptibility to infection with each of *S. rolfsii* and *R. solani.* This experiment was carried out in potted infested soil. Data presented in Table (5) indicate that all tested cultivars were susceptible or highly susceptible to infection with damping-off and root-rot caused by *S. rolfsii.* Percentage of survived plants after 30 days of planting ranged between 2.22 % in Pamela & Del 939 (highly susceptible to damping-off) and 26.67 % in Oscarpoly & Gloria (susceptible to damping-off). The rest cultivars distributed between these two extremes in this respect. Kawmera cultivar was highly susceptible to infection with root-rot (88.89%) showing the highest disease severity (7.33 % D.I.) whereas, Pleno cultivar showed the least level of infection with root-rot (33.33 %) showing the least severity of the disease (1.33 % D.I.). The rest cultivars exhibitedmoderate reactions between these two cultivars.

Screening for the resistance to *R. solani* (Table 5) showed that all the cultivars under study were susceptible to infection with damping-off and root-rot diseases. Percentage of survived plants (taken after 30 days of planting) ranged between 6.67 & 8.89 % in Del 936 & Kawmera cultivars respectively rot diseases. Percentage of survived plants (taken after 30 days of planting) ranged between 6.67 & 8.89 % in Del 936 & Kawmera cultivars respectively (insignificant difference) and 60.0% in Pleno cultivar. Four out of the 15 evaluated cultivars showed the highest ability to infection with root-rot. These cultivars are Kawmera, Del 936, Pamela and Rass poly which showed 4.67, 3.33, 2.67 and 2.33 % D.I., respectively. Whereas, Fareida, Top, and Lola, on the other hand were the least susceptible cultivars to infection with root-rot symptoms.

Generally, previous investigators stated that the majority of cultivars were recorded as susceptible to infection with these diseases (El-Kholi, 1984; Waraitch, 1985; El-Abyad *et al.*, 1992 & El-Kazzaz *et al.*, 1999). Sharma and Pathak, (1990) in India, reported that one out of 36 beet cultivars was the only resistant to root-rots which harden the breeding for resistance.

5- Varietal resistance of sugar beet root-rot in the field:

An experiment was designed to evaluate the previous 15 cultivars of sugar beet against root-rot under natural infection at Sakha Agricultural Experimental Station in 1998-1999 and 1999-2000 seasons.

Results in Table (6) indicate that some of the tested cultivars were susceptible to infection with root-rot. They were Pamela, Ras poly, Kawmera, Delmon and Del 936. However, Kawmera proved to be the most susceptible cultivar comparable to the other ones. The trend in disease severity and yield per plot were also observed to be consistent with infection percent for each cultivar.

As expected, root yield per plot was also found to be drastically affected by infection with root-rots. Root yield has been affected by root infection as this study has proved. These results coincided with those obtained by previous investigators who stated that root yields were negatively affected by root rotting of sugar beet. Sharma and Pathak (1994) found that the increase in the root-rot disease incidence caused a corresponding decrease in root yield. Mukhopadhyay (1971) found that root yield losses due to root-rot ranged between 14 and 59 % according to the varieties. Under artificially infestation, Tewari (1971) recorded almost 30 to 40 % reduction in root yield.

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دراسات عن تواجد أمراض لفحة البادرات و أعفان الجذور وكذا الشدة المرضية فى نباتات بنجر السكر

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أظهرت نتائج الحصر التى تمت لحقول بنجر السكر المنزرعة فى أربع محافظات من شمال ووسط الدلتا . انتشار الإصابة بلفحة البادرات واعفان الجذور وكانت الاصابة فى المحافظات تحت الدراسة توضح انتشار المرض بدرجات متفاوتة.

أظهرت النتائج ان الفطريات سكليروشيم رولفزياى وريزوكتونيا سولانى وفيوزاريم أوكسيسبورم كانت أكثر تكرارا اثناء العزل من العينات التى جمعت فى الحصر من جميع المحافظات بينما ظهر الفطر ماكروفومينا فاسيولينا أقل تكرارا فى العزل بالاضافة إلى بعض الفطريات الغير معرفة.

نتائج القدرة المرضية أظهرت أن الفطر سكليروشيم رولفزياى يليه الفطر ريزوكتونيا سولانى كانت أكثر الفطريات المختبرة شراسة على الصنف القابل للإصابة كاوميرا. وعلى العكس من ذلك أظهر الفطر ماكروفومينا فاسيولينا أقل قدرة على الاصابة لنباتات البنجر وذلك تحت ظروف العدوى الصناعية.

أوضحت النتائج أن كل أصناف البنجر المختبرة كانت قابلة للاصابة بموت البادرات وأعفان الجذور المتسببة عن فطر سكليروشيم رولفزياى والفطر ريزوكتونيا سولانى وأيضا تراوحت القابلية للإصابة للأصناف المختبرة من قابل للإصابة إلى شديد القابلية للإصابة وذلك تحت ظروف العدوى الصناعية ، بينما تحت ظروف العدوى الطبيعية أظهرت بعض الأصناف قابليتها للاصابة (أكثر من ٨%) بينما كانت الأغلبية متوسطة المقاومة ضد الإصابة بالمرض (أقل من ٨%) وكان هناك ارتباط سالب بين نسبة الإصابة والمحصول الناتج من كل معاملة.