

REACTION OF SOME SUGARBEET VARIETIES TO THE INFESTATION WITH SOME INSECTS AND FINAL YIELD

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Abstract

Some ecological studies on sugarbeet insect pests, were conducted in Sakha Agric. Res. Station, Kafr El-Sheikh Governorate, during the two growing seasons 2009/10 and 2010/11 to evaluate eleven sugarbeet varieties; Francesca, Helsinki, Revel, Sibel and Univers (monogerm); Diamond, Farida, Helioses, Hercule, Maghrible and Pleno (polygerm) for resistance to main insects of sugarbeet plants (*Pegomya mixta*, *Cassida vittata* and *Scrobipalpa ocellatella*) and high yielding potential. The results revealed that two varieties; Hercule and Helsinki had the least infestation by *P. mixta*. On the other hand, three varieties; Helsinki, Francesca and Helioses had the least infestation by *C. vittata* while each of Helsinki, Sibel and Francesca had the least infestation by *S. ocellatella*. Finally, two varieties Maghrible and Revel proved moderate insect population and in the same time increased root (24.44 and 23.75 ton/fed., respectively) and sugar (4.46 and 4.39 ton/fed., respectively) yield.

INTRODUCTION

In Egypt, sugarbeet, *Beta vulgaris* L. (Family: Chenopodiaceae) is considered the second important sugar crop after sugarcane. In 2009, the total cultivated area 248871 feddan in the old and newly lands, produced about 5138190 ton with an average yield of 20.646 ton/fed. (Sugar Crops Council Report, Jan. 2010). Under Egyptian ecosystem, sugarbeet plants are subjected to be attacked by numerous insect pests during its different group stages. So many authors are attracted to study a group of insect pests cause serious problems for growers and cause yield reductions (Bassyouny and Khalafalla, 1996, Ebieda, 1997 and 1998 and Ebieda *et al.*, 1998). In recent years, the beet fly *Pegomya mixta*, tortoise beetle *Cassida vittata* and beet moth *Scrobipalpa ocellatella* have become serious pests of the sugarbeet (Mousa, 2005, Amin *et al.*, 2008 and Abou-Elkasssem, 2010). The objective of the present study is to evaluate some cultivars of sugarbeet for tolerance against three serious pests, *P. mixta*, *C. vittata* and *S. ocellatella* in order to identify new source of tolerance to search for safer methods rather than toxicants and reducing yield losses due to these insect pests in relation to yield and quality. However, the present study aimed to determine the effect of sugarbeet varieties on the abundance of the three previously mentioned insects and increase yield potential.

MATERIALS AND METHODS

Field studies were carried out at Sakha Agric. Res. Station, Kafr El-Sheikh Governorate during two successive seasons 2009/10 and 2010/11 to evaluate the relative susceptibility of eleven sugarbeet varieties to the infestation with the main insects of sugarbeet plants (five monogerm varieties namely, Francesca, Helsinki, Revel, Sibel and Univers and six polygerm varieties namely, Diamond, Farida, Helioses, Hercule, Maghrible and Pleno) and yield and quality.

Susceptibility of eleven sugarbeet varieties was evaluated to the infestation with *P. mixta* (larvae), *C. vittata* (larvae and adults) and *S. ocellatella* (larvae). The experimental area was divided into plots each of 42 m² (1/100 feddan), each variety was replicated four times in a complete randomized block design and received the usually recommended agricultural treatment. No chemicals were used for controlling sugarbeet insect pests throughout the whole period of the study, the eleven sugarbeet varieties were sown on October 27th of both seasons.

Sampling started one month after sowing and continued until harvesting. The plants were visually examined and the insect pests were counted and recorded bi-weekly on 40 plants (10 plants/replicate) selected randomly for each variety to determine the percentage of leaves infestation, no. of blotches & no. of *P. mixta* larvae; no. of *C. vittata* larvae & adults and no. of *S. ocellatella* larvae.

At harvest, 25 sugarbeet plants were also randomly taken from the four middle ridges of each plot to determine: Foliage weight and the roots were directly pulled, cleaned and weighed. Sucrose percentages were estimated according to the procedure of Le Docte (1927) in Delta sugar company, Kafr El-Skeikh Governorate. Sugar yield in Tons/fed. = Yield of roots in tones / fed. X adjusted sucrose percentages.

Statistical analysis was carried out to obtain any significant differences among means of the treatments according to Duncan's (1955) method through SAS – computer program.

RESULTS AND DISCUSSION

1. Influence of some sugarbeet varieties on the infestation level with main insect pests:

The susceptibility of eleven sugarbeet varieties; Francesca, Helsinki, Revel, Sibel and Univers (monogerm), Diamond, Farida, Helioses, Hercule, Maghrible and Pleno (polygerm) to infestation with *Pegomya mixta*, *Cassida vittata* and *Scrobipalpa ocellatella*

were studied at Kafr El-Sheikh region during two successive seasons 2009/10 and 2010/11.

1.1. Sugarbeet fly, *P. mixta*:

Data illustrated in Tables (1, 2 & 3) showed that, the highest general mean of average of infested leaves, no. of blotches and no. of larvae was recorded on Pleno variety (25.63%, 61.39 blotches and 72 larvae/10 plants, respectively) followed by Helioses variety (24.55%, 52.08 blotches and 70.3 larvae/10 plants, respectively), then Farida variety (18.37%, 45.53 blotches and 63.5 larvae/10 plants, respectively). On the other hand Hercule and Helsinki varieties demonstrated the lowest *P. mixta* infestation on the basis of general mean of percentages of infested leaves (9.03 and 9.50%, respectively), blotches (24.23 and 30.49/10 plants, respectively) and larvae (37.2 and 34.2/10 plants, respectively). The statistical analysis indicated that there were significant differences among the tested sugarbeet varieties to infestation with *P. mixta* and the polygerm varieties were relatively susceptible to infestation with *P. mixta* comparing with monogerm varieties. These results are in agreement with those obtained by Zarif and Hegazi (1990), Solouma (1999), Hussein (2001), Mousa (2005), Amin *et al.* (2008) and Abou-Elkasssem (2010).

1.2. The tortoise beetle, *C. vittata*:

Results in Tables (1, 2 & 3) indicated significant differences among susceptibilities of the eleven varieties to infestation by *C. vittata*. On the other hand, the polygerm varieties were relatively susceptible to infestation by this insect comparing with monogerm varieties (42.0 and 32.7 larvae & adults / 10 plants, respectively). The obtained results showed that on the basis of general mean of larvae and adults which represented the feeders and injurious stages of the beetle, *C. vittata*, Pleno variety was found to be the most preferred and attractive for both larvae and adults as their general mean recorded 74.2 larvae & adults / 10 plants, followed by Farida variety (48.1 larvae & adults / 10 plants). While, Helsinki and Francesca varieties were considered the lowest infested varieties (29.7 and 30.2 larvae & adults / 10 plants, respectively). These results are in agreement with those obtained by Bassyouny and Khalafallah (1996), Talha (2001), Mousa (2005), Amin *et al.* (2008) and Abou-Elkasssem (2010).

Table 1. Effect of sugarbeet varieties on infested leaves by *P. mixta*, *C. vittata* and *S. ocellatella* & yield and quality during 2009/10 season.

Variety		<i>P. mixta</i>			<i>C. vittata</i>	<i>S. ocellatella</i>	Yield			
		% Infested leaves	No. of blotches / 10 plants	No. of larvae / 10 plants	No. of larvae and adults / 10 plants	No. of larvae/10 plants	Foliage Wt. ton/fe d.	Root yield ton/fe d.	Sucrose %	Sugar yield ton/fe d.
Monogerm	Francesca	10.74 c	37.93 bcd	55.2 b	35.7 c	11.8 def	15.63 bc	23.00 ab	18.50 ab	4.26 ab
	Helsinki	7.15 cd	25.75 de	30.4 d	34.2 c	9.7 f	19.30 ab	22.50 abc	18.00 ab	4.05 ab
	Revel	8.48 cd	28.83 cde	39.6 cd	37.3 c	14.6 cde	18.93 ab	24.50 a	18.80 a	4.61 a
	Sibel	7.40 cd	27.50 cde	37.0 cd	36.3 c	10.6 ef	16.80 abc	21.25 bcd	18.20 ab	3.86 abc
	Univers	10.43 c	34.30 bcd	43.5 c	46.0 bc	24.0 a	21.68 a	22.75 ab	18.30 ab	4.16 ab
	Mean	8.84	30.86	41.1	37.9	14.1	18.47	22.80	18.36	4.19
Polygerm	Diamond	6.80 cd	26.90 de	36.9 cd	38.1 c	13.1 def	15.15 bc	24.00 a	17.08 ab	4.10 ab
	Farida	16.80 b	41.38 bc	62.1 ab	55.3 b	14.8 cde	12.40 cd	19.98 cd	15.63 bc	3.12 cd
	Helioses	23.80 a	45.68 ab	67.4 a	36.8 c	15.2 cd	14.13 bcd	19.00 de	16.65 abc	3.16 c
	Hercule	5.80 d	20.10 e	33.4 cd	37.7 c	18.4 bc	12.75 cd	21.75 bc	16.63 abc	3.62 bc
	Maghrible	9.40 cd	32.63 bcde	39.6 cd	38.2 c	14.5 cde	18.48 ab	24.75 a	18.65 ab	4.62 a
	Pleno	23.85 a	57.95 a	68.5 a	80.7 a	19.7 ab	9.63 d	17.15 e	13.63 c	2.34 d
	Mean	14.41	37.44	51.3	47.8	16.0	13.76	21.11	16.38	3.49
LSD 0.05		3.98	13.94	10.80	16.97	4.47	4.95	2.69	3.11	0.78

Means followed by the same letter(s) in each column within each treatment are not significant.

Table 2. Effect of sugarbeet varieties on infested leaves by *P. mixta*, *C. vittata* and *S. ocellatella* & yield and quality, during 2010/11 season.

Variety		<i>P. mixta</i>			<i>C. vittata</i>	<i>S. ocellatella</i>	Yield			
		% Infested leaves	No. of blotches / 10 plants	No. of larvae / 10 plants	No. of larvae and adults / 10 plants	No. of larvae/10 plants	Foliage Wt. ton/fed.	Root yield ton/fed.	Sucrose %	Sugar yield ton/fed.
Monogerm	Francisca	14.38 c	43.69 cd	61.1 bc	24.6 e	7.2 de	15.33 bcd	22.20 abcd	18.08 ab	4.01 ab
	Helsinki	11.84 c	35.23 de	37.9 d	25.1 e	5.9 de	17.30 ab	21.00 bcd	17.35 ab	3.65 ab
	Revel	14.13 c	40.53 cde	48.7 cd	27.1 de	8.9 cd	18.23 a	23.00 abc	18.1 ab	4.16 a
	Sibel	11.94 c	35.95 de	42.6 d	27.8 de	5.7 e	14.03 de	20.43 cd	17.75 ab	3.63 ab
	Univers	15.04 c	42.65 cd	50.7 cd	32.8 c	17.3 a	19.43 a	21.88 abcd	18.20 a	3.98 ab
	Mean	13.47	39.61	48.2	27.5	9.0	16.86	21.70	17.90	3.89
Polygerm	Diamond	12.16 c	39.05 cde	44.0 d	28.8 d	8.9 cd	14.13 cde	23.45 ab	16.95 ab	3.97 ab
	Farida	19.93 b	49.68 bc	64.9 ab	40.8 b	8.4 cde	11.68 ef	20.65 cd	15.73 bc	3.25 bc
	Helioses	25.30 a	58.48 ab	73.2 ab	25.1 e	10.4 bc	12.98 d	19.60 de	16.13 abc	3.21 bc
	Hercule	12.25 c	28.35 e	40.9 d	25.8 de	11.4 bc	11.80 ef	21.18 bcd	16.28 abc	3.46 ab
	Maghribie	14.36 c	41.30 cde	47.8 d	28.2 d	11.0 bc	16.98 abc	24.13 a	17.78 ab	4.30 a
	Pleno	27.40 a	64.83 a	75.5 a	67.6 a	13.5 b	9.13 f	17.50 e	13.93 c	2.42 c
	Mean	18.57	46.95	57.7	36.1	10.6	12.78	21.09	16.13	3.44
LSD 0.05		3.99	13.59	12.82	3.28	3.11	2.87	2.65	2.40	0.90

Means followed by the same letter(s) in each column within each treatment are not significant.

Table 3. Relationship between infested leaves of sugarbeet varieties by *P. mixta*, *C. vittata* and *S. ocellatella* & yield and quality (Two seasons combined data).

Variety		<i>P. mixta</i>			<i>C. vittata</i>	<i>S. ocellatella</i>	Yield			
		% Infested leaves	No. of blotches / 10 plants	No. of larvae / 10 plants	No. of larvae and adults / 10 plants	No. of larvae/10 plants	Foliage Wt. ton/fed.	Root yield ton/fed.	Sucrose %	Sugar yield ton/fed.
Monogerm	Francesca	12.56 cd	40.81 cd	58.2 b	30.2 d	9.5 ef	15.48 bcd	22.60 bc	18.29 a	4.14 ab
	Helsinki	9.50 d	30.49 ef	34.2 d	29.7 d	7.8 f	18.30 ab	21.75 cde	17.68 ab	3.85 bcd
	Revel	11.31 cde	34.68 de	44.2 c	32.2 d	11.8 cde	18.58 ab	23.75 ab	18.45 a	4.39 a
	Sibel	9.67 cde	31.73 def	39.8 cd	32.1 d	8.2 f	15.42 bcd	20.84 de	17.98 a	3.75 bcd
	Univers	12.74 c	38.48 cde	47.1 c	39.4 c	20.7 a	20.56 a	22.32 bcd	18.25 a	4.07 ab
	Mean	11.16	35.24	44.7	32.7	11.6	17.67	22.25	18.13	4.04
Polygerm	Diamond	9.48 de	32.98 def	40.5 cd	33.5 d	11.0 def	14.64 cd	23.73 ab	17.02 ab	4.04 abc
	Farida	18.37 b	45.53 bc	63.5 ab	48.1 b	11.6 de	12.04 de	20.32 ef	15.68 bc	3.19 d
	Helioses	24.55 a	52.08 ab	70.3 a	31.0 d	12.8 cd	13.56 d	19.30 fg	16.39 ab	3.19 d
	Hercule	9.03 e	24.23 f	37.2 cd	31.8 d	14.9 bc	12.28 de	21.47 cde	16.46 ab	3.54 cd
	Maghrible	11.88 cde	36.97 cde	43.7 cd	33.2 d	12.8 cd	17.73 abc	24.44 a	18.22 a	4.46 a
	Pleno	25.63 a	61.39 a	72.0 a	74.2 a	16.6 b	9.38 e	17.33 g	13.78 c	2.38 e
	Mean	16.49	42.20	54.5	42.0	13.3	13.27	21.10	16.26	3.47
LSD 0.05		3.18	10.24	10.34	5.53	3.24	3.45	1.51	2.15	0.52

Means followed by the same letter(s) in each column within each treatment are not significant.

1.3. The beet moth, *S. ocellatella*:

The tabulated results indicated that the Univers variety had the highest general mean of larvae (20.7/10 plants) followed by Pleno variety (16.6 larvae/10 plants) then Hercule (14.9 larvae/10plants). Also, results in Tables (1, 2 & 3) revealed that Helsinki and

Sibel varieties had the lowest general mean of the larval stage (7.8 and 8.2 larvae / 10 plants, respectively). The polygerm varieties were relatively susceptible to infestation with *S. ocellatella* comparing with monogerm varieties. The statistical analysis showed that there were significant differences among the tested sugarbeet varieties to infestation with *S. ocellatella*. These results are in agreement with those obtained by Abdel-Ghany (1994), Mousa (2005), Amin *et al.* (2008) and Abou-Elkassem (2010).

2. Influence of some sugarbeet varieties on the yield and quality:

Tables (1, 2 & 3) showed significant differences among the tested sugarbeet varieties in foliage weight, root yield and sugar yield (ton/fed). The monogerm varieties were relatively increase for those comparing with polygerm varieties. The four varieties ; Univers, Revel, Helsinki and Maghrible achieved the highest values of foliage weight (20.56, 18.58, 18.30 and 17.73 ton/fed., respectively). The three varieties Maghrible, Revel and Diamond achieved the highest values of root yield (24.44, 23.75 and 23.73 ton/fed., respectively). The five varieties Maghrible, Revel, Francesca, Univers and Diamond achieved the highest values of sugar yield (4.46, 4.39, 4.14, 4.07 and 4.04 ton/fed., respectively). These results are in agreement with those obtained by Ismail (2002) and Ismail *et al.* (2002).

A short glance to the data in Table (3) reveals that, two varieties Maghrible and Revel proved moderate insect population and in the same time increased root (24.44 and 23.75 ton/fed., respectively) and sugar (4.46 and 4.39 ton/fed., respectively) yield.

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رد فعل بعض أصناف بنجر السكر للإصابة بالحشرات الرئيسية والمحصول النهائي

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أجريت تجربتان حقليتان بمحطة البحوث الزراعية بسخا - محافظة كفر الشيخ لدراسة اختبار حساسية 11 صنف من بنجر السكر لإصابتهم بالحشرات الرئيسية (ذبابة أوراق البنجر، خنفساء البنجر السلحفائية وفراشة البنجر) وكذلك على المحصول وجودته خلال موسمين متتاليين 2010/2009 و2011/2010. واشتملت الدراسة على خمسة أصناف من بنجر السكر وحيدة الأجنة (Pleno, Univers, Sibel, Revel, Helsinki, Francesca) وعدد ستة أصناف عديدة الأجنة (Maghrible, Hercule, Helioses, Farida, Diamond).

وأوضحت النتائج المتحصل عليها ما يلي:

أن صنفى البنجر Helsinki, Hercule كانوا أقل إصابة بذبابة البنجر وعلى الجانب الآخر وجد أن الثلاثة أصناف Helioses, Francesca, Helsinki كانوا أقل إصابة بخنفساء البنجر السلحفائية وأن الثلاث أصناف Francesca, Sibel, Helsinki كانوا أقل إصابة بفراشة البنجر. وكننتيجة نهائية لهذا البحث فقد وجد أن صنفى البنجر Revel, Maghrible كانا متوسطي الإصابة بالحشرات وفي نفس الوقت أعطيا أعلى إنتاجية لمحصولي الجذور (24.44 و 23.75 طن/فدان بالترتيب) والسكر (4.46 و 4.39 طن/فدان بالترتيب).