J. Agric. Sci. Mansoura Univ., 32 (1): 653 - 660, 2007

SCREENING OF NINETEEN NEW SUGARBEET (*Beta vulgaris* L .) VARIETIES FOR THE TORTOISE BEETLE, (*Cassida vittata* VILL.) RESISTANCE AND YIELD AT NUBARYIA REGION, EGYPT.

Abo El Ftooh, A. A.[1]; O.M.Badawy[2] and M.M Abd El Rahman[1]

1- Sugar Crops Res. Dept., Nubaryia, Sugar Crops Res. Inst. Agric. Res. Center, Egypt

2- Dept. of Breeding and Genetics, Agric. Res. Station (Sabahia), Alex. Sugar Crops Res. Inst. Agric. Res. Center, Egypt.

ABSTRACT

This study was carried out to evaluation nineteen new sugar beet varieties for susceptibility or resistance to most dominate insect, tortoise beetle, *C. vittata* and productive yield, under field conditions at west Nubaryia region during two successive seasons,2003/04 and 2004/05. The results indicated that the tortoise beetle, *C. vittata* appeared from January with an average of 1.3 individual/plant in both seasons 2003/04 and 2004/05 , and significantly increased up to maximum population at harvest time (Jun) 54.9 and 60.2 individual/plant in the first and second season, respectively . The results also, reveled that the different sugar beet varieties have great variation in their susceptibility to infestation with the tortoise beetle, *C. vittata* .Those could be classified according to their susceptibility into four significantly separated groups, five were highly susceptibility, six were susceptibility and five were moderately susceptibility . The remaining ones, S814 as (monogram variety) , Mareapo breama poly and Nejma as (polygram varieties) were relatively resistant to *C. vittata* and best ones in yield components and sucrose% under Nubaryia conditions. These varieties could be used as commercial varieties at west Nubaryia region in Egypt.

INTRODUCTION

Sugar beet plants attract many insect species, being more than 150 insect and mites species. About 40-50 species cause economic damage (Zarif and Hegazi, 1990).The associated insects with sugarbeet are classified into four groups , harmful insects , parasitoids , predators and visiting insects (Solouma , 1989)and Abo El Ftooh(2002) . The tortoise beetle , *Cassida vittata* Vill. (Coleoptera: Chrysomelidae) is one of the most serious and destructive insect pests of sugarbeet plants in Egypt (Guirguis, 1985, Bassuony , 1987 , Abo El Ftooh, 1995 and Ebieda, 1997). In addition, larvae and adults of *C. vittata* cause serious damage and great losses in sugarbeet yield (Ebieda, 1997). Both tortoise beetle larvae and adults feed on the lower side of the sugarbeet leaves , where , they eat the lower epidermis and inner tissue, but the upper epidermis remains intact looking like a glass (Abo El Ftooh, 1995).

The aim of this research was to evaluate the susceptibility or resistance of some native sugar beet varieties the tortoise beetle, *C. vittata* and its productive yield under field conditions at west Nubaryia region and study the relationship between this infestation and sugarbeet characters such as total yield ,root yield , leaf yield , total soluble solid (T.S.S %) and Sucrose%.

MATERIALS AND METHODS

This study was carried out at Nubaryia Agricultural Research Station ,during two successive seasons, 2003/04 and 2004/05 for evaluating the susceptibility of nineteen sugar beet varieties to infestation by *C. vittata* under field conditions. These varieties were sown on the first of November for both seasons. The sugar beet varieties were Mono germ varieties as Cypus-, Inverrmono , Lser, Oric, Sofie , S814 and poly germ varieties as Baranca, Chems. Del 938, Deprees poly, Gazelle, Kawe inter poly, Kawmmena poly, Nejma , Mareapo breama poly , Panther , Pamela, Rimken strop poly and Top . A randomized complete block design was used .Each varieties was replicated in four plots received the regular agricultural practices and the application of infested was excluded. Each plot had 14 rows (each 10m long and 50cm apart) .The first sample of insect pests was taken after four weeks from sowing . Monthly samples, each consisted of twenty sugarbeet plants (5 plants / replicate), were randomly collected along the period of growing season. Each sample was put in plastic bag at different dimensions according to the status of plant growth to be transported to the laboratory. At laboratory , a moistened cotton pieces with ether was placed in the plastic bag for anesthetizing insects. The sampled plants were carefully examined for counting the total of the adults and larvae of *C. vittata*. At harvest, plants in the two central ridges were used to determine root yield , and sugar yield . Also total soluble solids % , sucrose % in the fresh roots . Total soluble solids (T.S.S.) was determined with a hand reflectometer. Sucrose percentage was determined according to the method described by Le- Docte (1927). Statistical analysis was done according to Steel and Torrie (1981).

RESULTS AND DISEUSSION

1-Susceptibility of sugarbeet varieties to infestation by major insect, *Cassida vittata* Vill.

As shown in Table(1) the tortoise beetle, *C. vittata* appeared from January with an average of 1.3 individual/plant in both seasons , and significantly increased up to maximum population 54.9 and 60.2 individual/plant in the first and second seasons, respectively at harvest time in Jun .The results also showed that a significant difference in population density of *C. vittata* on sugarbeet plants was found between the two seasons .It appears that infestation plants were higher in the second seasons than first one. They reported that the maximum abundance of *C. vittata* was at harvesting time . These results agree with Bassuony , 1987 , Abo El Ftooh, 1995 .

Data in Tabie 2 indicated that different sugarbeet varieties under study have greet variation in their susceptibility to infestation with this major insect. The high infestation rate (33. 4 individual/plant) was found on the variety, Kawe inter poly , while the lowest infested variety was S814(17.0 individual/plant).

Table(1):- Monthly average number of *Cassida vittata* vill larvae and adults on nineteen Sugar beet varieties through 2003/2004 and 2004/2005 seasons.

Varieties	January		February		March		April		May		June		General mean	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Mono germ varieties														
Cypus-(M)	3	3	23.3	24	20.3	21.7	35.7	21.7	35.7	53.7	48	65.7	23.78	22.68
Inverrmono-(M)	0	0	6	6.7	26	27	45	27	45	55.3	53.7	63.3	28.28	20.67
Lser-(M)	0	0	6	6	24.7	24.7	34	24.7	34	61.3	58.3	65.7	25.17	20.18
Oric-(M)	0	0	9	8.7	18.7	19.3	32	19.3	32	47	43.7	54	21.07	16.88
Sofie-(M)	0	0	14.7	14.3	32	32.7	46.3	32.7	46.3	56.3	52.3	62.7	29.48	23.73
S 814 (M)	0	0	0	3.3	17	18.7	22	18.7	22	36	33	67.3	15.67	18.00
Poly germ varieties														
Baranca	4.7	4.7	13.7	13	24	25.3	21.7	25.3	34	40.7	53	53	22.90	20.22
Chems	2.3	2	21.3	22.7	26	29	36	42.3	47.7	50.7	52.7	52.7	27.45	24.78
Del 938	0	0	16.3	17.3	24	26	35.7	37.7	29.3	36.3	43	48	22.00	21.50
Deprees poly	0	0	8.3	10	32.3	33.7	41	43	55.7	59.7	72.3	72.3	33.55	26.50
Gazelle	5.7	5.3	15	15.3	27	28.3	32.3	34	43	49.3	55.3	55.3	27.22	23.03
Kawe inter poly	1	1.3	13	14.3	36	36.7	45	45.3	60.7	63.7	75	75	36.28	28.77
Kawmmena poly	0	0	7.3	9.3	31.7	33.3	44.3	44.7	54.7	57	69	69	33.28	26.05
Nejma	0	0	4	5.7	18.3	20	22	28.7	32.3	38.7	43.7	43.7	19.38	16.35
Mareapo breama poly	0	0	5.7	6.7	15.7	19.3	19	40.7	35	40	40.3	45.7	18.33	18.73
Panther	2	2.3	11.3	10.3	29.7	31	44.3	45.7	54.7	55.7	68.7	68.7	33.23	26.33
Pamela	1	1	8	11	26.7	28	33.3	36.3	43.7	49	52.7	52.7	26.23	21.50
Rimken strop poly	0	0	4.3	5.7	26	27.7	37	40.7	42.6	51.3	66.3	66.3	28.65	23.40
Top	5.3	4.3	17.7	19.7	27.3	30	45	45.3	55	55	61.7	61.7	32.38	26.83
Monthly mean	1.32	1.26	10.78	11.79	25.4	27	35.3	34.4	42.28	50.35	54.88	60.15	26.53	22.43

1st =First season
2nd = Second season

L.S.D.0.5 between dates in 1st season (A) = 0.855
L.S.D 0.5 between varieties 1st season (B) = 1..316
AXB =2.98

L.S.D. 0.5 between dates 2nd season (A') = 0.792
L.S.D .0.5 between varieties 2nd season (B') = 1.204
A'XB' = 3.05

L.S.D.0.5 between year = 0.792

The figures given in Table(2) ,also, showed that three sugarbeet varieties had less of 20 individual/plant, five from 20-25 individual/plant, six from>25-30 and five varieties more than 30 individual/plant. This clearly indicated that there was natural infestation by *C. vittata* in all tested sugarbeet varieties ., the screened sugarbeet varieties greatly differed in susceptibility to *C. vittata* infestation under filled conditions.

In general screened sugarbeet varieties could be classified according to the degree of field infestation by *C. vittata* into four separated groups. Varieties, S814, Mareapo breama poly and Nejma were found to be relatively resistance. Five varieties, Lser, Oric, Del938, Baranca and Pamela were rated as moderately susceptibility, and six varieties , Inverrmono, Sofie, Cypus, Rimken strop poly, Gazelle and Chems were susceptibility. The renaming ones, five varieties , Kawmmena poly, Deprees poly, Kawe inter poly, Top, and Panther were highly susceptibility varieties.

2-Yield and its components:-

The results in Table(2) revealed that the screened varieties significantly differed in their root yield , sugar yield , total soluble solids (T.S.S) and sucrose percentage in the first and second seasons.

The mean of root yield of studied sugarbeet varieties at harvesting time showed that the values of root yield ranged from 23.0 to 35.3 tons /fed , the data indicated that the sugarbeet varieties Cypus, S814, Kawmmena poly , Mareapo breama poly, Nejma, Panther, Gazelle, Baranca and Chems were the best ones and the root yield of each of those sugarbeet varieties recorded over than 30 tons/fed .

The mean of sugar yield of the investigated varieties showed that the sugarbeet varieties , Cypus, S814, Kawmmena poly, Nejma, Gazelle and Baranca were the highest varieties in their sugar yield ton /fed. as they recorded over than 6.0 tons/fed . The data , also showed that the mean of sugar yield of the tested varieties ranged from 4.2to 6.6 tons/fed .

The mean of total soluble solids (T.S.S) and sucrose percentage in root juice of sugar beet varieties under study showed that they ranged from 21.0 to 24.0 and 17.8 to 20.4%, respectively. The varieties Sofie,S814, Nejma, Gazelle and Baranca were the highest in their T.S.S. and sucrose content.

In short the evaluation studied of 19 sugarbeet varieties to the tortoise beetle, *C. vittata* infestation and their yields under Egyptian conditions, showed sugarbeet varieties , S814 , Mareapo breama poly, Nejma and Baranca were the most resistance to the *C. vittata* infestation and the best sugarbeet in yield components and sucrose percentage. These varieties could be used as commercial varieties of Nubaryia region in Egypt.

3-Relationship between the infestation and sugarbeet characters :

This data recorded from Table (1,2&3 and the results in Table(4) noticed that the tortoise beetle , *Cassida vittata* Vill. was effected on sugarbeet characters.

Table (2) :-Monthly averge number of *Cassida vittata* larvae and adults on nineteen sugarbeet varieties as combined analysis of 2003/2004 and 2004/2005 seasons.

varieties	December	January	February	March	April	May	June	Mean
Mono germ varieties								
Cypus-(M)	0.00	3.00	23.70	21.00	28.70	44.70	55.90	25.29
Inverrmono-(M)	0.00	0.00	3.00	13.00	22.50	22.50	26.85	12.55
Lser-(M)	0.00	0.00	3. 0	12.35	17.00	17.00	29.15	12.58
Oric-(M)	0.00	0.00	4. 5	9.35	16.00	16.00	21.85	10.53
Sofie-(M)	0.00	0.00	7.35	16.00	23.15	23.15	26.15	13.69
S 814 (M)	0.00	0.00	0.00	8.50	11.00	11.00	16.50	6.71
Poly germ varieties								
Baranca	0.00	2.35	6.85	12.00	10.85	17.00	26.50	10.79
Chems	0.00	1.15	10.65	13.00	18.00	23.85	26.35	13.29
Del 938	0.00	0.00	8.15	12.00	17.75	14.65	21.50	10.58
Deprees poly0	0.00	0.00	4.15	16.15	20.50	27.85	36.15	14.97
Gazelle	0.00	2.85	7.50	13.50	16.15	21.50	27.65	12.74
Kawe inter poly	0.00	0.50	6.50	18.00	22.50	30.35	37.50	16.48
Kawmmena poly	0.00	0.00	3.65	25.85	22.15	27.35	34.50	16.21
Nejma	0.00	0.00	2.00	9.15	11.00	16.15	21.85	8.59
Mareapo breama poly	0.00	0.00	2.85	7.85	9.50	17.50	20.15	8.26
Panther	0.00	1.00	5.65	14.85	22.15	27.25	34.35	15.04
Pamela	0.00	0.50	4.00	13.35	16.05	21.85	26.35	11.81
Rimken strop poly	0.00	1.00	2.15	13.00	18.50	21.30	33.15	12.73
Top	0.00	2.65	8.85	13.65	22.50	27.50	30.85	15.14
Mean	0.00	0.79	6.29	13.82	18.24	22.55	29.12	13.05

varieties (V):1.904 Dates(D):2.10 VxD:3.126

Table(3): Average of yields and total soluble solids and sucrose percentage for nineteen sugarbeet varieties on first season 2003/2004.

Var Varieties	Root yield (ton /fed)			Sugar yield (ton/fed)			T.S.S			Sucrose %		
	1st	2nd	MeanMean	1st	2nd	MeanMean	1st	2nd	MeanMean	1st	2nd	MeanMean
Mono germ varieties												
Cypus-(M)	35.3	35.3	35.3	6.4	6.1	6.3	21.3	20. 7	21.0	18.1	17.6	17.8
Inverrmono-(M)	22.7	24.3	23.5	4.3	4.6	4.5	23.0	22.3	22. 7	19.1	19.0	19.0
Lser-(M)	27.3	24.0	25.7	5.3	4.8	5.0	22. 7	23.0	22.8	19.3	19. 8	19.5
Oric-(M)	26.7	19.3	23.0	4.9	3. 6	4.2	21. 7	21. 7	21. 7	18.2	18.4	18.3
Sofie-(M)	28.7	24.7	26.7	5.70	5.2	5.4	23. 7	24.3	24.0	19.8	20.2	20.4
S 814 (M)	36.7	31.0	33.8	7.3	6.0	6.6	23.0	22. 7	22.8	19. 8	19.7	19.5
Poly germ varieties												
Baranca	32.7	32.7	32.7	6.5	6.7	6.6	24.0	23.7	23.8	19.9	20.4	20.1
Chems	34.0	29.3	31.7	6.1	5.2	5.7	21.3	20.7	21.0	17.9	17.8	17.9
Del 938	23.3	24.0	23.7	4.3	4.6	4.5	21.7	22.3	22.0	18.4	19.2	18.8
Deprees poly	23.3	24.0	23. 7	4.3	4.4	4.3	21.3	21.3	21.3	18.3	18.3	18.3
Kawe inter poly	23.3	24.7	24.0	4.5	4.4	4.5	23.3	21.3	22.3	19.4	17.9	18.6
Kawmmena poly	32.7	34.0	33.3	6.3	6.3	6.3	22.7	21.7	22.2	19.3	18.6	19.0
Gazelle	32.7	31.0	31.8	6.6	6.0	6.3	23.7	22.3	23.0	20.1	19.2	19.7
Nejma	32.7	28.7	30.7	6.6	5.9	6.3	23.7	24.0	23.8	20.1	20.6	20.4
Mareapo breama poly	28.0	34.0	31.0	5.2	6.7	6.0	22.0	23.0	22.0	18.5	19.8	19.1
Panther	27.3	34.7	31.0	5.0	6.8	5.9	21.7	22.7	22.2	18.4	19.5	19.0
Pamela	24. 7	27.7	26.2	4.6	4.9	4.8	22.7	20.7	2167	18.6	17.8	18.2
Rimken strop poly	32.7	24.7	28.7	6.0	4.8	5.4	21.7	22.7	22.2	18.4	19.3	18.8
Top	26.7	26.7	26.7	4.9	5.0	5.0	22.3	21.7	22.0	18.5	18.6	18.6
L.S.D. between varieties	0.505			1.009			2.49			2.78		

Relationship between *C. vittata* (larvae & adults) and root yield , and sugar yield had a inverse relation while, this relation had a direct effect on T.S.S .% and Sucrose%.Simple correlation coefficient values were (-0.411)and(-0. 967) as root yield , and sugar yield respectively. This direct effect root yield with sugar yield (0.551) and this relation had a inverse effect T.S.S.% on sucrose%(-0.515&-0.467). On the other hand , the adverse effect was significant root yield on T.S.S. (-0.515) and was insignificant root yield on Sucrose%
(-0.467) . The major insects *C. vittata* (larvae & adults) and were direct and adverse effect on sugar beet quantity and quality characters.

Table(4):-Simple Correlation coefficient values between the major Insects infested sugarbeet plants (*C. vittata*, larvae & adults) and Sugarbeet characters during two seasons.

Sugarbeet characters	Root yield	Sugar yield	T.S.S	Sucrose%
Cassida vittata (larvae & adults)	-0.411	-0. 967	0.667	0.407
Root yield		0.551	-0.515	-0.467
Sugar yield			-0.122	0.128
T.S.S				0.916
Sucrose%				

REFERENCES

Abo El-Ftooh, A. A. (1995). Studies on sugarbeet insect *Cassida vittata* Vill (Coleoptera: Chrysomelidae.) in Egypt. M. Sc. Thesis, Fac. Agric., (Saba- Basha) Alexandria Univ., Egypt , 210 pp.

Abo El Ftooh, A.A.(2002).Biological control to tortoise beetle *Cassida Vittata* Vill on sugarbeet. Ph.D.Thesis, Fac .of Agric (Moshtohor), Zagazig. Univ., Egypt. 312pp.

Bassuony, A. M. (1987) . Studies on the insects of sugarbeet in Kafr El Sheikh Governorate. Ph.D. Thesis, Fac. .Agric. Kafr El – Sheikh, Tanta Univ., Egypt ,152 pp.

Ebieda , A. M. M. (1997) . Studies on sugarbeet pests. V. Effect of the tortoise beetle *Cassida vittata* Vill (Coleoptera : Chrysomelidae) on sugarbeet with special reference to determination of economic threshold . Advance Agric. Res., 2 (1): 1-11.

Le- Docte, A. (1927).Commercial determination of sugar in the beet root using the Sacks Le-Docte & socess .Int. Sug. J., (29):488-492.

Guirguis, S.Z. (1985) . Studies on certain insects attacking sugarbeet in Western Desert, Egypt. Ph. D Thesis, Fac. of Agric., Monoufiya Univ. Egypt. 185pp.

Solouma, Arifa G. (1989). Biological and ecological studies on some insect pests of sugar beet and their natural enemies. Ph.D. Thesis, Entomology Dept., Fac. of Agric., Alexandria Univ., Egypt , 203 pp.

Steel, R.G.D. and J.H. Torrie (1981). Principals and procedures of statistics, a biometrical approach. 2nd ed. by Mc Graw-Hill International Book Company, Singapore, 633 pp.

Zarif, G. and E.M. Hegazi (1990). Effect of nitrogen fertilization and sugarbeet cultivars on population of *Pegomyia mixta* Vill. (Diptera : Anthomyidae). Com. Sci. &Dev. Res. 29.: 1-10

تقيم تسعة عشرة صنف جديد من بنجرالسكر لمدى قابليتها للإصابة بخنفساء البنجر السلحفائية (*Cassida vittata* Vill.) علي الصفات المحصولية في منطقة غرب النوبارية بمصر.

*عادل أبو المعاطى أبو الفتوح-**أسامه مصطفى بدوي و
* محمد مصطفى عبد الرحمن
*قسم بحوث المحاصيل السكرية بالنوبارية - معهد بحوث المحاصيل السكرية
**محطة البحوث الزراعية بالصبحية(القصب)- معهد بحوث المحاصيل السكرية

تم تقييم تسعة عشرة صنفا" من بنجر السكر من حيث مدى قابليتها للأإصابة بلخنفساء البنجر السلحفائية وكذلك الصفات المحصولية الإصابة لهذه الأصناف و أوضحت النتائج السابقة أن الإصابة تبداء بخنفساء السلحفائية في شهر يناير بمعدل ١,٣ فرد/نبات في كل من موسمي الدراسة ثم تزداد زيادة معنوية تدريجية حتى تصل إلى أعلى تعداد لها وهو ٥٤,٩ ، ٦٠,٢ فرد/نبات عند وقت الحصاد بشهر يونيو خلال الموسم الأول والثاني على الترتيب.كما أظهرت النتائج أن هناك تباين كبير في شدة للإصابة بالخنفساء السلحفائية بين أصناف بنجر السكر تحت الدراسة ..يمكن تقسيم هذه الأصناف لمدى قابليتهاا للإصابة إلى أربعة مجاميع محددة هي:

- خمسة أصناف شديدة الحساسية.
- ستة أصناف حساسة للإصابة.
- خمسةأصناف متوسطة الحساسية.
- و المجموعة الأخيرة تتضمن ثلاثة أصناف مقاومة للإصابة نسبيا" وهي أس٨١٤ و ماريبو بريما بولي و نجيما . ومن الدراسة المحصولية لهذه الأصناف الثلاثة وجد ان هذه الأصناف تتميز عن الأصناف الأخرى بالمحصول العالي و نسبة السكر المرتفعة ولذا يمكن التوصية بزراعة هذه الأصناف الثلاثة كأصناف تجارية لمنطقة غرب النوبارية.