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THE ROLE OF COTTON LEAFWORMS CONTROL WITH CERTAIN INSECTICIDES IN INCREASING SUGAR BEET CROP PRODUCTIVITY

Kamal G.I Bazazo*

Plant Prot. Dept., Sugar Crops Res., Inst., Agric., Res., Cent., Egypt

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ABSTRACT: The current study was done at Shenno village, Kafr El-Sheikh Governorate, Egypt during 2017/2018 and 2018/2019 seasons. The results showed that the mean numbers of cotton leafworms larvae throughout the growing season 2017/2018 were 22.10, 16.57 and 12.25 larvae/ sample (30 plants) to the three plantations, respectively. In 2018/2019 season, the mean numbers of larvae/sample were 22.45, 16.14 and 11.25 larvae to the three plantations, respectively. Statistical analysis proved significant differences among three plantations in the two seasons In 2017/2018 season, the overall mean of reduction values in the larva numbers were 82.76,82.33,81.50,81.79 and 81.66% for Tac 48% EC, Diracomel 90% SP, Billy 25% WG, Kenzaban 50% EC and Marshal 20% EC, respectively. Also,the root yield of sugar beet were 21.666, 21.690, 21.642, 21.714 and 21.690 ton/faddan for the previous insecticides, respectively, as compared with 11.928 ton/fad., in the untreated plots. Whereas, the sugar yield were 4.008, 3.904, 3.919, 3.936 and 3.997 ton sugar/ faddan to the plots treated with above mentioned insecticides, respectively, as compared with 1.312 tons sugar/faddan in the untreated plots. In 2018/2019 season, the overall mean of reduction values were 87.00, 87.00, 88.00, 88.03 and 87.33% for Tac 48% EC, Diracomel 90% SP, Billy 25% WG, Kenzaban 50% EC and Marshal 20% EC, respectively. Also, the root yield of sugar beet were 21.547, 21.452, 21.500, 21.404 and 21.428 ton/faddan for the treated plots with the previous insecticides, respectively, as compared with 5.976 ton/faddan on the untreated plots. Whereas, the sugar yields were 3.878, 3.818, 3.913, 3.833 and 3.878 ton sugar/faddan to the treated plots with the above mentioned insecticides, respectively, as compared with 0.604 tons sugar/faddan in the untreated plots. Statistical analysis indicated significant differences among treated plots with all insecticides and untreated ones in reducing larva numbers, increasing root and sugar yields in the two seasons. Finally, these results indicated that the importance of insecticides in reducing cotton leaf worms larvae, consequently enhancing root and sugar yield of sugar beet crop.

Key words: Role, cotton leafworms, increasing, sugar beet.

INTRODUCTION

The cotton leafworms, *Spodoptera littoralis* (Boisd) and *Spodoptera exigua* (Hub.) (Lepidoptera: Noctuidae) are destructive insects pests of sugar beet, *Beta vulgaris* L. (Family: Chenopodiaceae) plantations particularly to the first (August) and second (September), plantations as the larvae seriously attack the young plants causing significant defoliation. These insect pests proved to reduce the crop quality (sugar percent) and quantity (roots weight per faddan) (**AKil, 1974; Hammad *et al.* 1980; Iskander, 1982; Guirguis, 1985; Youssef, 1986; Bassyouny, 1987; Shalaby, 2001; Bazazo, 2010; Shalaby, 2011; Shalaby *et al.* 2011; Rashed, 2017 and Abbas, 2018**). **Bassyouny *et al.* (1991)** found that the younger plants were highly infested with cotton leaf worms, the greater damage was caused in both sugar beet leaves and roots and consequently a considerable reduction in sugar percentages. **Mesbah (2000)** concluded that one larva of *S. littoralis* consumes 183.6 cm^2 of sugar beet leaf

***Corresponding author: Tel. :** +201009397025
E-mail address: Bazazo197331@yahoo.com

tissues throughout the entire larval stage. **Abou-Elkassem (2010) and El-Mahalawy (2011)** reported that *S.littoralis* and *S.exigua* are destructive insect pests of sugar beet. These insect can severely attack the seedlings of sugar beet causing large bare batches in the field and resulted in high economic losses. Also, **Mahmoud *et al.* (2011)** showed that sugarbeet plants are attacking by many serious insect pests causing a great economic damage to this corps, among these pests, *S. exigua* which considered as common pest on various agricultural crops in many different parts of the world. It is a periodic pest attacking the roots as well as the foliage of sugar beet. It became a destructive pest to sugar beet causing high economic damage.

Therefore, this study was carried out to investigate the importance of cotton leaf worms controlling in enhancing sugar crops productivity and quality.

MATERIALS AND METHODS

Effect of Planting Date on Infestation of Sugar Beet Plants with Cotton Leafworms

The experimental area (168 m^2) was divided into three replicates for each planting date. Sugar beet (Hussam cultivar) was sown on the 1st August, 2nd September and 5th October during 2017 and 2018 years, at Shenno region, Kafr El-Sheikh Governorate, Egypt. Numbers of larvae were counted by visual record for 30 plants (10 plants/replicate), for each examination about 5 days intervals between each inspection.

Effect of some Insecticides on the Larval Population of the Cotton Leafworms

The current experiment, was conducted at a sugar beet field planted with Hussam cultivar on 5th August during 2017/2018 and 2018/2019 seasons at Shenno region, Kafr El-Sheikh Governorate. Five insecticides (in Table 1) were used, each insecticide was replicated four times (5×4= 20 plots), each plot area was 42 m^2, in addition to four plots as control (check). Completely randomized block design was applied. Reduction in larvae were calculated by **Henderson and Tilton (1955)**. Knap sac sprayer (20 L volume) was used in spraying of insecticides, when the egg masses reached one egg mass/10 plants. Number of larvae were counted one, seven and 10 days after spraying, according to **Anonymous (2017)**. Date of spraying was 4th September during the two seasons.

Estimation of Root and Sugar Yield

The roots of treated plots which sprayed with previous insecticides and untreated ones were weighed after harvest to estimate the root yield and sugar percent (%) per faddan. Date of harvest was 20th February during the two seasons.

Sugar percent (%) was determined by sucrometer device according to **AOAC (1990)**.

Statistical Analysis

Mean numbers of cotton leafworms larvae in the three cultivations were analyzed according to **Duncan (1955)**.

Reduction percentages in cotton leafworms larvae due to some insecticides were calculated by **Henderson and Tilton (1955)**.

Reduction (%) = 1- (No. in control before spary)/(No. in control after spray) × (No. in treated after spray)/(No. in treated before spray) × 100.

RESULTS AND DISCUSSION

Population Fluctuations of Cotton Leafworms Larvae in Three Plantations

Results in Tables 2 and 3 and Figs. 1 and 2 show the mean numbers of the cotton leafworms larvae/sample (30 plants) throughout the growing season. During the first season (2017/2018), there were 22.10, 16.57 and 12.25 larva/sample in the first, second and third plantations, respectively. During the second season (2018/ 2019), the mean numbers of larvae/sample were 22.45, 16.14 and 11.25 larvae in the previously mentioned plantations, successively. Statistical analysis showed significant differences among three plantations in the two seasons.

These results are in agreement with those of **Abou-Elkassem (2010), Shalaby and El-Samahy (2010), El-Mahalawy (2011), El-Dessouki (2014), Ibrahim (2014) and Abbas (2018)**. They reported that the highest infestation

Table 1. List of insecticides sprayed against the cotton leafworms during 2017/2018 and 2018/ 2019 seasons

Compound	Chemical class	Common name	Rate
Tac 48% EC	Organophosphate	Chlorpyrifos	1000 ml/fad.
Diracomel 90% SP	Carbamate	Methomyl	300 g/fad.
Billy 25%WG	Neonicotinoids	Thiamethoxam	125 g/fad.
Marshal 20% EC	Carbamate	Carbosulfan	250 ml/fad.
Kenzban 50% EC	Organophosphate	Chlorpyrifos methyl	1000 ml/fad.

Table 2. Population fluctuations of the cotton leafworms larvae in three sugar beet plantations during 2017 season

Date	1st plantation		2nd plantation		3rd plantation	
	*	**	*	**	*	**
	No	Mean	No	Mean	No	Mean
20/8/2017	3	1.00	-	-	-	-
25/8	4	1.33	-	-	-	-
30/8	13	4.33	-	-	-	-
5/9	22	7.33	-	-	-	-
10/9	19	6.33	-	-	-	-
15/9	26	8.66	-	-	-	-
20/9	29	9.66	2	0.66	-	-
25/9	28	9.33	5	1.66	-	-
1/10	31	10.33	8	2.66	-	-
7/10	33	11.00	10	3.33	-	-
12/10	36	12.00	13	4.33	-	-
17/10	35	11.66	18	6.00	-	-
22/10	41	13.66	21	7.00	4	1.33
27/10	32	10.66	25	8.33	10	3.33
2/11	27	9.00	31	10.33	13	4.33
8/11	23	7.66	20	6.66	16	5.33
13/11	18	6.00	16	5.33	5	1.66
18/11	7	2.33	21	7.00	13	4.33
23/11	6	2.00	23	7.66	16	5.33
30/11/2017	9	3.00	19	6.33	21	7.00
Total	442	-	232	-	98	-
Mean	22.10 a	-	16.57 b	-	12.25 c	-

*No. of larvae (10 plants x3 replicates) for each sample.
**Mean numbers of larvae per 10 plants.
LSD = 4.702 (significant at 0.05 level)

Table 3. Population fluctuation of cotton leafworms larvae in three sugar beet plantations, during 2018 season

Date	1st plantation		2nd plantation		3rd plantation	
	*	**	*	**	*	**
	No	Mean	No	Mean	No	Mean
19/8/2018	4	1.33	-	-	-	-
24/8	3	1.00	-	-	-	-
31/8	14	4.66	-	-	-	-
6/9	20	6.66	-	-	-	-
11/9	27	9.00	-	-	-	-
17/9	32	10.66	-	-	-	-
23/9	33	11.00	2	0.66	-	-
30/9	37	12.33	6	2.00	-	-
4/10	40	13.33	9	3.00	-	-
9/10	36	12.00	9	3.00	-	-
14/10	32	10.66	11	3.66	-	-
19/10	29	9.66	20	6.66	-	-
24/10	27	9.00	19	6.33	3	1.00
28/10	29	9.66	23	7.66	9	3.00
2/11	26	8.66	32	10.66	14	4.66
7/11	20	6.66	33	11.00	18	6.00
14/11	19	6.33	31	10.33	17	5.66
21/11	10	3.33	19	6.33	13	4.33
26/11	8	2.66	10	3.33	9	3.00
30/11/2018	3	1.00	2	0.66	7	2.33
Total	449	-	226	-	90	-
Mean	22.45 a	-	16.14 b	-	11.25 c	-

*No. of larvae (10 plants x3 replicates) for each sample.
Mean numbers of larvae per 10 plants.
LSD = 5.603 (significant at 0.05 level)

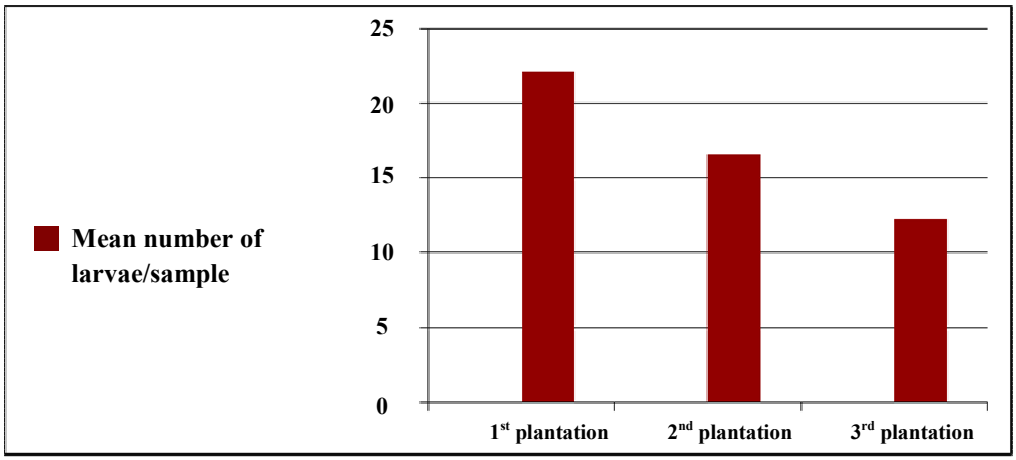

Fig. 1. Mean numbers of larvae/sample in three plantations during 2017 season

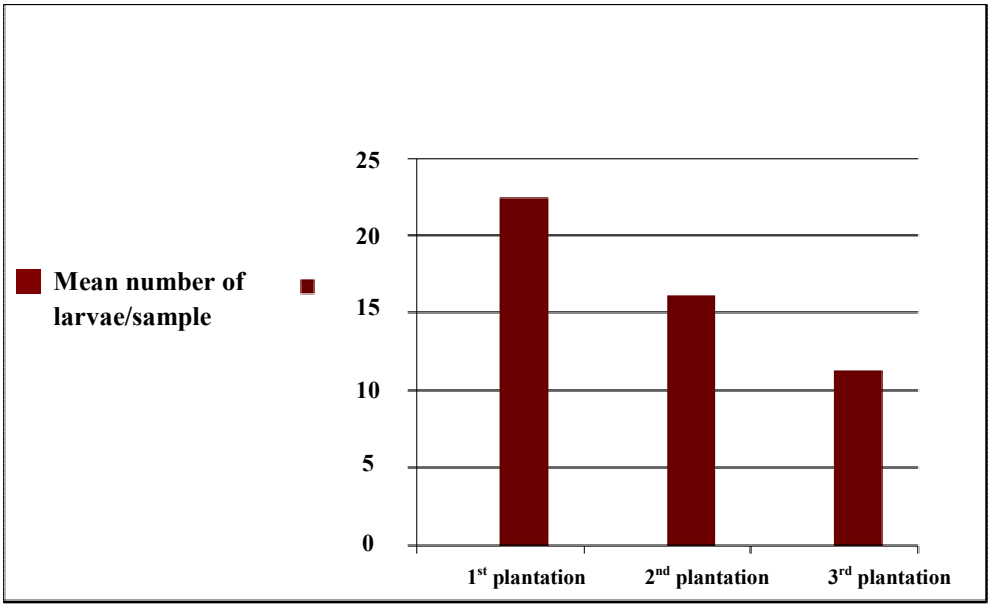

Fig. 2. Mean numbers of larvae/sample in three plantations during 2018 season

by cotton leafworms occurred in August plantation, the second rank was occurred in September plantation and the third plantation (October) was the lowest population by cotton leafworms.

Effect of some Insecticides on the Larval Population of the Cotton Leafworms

In 2017/2018 season, results presented in Table 4 show the effect of certain insecticides (Tac 48% EC, Diracomel 90% SP, Billy 25% WG, Kenzban 50% EC and Marshal 20% EC) on the number of the cotton leafworms larvae. The overall mean of reduction values were 82.76, 82.33, 81.50, 81.79 and 81.66%, respectively. Also, 10 days after spraying the mean numbers of larvae/10 plants ranged between 2.5-3.0 larvae in the treated plots compared with 46.50 larvae in untreated ones.

In 2018/2019 season, results presented in Table 5 show the effect of certain insecticides (Tac 48% EC, Diracomel 90% SP, Billy 25% WG, Kenzban 50% EC and Marshal 20% EC) on the number of the cotton leafworms larvae. The overall mean of reduction values were 87.00, 87.00, 88.00, 88.03 and 87.33%, respectively. Also, 10 days after spraying the mean numbers of larvae/10 plants ranged between 2.25 to 2.75 larvae in treated plots, compared with 65.75 larvae in untreated ones.

These results indicated that the importance of insecticides in reducing cotton leafworms larvae on sugar beet plants. **Talha (2001)** revealed that Reldan 50% EC was the most effective insecticide against young *S.littoralis* larvae on sugar beet plants. However, the insecticide Lannate 90% SP, and the insect growth regulator Match 10% EC were the most potential against the old larvae.

Effect of the Different Insecticide Groups Applied Against the Cotton Leafworms on Sugar Beet Root and Sugar Yield

In 2017/2018 season, results in Table 6 show the root yield of sugar beet in plots sprayed with insecticides compared with the untreated ones. The yields were 21.666, 21.690, 21.642, 21.714 and 21.690 ton/fad., for Tac, Diracomel, Billy, Kenzban and Marshal, respectively, as compared with 11.928 ton/fad., in the untreated plots. The corresponding values of sugar yields were 4.008, 3.904, 3.919, 3.936 and 3.997 ton sugar/ faddan for the above mentioned insecticides, respectively, as compared with 1.312 tons sugar/ faddan in the untreated plots. Also, in 2018/ 2019 season, results in Table 7 show the root yield of sugar beet in plots sprayed with insecticides compared with the untreated ones. The root yield were 21.547, 21.452, 21.500, 21.404 and 21.428 tons/faddan, for Tac, Diracomel,

Table 4. Reduction in the numbers of the cotton leafworms larvae due to some insecticides, during 2017/2018 season

Insecticide	Before		After 24 hr.			After 7 days			After 10 days			Overall mean of reduction (%)
	Total	Mean	T.	M.	Red. (%)	T.	M.	Red. (%)	T.	M*	Red. (%)	
Tac	130	32.50	42	10.50	68.42	22	5.50	85.73	11	2.75a	94.13	82.76
Diracomel	129	32.25	43	10.75	67.43	23	5.75	84.96	10	2.50a	94.62	82.33
Billy	132	33.00	44	11.00	67.42	26	6.50	83.39	12	3.00a	93.69	81.50
Kenzban	127	31.75	39	9.75	69.98	28	7.00	81.41	11	2.75a	93.99	81.79
Marshal	131	32.75	41	10.25	69.41	21	5.25	81.41	11	2.75a	94.17	81.66
Control	129	32.25	132	33.00	-	153	38.25	-	186	46.50b	-	-

* The Duncan test at level of 5% probability was applied, the means followed by the same letter do not differ significantly.

Table 5. Reduction in the numbers of the cotton leafworms larvae due to some insecticides, during 2018/2019 season

Insecticide	Before		After 24 hr.			After 7 days			After 10 days			Overall mean of reduction (%)
	Total	Mean	T.	M.	Red. (%)	T.	M.	Red. (%)	T.	M*	Red. (%)	
Tac	115	28.75	33	8.25	72.44	17.00	4.25	91.10	9	2.25a	96.40	87.00
Diracomel	117	29.25	33	8.25	73.00	18.00	4.50	91.00	9	2.25a	96.50	87.00
Billy	115	28.75	29	7.25	76.00	16.00	4.0	92.00	10	2.50a	96.00	88.00
Kenzban	118	29.50	30	7.50	76.00	16.00	4.0	92.00	10	2.50a	96.10	88.03
Marshal	119	29.57	31	7.75	75.00	18.00	4.50	91.00	11	2.75a	96.00	87.33
Control	121	30.25	126	31.50	-	201	50.25	-	263	65.75b	-	-

* The Duncan test at level of 5% probability was applied, the means followed by the same letter do not differ significantly.

Table 6. Effect of the different insecticide groups applied against the cotton leafworms on sugar beet root and sugar yield, during 2017/2018 season

Treatment	Root weight (kg/168 m^2)		Root yield (ton/fad.)	Sucrose (%)	Sugar yield (ton/fad.)
	Total	Mean*			
Tac	910	227.50a	21.666	18.50	4.008a
Diracomel	911	227.75a	21.690	18.00	3.904a
Billy	909	227.25a	21.642	18.11	3.919a
Kenzban	912	228.00a	21.714	18.31	3.936a
Marshal	911	227.75a	21.690	18.43	3.997a
Control	501	125.25b	11.928	11.00	1.312b

* The Duncan test at level of 5% probability was applied, the means followed by the same letter do not differ significantly.

Table 7. Effect of the different insecticide groups applied against cotton leafworms on sugar beet root and sugar yield, during 2018/2019 season

Treatment	Root weight (kg/168 m^2)		Root yield (ton/fad.)	Sucrose (%)	Sugar yield (ton/fad.)
	Total	Mean*			
Tac	905	226.25a	21.547	18.00	3.878a
Diracomel	901	225.25a	21.452	17.80	3.818a
Billy	903	225.75a	21.500	18.20	3.913a
Kenzban	899	224.75a	21.404	17.91	3.833a
Marshal	900	225.00a	21.428	18.10	3.878a
Control	251	62.75b	5.976	10.11	0.604b

* The Duncan test at level of 5% probability was applied, the mean followed by the same letter do not differ significantly.

Billy, Kenzban and Marshal, respectively, as compared with 5.976 tons/fad., in the untreated plots. The corresponding values of sugar yield were 3.878, 3.818, 3.913, 3.833 and 3.878 ton sugar/fad., for the above mentioned insecticides, respectively, as compared with 0.604 ton sugar/fad., in the untreated plots. Statistical analysis indicated significant differences among treated plots with all insecticides and untreated ones in reducing larvae numbers, root and sugar yields in the two seasons.

These results show the importance of insecticides in reducing numbers of the cotton leafworms larvae, consequently increasing root and sugar yields per faddan. **Shairra (2010)** indicated that the cotton leafworm in one of the most notorious chewing insect pests that causes heavy losses in early sugar beet plantation. **Shaheen (2011)** showed that the importance of insecticides in increasing root yield (19.30 ton/faddan) and sugar yield (3.10 ton/fad.) in plots treated with insecticides in comparison with untreated plots (root yield, 8 ton/fad., and sugar yield 1.99 ton/fad.). **Ibrahim (2014)** showed that the cotton leafworms are considered the most dangerous insect pest which threat the early sugar beet plantations.

These results show the importance of insecticides in reducing numbers of the cotton leafworms larvae, consequently increasing root and sugar yields per faddan.

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دور مكافحة دودة ورق القطن ببعض المبيدات الحشرية في زيادة إنتاجية محصول بنجر السكر

كمال جابر إبراهيم بظاظو

قسم بحوث وقاية النبات - معهد بحوث المحاصيل السكرية – مركز البحوث الزراعية – مصر

أجري هذا البحث في قرية شنو، محافظة كفرالشيخ خلال موسمي ٢٠١٨/٢٠١٧ ، ٢٠١٩/٢٠١٨ وأظهرت النتائج ما يلي: كان متوسط أعداد يرقات دودة ورق القطن خلال الموسم الأول (٢٠١٨/٢٠١٧) هو ٢٢,١٠، ١٦,٥٧، ١٢,٢٥يرقة/عينة (٣٠ نبات) للثلاث عروات على التوالى، وفى الموسم الثانى ٢٠١٩/٢٠١٨ كان متوسط أعداد اليرقات ٢٢,٤٥، ١٦,١٤ و ١١,٢٥ يرقة/عينة (٣٠ نبات) للثلاث عروات علي التوالي، أثبت التحليل الإحصائي وجود فروق معنوية بين الثلاث عروات في متوسط أعداد يرقات دودة ورق القطن خلال موسمي الدراسة، حيث كانت العروة الأولى (المبكرة) أعلى من الثانية ثم الثالثة، كان المتوسط العام لخفض أعداد اليرقات نتيجة استخدام مجاميع مختلفة من المبيدات الحشرية (فسفورية، كرباماتية، نيونيكوتينودز) ٨٢,٧٦، ٨٢,٣٣، ٨١,٥٠، ٨١,٧٩ و ٨١,٦٦% للمبيدات تاك ٤٨%، دير اكوميل ٩٠%، بيلي ٢٥%، كنزبان ٥٠% ومارشال ٢٠%، على التوالي في الموسم الأول، كان المتوسط العام لخفض أعداد اليرقات نتيجة استخدام نفس المجاميع السابقة من المبيدات الحشرية (فسفورية، كرباماتية، نيونيكوتينودز) ٨٧,٠٠، ٨٧,٠٠، ٨٨,٠٠، ٨٨,٠٣ و ٨٧,٣٣% للمبيدات تاك ٤٨%، دير اكوميل ٩٠%، بيلي ٢٥%، كنزبان ٥٠% ومارشال ٢٠%، على التوالي في الموسم الثانى، أوضح التحليل الإحصائى وجود فروق معنوية فى معدل انخفاض أعداد اليرقات نتيجة استخدام المبيدات الحشرية المختلفة للقطع المعاملة مقارنة بتلك غير المعاملة خلال موسمي الدراسة، حيث بلغ متوسط عدد اليرقات/١٠ نباتات بعد عشرة أيام من الرش فى القطع المعاملة ٢,٥٠- ٣,٠٠ يرقة مقارنة بـ ٤٦,٥٠ يرقة فى القطع غير المعاملة فى الموسم الأول، وفى الموسم الثانى كان عدد اليرقات فى القطع المعاملة ٢,٢٥- ٢,٧٥ يرقة بينما كان فى القطع غير المعاملة ٦٥,٧٥ يرقة، سجل وزن جذور المحصول ٢١,٦٦٦ ، ٢١,٦٩٠، ٢١,٦٤٢، ٢١,٧١٤ و ٢١,٦٩٠ طن/ فدان فى القطع المعاملة بالمبيدات السابقة على التوالي، بينما كان ١١,٩٢٨ طن/فدان للقطع غير المعاملة بالمبيدات أيضاً، سجل محصول السكر ٤,٠٠٨ ، ٣,٩٠٤، ٣,٩١٩ ، ٣,٩٣٦ و ٣,٩٩٧ طن سكر/فدان للقطع المعاملة بالمبيدات السابقة على التوالى، بينما كان ١,٣١٢ طن سكر/فدان للقطع غير المعاملة وذلك فى الموسم الأول، وفى الموسم الثانى سجل وزن جذور المحصول ٢١,٥٤٧، ٢١,٤٥٢، ٢١,٥٠٠، ٢١,٤٠٤ و ٢١,٤٢٨ طن/فدان فى القطع المعاملة بالمبيدات السابقة علي التوالي، بينما كان ٥,٩٧٦ طن/فدان للقطع غير المعاملة بالمبيدات أيضاً، سجل محصول السكر ٣,٨٧٨، ٣,٨١٨، ٣,٩١٣ ، ٣,٨٣٣ و ٣,٨٧٨ طن سكر/فدان علي التوالي للقطع المعاملة بالمبيدات السابقة على التوالى، بينما كان ٠,٦٠٤ طن سكر/فدان للقطع غير المعاملة، أظهر التحليل الاحصائي أن هناك فروقاً معنوية فى محصول الجذور والسكر للقطع المعاملة وغير المعاملة خلال الموسمين، تؤكد هذه النتائج أهمية المكافحة الكيماوية بالمبيدات الحشرية الموصي بها ليرقات دودة ورق القطن وذلك بمجرد ظهور لطع البيض وبصفة خاصة للعروات المبكرة وبالتالي زيادة محصول بنجر السكر كماً (وزن الجذور) ونوعاً (وزن السكر).

المحكمـــــون:

١- د. ســـعد بســيوني بليــح رئيس بحوث متفرغ – قسم آفات محاصيل الحقل – محطة البحوث الزراعية بسخا – مركز البحوث الزراعية.

٢- أ.د. كامل عبداللطيف حماد أستاذ الحشرات الاقتصادية المتفرغ – كلية الزراعة – جامعة الزقازيق.