J. of Plant Protection and Pathology, Mansoura Univ., Vol. 10 (10):477 - 482, 2019

Journal of Plant Protection and Pathology

Journal homepage: www.jppp.mans.edu.eg
Available online at: www. jppp.journals.ekb.eg

Influence of Sowing Dates, Varying Hybrids of Maize, *Zea mays* L. and Application of some Insecticides on the Population Density of the Greater Sugarcane Borer, *Sesamia cretica* Led. (Lepidoptera: Noctuidae)

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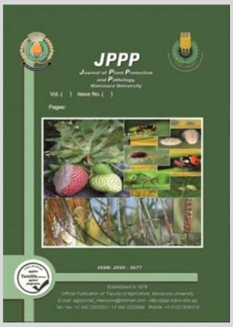

ABSTRACT

Study was conducted to investigate effect of sowing dates and varying maize hybrids on population density of *S. cretica* in farm at Nubariya district, Beheira governorate, Egypt during seasons, 2018 and 2019. Five maize hybrids viz., yellow three ways cross 352, yellow single cross 168, white single cross 122, white single cross 10 and white single cross 128 were tried on three sowing dates viz. 1st April, 15th April and 1st May. Results showed that, population of *S. cretica* (eggs and larvae) was highest in early sown crop (1st April) while was least in late sown maize (1st May). Also, none of tested hybrids showed immunity or high resistance and S.C.128 hybrid was more resistant to larvae (minimum dead heart percent), while T.W.C.352 hybrid was more sensitive to *S. cretica* (maximum dead heart percent). Five hybrids can be arranged in ascending order according to their susceptibility (population density of eggs, larvae and infested percentages) as follow: T.W.C.352, S.C.168, S.C.122, S.C.10 and S.C.128. These results were repeated in both seasons study. Five insecticides were tested for their efficacy against *S. cretica* under field conditions. All treatments were found effective in reducing larvae and protecting plants compared with control. Insecticide Emamectin benzoate was found best, led to minimum number of larvae followed by Chlorantraniliprole and Lufenuron, respectively. While, radiant resulted lowest. On the other hands, Chlorantraniliprole was found best, led to minimum infested followed by Emamectin benzoate.

Keywords: *Sesamia cretica*, sowing dates, hybrids, *Zea mays*

INTRODUCTION

Maize (*Zea mays* L.) is one of the most important crops either in Egypt or in the world. It ranks the third after rice and wheat. In Egypt, the cultivated area of maize in 2013 was about 1.676 million feddans producing about 5.4 million tons (Zohry and Ouda, 2015). The maize plants are subject to infestation with a variety of insect pests. James (2003) stated that about 9 % of the world maize crop was lost annually due to damage caused by insect pests. The greater sugarcane borer, *Sesamia cretica* is considered one of the most destructive insect pests which causes serious economic damage and reduces the crop yield (Habashy, *et al.*2012 and Salman,*et al.* 2018). The female moths of *S. cretica* lay their eggs beneath leaf sheaths of maize and sugarcane plants. Adult females prefer laying most of eggs on the young maize plants (about 20- 30 days) after plantation (Adams and Clark, 1995). The larval feeding (whorl feeding) results in the formation of rows of elongated holes in the unfolded leaves. The elder larvae form what it's called the "dead hearts" of maize plants by boring into the central shoots and resulting in drying up of the growing points of young plants (Semeada, 1985; EL-Naggar, 1991; Soliman, 1994; Massoud, *et al.*, 2016; Salman, *et al.* 2018).

To reduce the level of pest infestation and subsequently increase plant yield, the agriculture manipulation should be used along with pesticide application (Fayed *et al*., 2002; Salem (2012). It is essential to find out varieties which are resistant to insect pests and optimum sowing times where crop can escape damage of insect pests and offer excellent opportunity for the development such technology for pest management. Therefore, the aim of this work was to evaluate the susceptibility of certain maize hybrids to *S. cretica* (ovipositional preference of adults and the larval damage), to identify the optimum sowing date for maize crop and to assay the efficacy of certain bio and chemical insecticides against *S. cretica.*

MATERIALS AND METHODS

Field experiments were carried out in a private farm at Nubaria district, Beheira Governorate, Egypt throughout two successive seasons, 2018 and 2019. The 1st experiment was planned to study the susceptibility of five maize hybrids to infestation with greater sugarcane borer, *S. cretica* in different sowing dates. Five maize hybrids (yellow three ways cross 352, yellow single cross 168, white single cross 122, white single cross 10 and white single cross 128) were tried on three sowing dates viz. 1st April, 15th April and 1st May. The layout system was split plot design replicated thrice in randomized complete block design (RCBD). Sowing dates and hybrids were randomized in main and sub-plots, respectively. All the agronomic practices such as fertilization, land preparations, irrigation, and mechanical weed control were kept normal and uniform for all the treatments. Each sub-plot was 5 m long and 3 m wide and the plants were grown along a distance of 30 cm apart and of 70 cm between rows. For each treatment, fifteen plants (five plants from each plot) were randomly selected, cut of at soil level and dissected and the number of eggs (in the egg masses) and larvae of *S. cretica* were counted and recorded.

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DOI: 10.21608/jppp.2019.64424

Also, as a symptom of infestation of *S. cretica* larvae, the percentages of dead heart of a sample of 50 plants from each plot were counted and recorded. Sampling started when the age of maize plants reached about 28 days after sowing and continued at weekly intervals throughout the two growing seasons between the 3rd and 7th weeks after planting (5 recording times). The maize plants at age of 30 - 45 days or that's height extended from 40-45 cm were the most preferable for *S. cretica*.

Effect of five insecticides against the greater sugarcane borer, *S. certica*:

The 2nd experiment was planned to evaluate the efficacy of five insecticides from different groups with different modes of action against *S. certica* on maize plants (cv. yellow three ways cross 352). An area of about 1000 m2 was divided into 24 plots, of 30 m2 each. Each treatment was replicated four times in addition to four control plots. Each replicate was separated from the adjacent one by a belt (half meter) to minimize the interference of spray drift from one replicate to another. During the two growing seasons 2018 and 2019, the application of the five treatments was in the maize plants which sown in 1st April (the 1st sowing date) after 30 days from the sowing. The following observations were recorded in each experimental plot

i. Number of alive larvae of *S. certica* on randomly selected six plants from each plot were examined and recorded before treatment and after 1, 4, 7 and 14 days of the treatment.
ii. Numbers of infested maize plants (dead heart plants) on a sample of 50 plants from each plot were counted before the treatment and after 1, 2 and 3 weeks of the treatments.

The reduction percentages of population of *S. certica* larvae and the infested maize plants were calculated according the Henderson and Tilton equation (1955) as following:

$$\% \text{ Reduction} = 100 \times \left(1 - \frac{\text{N in Co before treatment} \times \text{n in T after treatment}}{\text{N in Co after treatment} \times \text{n in T before treatment}}\right)$$

Where:

N = insect population; T = Treated plot; Co = Control plot

The tested insecticides were

Common name	Trade name	Rate/Fed. (ml/200 liters)
Lufenuron	Match 5% EC	160
Chlorantraniliprole	Coragen 20% SC	60
Bacillus thuringiensis kurstaki	Dipel 2X 6.4% WP	300 gm / feddan
Spinetoram	Radiant 12% SC	100
Emamectin benzoate	Proclaim 5% SG	80 gm

Data analysis:

Statistically significant mean values (*P* <0.05) were calculated as mean ± SD (standard deviation) using analysis of variance (ANOVA) and separated by LSD test (SAS Statistical, 1988).

RESULTS AND DISCUSSION

Effect of sowing dates:

The results indicated that there were significant differences between numbers of deposited eggs of *S. cretica* on the maize plants which sown at different dates (Table 1). Among the different sowing dates, the *S. cretica* eggs has recorded the maximum number on the plants which sown in 1st week of April with a mean of 6.62 and 5.88 eggs/ plant followed by 2nd sowing date (3rd week of April) with a general means of 4.42 and 4.12 eggs/ plant. The lowest number of eggs was recorded on the plants sown at 1st of May (2.26 and 2.02 eggs/ plant) in 1st and 2nd seasons, respectively. The data presented in Table 1 revealed that the incidence of larvae of *S. cretica* increased significantly in the crop sown at different dates from 1st sowing date (1st week of April) to 3rd sowing date (May 1st) and also with advance in the age of the crop up to 6th week. In the 1st sowing date, the average number of larvae of *S. cretica* was 2.79 larvae / plant and 2.65 larvae / plant in the 1st and 2nd seasons, respectively. The general means of larvae per plant recorded 2.08 and 1.94 larvae/plant in the 2nd sowing date and 1.195 and 1.19 larvae /plant during 3rd sowing date in the 1st and 2nd seasons, respectively. Data in Table (1) also demonstrated that, the stem borer damage in terms of percent dead hearts was lowest in the plant which sown in the 3rd sowing date (6.59 % and 5.95% in the 1st and 2nd seasons, respectively). It has increased gradually to 14.56% and 12.88%, in the 1st and 2nd seasons, respectively during the 2nd sowing date. The greater sugarcane borer damage was the maximum in the 1st sowing date with a percent of 23.81% and 21.54% in the 1st and 2nd seasons, respectively. These results agree with many investigators, e.g. Al-Hassnawi and Al-Karboli revealed that the delay of the sowing dates of sorghum to the end of July in Iraq, significantly reduced the infestation percentage of *S. cretica* and seedling dead heart to 5.03%, 4.74% respectively. On the other hand, Abul-Nasr *et al.*, (1968) in Egypt reported that the highest infestation of maize plants by the greater sugarcane borer, *S. cretica* occurs to plants sown in Mid-April.

Table 1. Effect of sowing dates on population density of the sugarcane borer, *Sesamia cretica* in maize plants in two successive seasons at Nubaria district:

Season	1st season, 2018			2nd season, 2019		
Parameters	Mean No. of eggs /plant	Mean No. of larvae /plant	Percentages of dead heart /50 plant	Mean No. of eggs /plant	Mean No. of larvae /plant	Percentages of dead heart /50 plant
1st April	6.62±2.53a	2.79±1.15a	23.81±17.75a	5.88±2.32a	2.65±1.13a	21.54±16.6a
15th April	4.42±1.81b	2.08±1.05b	14.56±12.87b	4.12±1.51b	1.94±1b	12.88±10.34b
1st May	2.26±1.25c	1.19±0.74c	6.59±5.55c	2.02±0.91c	1.19±0.71c	5.95±4.97c
F value	31.661	15.944	10.9	32.990	14.222	11.249
L.S.D.	1.0916	0.56315	7.3616	0.9486	0.54425	6.5688

Means followed by the same letter do not differ significantly at the 5% level of significance (L.S.D. test).

Effect of maize hybrids:

The data presented in (Table 2) revealed that the attractiveness of *S. cretica* moths to the various hybrids of corn varied significantly. The hybrid T.W.C. 352 was the most attractive hybrid with average number of 6.96 and 6.03 deposited eggs /plant in the 1st and 2nd seasons, respectively. Next in attractiveness was the hybrids S.C.168 and S.C. 122 hybrids with average numbers of (5.24 and 4.76) and (4.04 and 3.67) eggs/plant in the 1st and 2nd seasons, respectively. The hybrid S.C.10 has been categorized as number four among the tested hybrids for susceptibility to *S. cretica*. Finally the S.C. 128 was the lowest attractive hybrid for moths of *S. cretica* to lay its eggs with a mean of 2.52 and 2.33 egg /plant in the 1st and 2nd seasons, respectively. Similarly, among the tested hybrids, the results in table 1 showed that the mean densities of larvae of *S. cretica* in season 1 and 2 was significantly higher on T.W.C. 352 with a general means of 3.2 and 2.89 larvae/plant, respectively. The hybrid S.C. 168 was in the 2nd place with a means of 2.61 and 2.53 larvae / plant in the 1st and 2nd seasons, respectively. Overall mean density of the pest was significantly lower on S.C. 10 and S.C. 128 with a means of 1.37 and 1.12 larvae/plant in 1st season and 1.44 and 0.98 larvae / plant in the 2nd season, respectively. Data illustrated in Tables 2 also showed that; none of the tested maize hybrids was immune or highly resistant to *S. cretica*. However, the hybrid S.C. 128 showed a noticeable degree of resistance at the three different sowing dates where the percent of dead hearts was recorded 8.4 and 7.02% as compared to 26.31 and 22.75% for T.W.C. 352 hybrid. Different authors studied the susceptibility of different maize hybrids to infestation with *S. cretica* such as Metwally (1988), who found that Giza proved to be a relatively resistant cultivar while D.C. 202 and Balady were susceptible. Also, Ali *et al*. (1989) revealed that Giza 2 was considered to be relatively resistant and D.C. 514 was highly resistant, while D.C. 202 was highly susceptible and Balady was susceptible. In 2009, Ezzeldin. *et al*. arrange four maize varieties according to infestation with *S. cretica* in descending order as: Hybrid single 10, Hybrid third 313, Balady and Hybrid single 3080. Also, Ismail *et al*. (2012) investigated the effect of commercial and transgenic commercial corn hybrids on the pink corn borer, *S. cretica* (behavior and feeding activity). They found that food consumption was different according to hybrids and the feeding period. As well, Salman *et al*. 2018, found that the hybrid S.C. Hi-Tech 2031 was the most attractive to *S. cretica* larvae and the least attractive hybrid was S.C. 131. In this work, among the tested hybrids, the S.C. 128 was considered to be relatively resistant in agreement with Metwally, Sameha, (2015) who find that 5 cultivars were resistant (S.C. 101, S.C. 128, S.C. 166, S.C. 173 and T.W.C. 329), 5 were relatively resistant (S.C. 162, S.C. 163, S.C. 164, S.C. 30 K9 and Cairo 1), 4 were susceptible (S.C. 168, S.C. 2055, S.C. 3062 and S.C. 30N-11) and 4 were highly susceptible (S.C. 125, S.C. 167, S.C. 2031, and S.C. 30K8).

Table 2. Effect of five maize hybrids on population density of the sugarcane borer, *Sesamia cretica* in maize plants in two successive seasons at Nubaria district:

Season	1st season, 2018			2nd season, 2019		
parameters	Mean No. of eggs /plant	Mean No. of larvae /plant	Percentages of dead heart /50 plant	Mean No. of eggs /plant	Mean No. of larvae /plant	Percentages of dead heart /50 plant
T.W.C.352	6.96±2.83a	3.2±0.9a	26.31±19.99a	6.03±2.69a	2.89±0.87a	22.75±17.99a
S.C. 168	5.24±2.72b	2.61±1.31a	17.78±15.23ab	4.76±2.34ab	2.53±1.31ab	16.93±13.6ab
S.C. 122	4.04±1.92bc	1.8±0.89b	13.07±11.51b	3.67±1.76bc	1.79±0.91bc	11.69±10.7bc
S.C. 10	3.4±1.72c	1.37±0.73bc	9.38±8.77b	3.25±1.49c	1.44±0.68c	8.89±7.83bc
S.C. 128	2.52±1.19c	1.12±0.56c	8.4±8.44b	2.33±1.08c	0.98±0.55c	7.02±7.47c
F value	9.512	13.733	4.409	7.977	11.255	4.15
L.S.D.	1.5779	0.66335	9.8373	1.42615	0.65695	8.8628

Means followed by the same letter do not differ significantly at the 5% level of significance (L.S.D. test).

The results presented in Tables 3&4, illustrated that there was a statistically significant interaction between sowing date and maize variety for mean no. of eggs /plant, mean no. of larvae /plant, and percentages of dead heart /50 plant. These interactions indicate that the population density of *S. cretica* and the infested maize plants were responded differently when maize hybrids were sowing in different dates. The most suitable hybrid for this insect was the T.W.C.352 when planting in the 1st date with a means of (10.32 and 9.08 eggs/plant, 3.97 and 3.73 larvae/plant and 41.34 and 36.66 % infested plants) in 1st and 2nd seasons, respectively. On the contrary, the least suitable hybrid for *S. cretica* was S.C.128 when planting in the 3rd sowing date with a means of (1.41 and 1.49 eggs/plant, 0.65 and 0.6 larvae/plant and 2.4 and 2.67 % infested plants) in 1st and 2nd seasons, respectively.

Table 3. Effect of the interaction between five maize hybrids and three sowing dates on the population density of the sugarcane borer, *Sesamia cretica* in maize plants in 2018 season at Nubaria district:

Sowing date	Hybrid	Mean No. of eggs /plant	Mean No. of larvae /plant	Percentage of dead heart /50 plant
1st sowing date	T.W.C.352	10.32±1.01a	3.97±0.83a	41.34±22.7a
	S.C.168	8.05±1.47b	3.57±1.41ab	27.33±18.11b
	S.C.122	5.77±0.7cd	2.57±0.48cde	21.47±13.79bcd
	S.C.10	5.2±0.9cde	2.16±0.34defg	14.8±11.37bcd
	S.C.128	3.75±0.78efg	1.65±0.48efgh	14.13±10.1bcd
2nd sowing date	T.W.C.352	6.57±1.03c	3.32±0.47abc	24.26±18.82bc
	S.C.168	5.25±1.51cde	2.77±0.99bcd	17.73±14.94bcd
	S.C.122	4.51±1.38def	2.04±0.54defg	12.67±9.64bcd
	S.C.10	3.35±1fg	1.23±0.52gh	9.46±7.43bcd
	S.C.128	2.4±0.422gh	1.04±0.33h	8.67±7.63cd
3rd sowing date	T.W.C.352	3.99±0.74ef	2.32±0.43def	13.33±5.62bcd
	S.C.168	2.4±1.26gh	1.48±0.44fgh	8.27±5.77cd
	S.C.122	1.85±0.7h	0.8±0.45h	5.07±3.55d
	S.C.10	1.65±0.82h	0.72±0.36h	3.87±3.18d
	S.C.128	1.41±0.85h	0.65±0.32h	2.4±1.67d
L. S. D.		1.05357689911	0.68044716259	10.7315742713

Means followed by the same letter do not differ significantly at the 5% level of significance (L.S.D. test).

Table 4. Effect of the interaction between five maize hybrids and three sowing dates on the population density of the sugarcane borer, *Sesamia cretica* in maize plants in 2019 season at Nubaria district:

Sowing date	Hybrid	Mean No. of eggs /plant	Mean No. of larvae /plant	Percentage of dead heart /50 plant
1st sowing date	T.W.C.352	9.08±0.61[a]	3.73±0.21[a]	36.66±21.15[a]
	S.C.168	7.44±1.11[b]	3.44±1.42[ab]	27.06±16.44[b]
	S.C.122	5.17±1.06[cd]	2.56±0.68[bcd]	18.4±14.03[d]
	S.C.10	4.56±0.92[de]	2.12±0.58[cde]	14.26±10.14[f]
	S.C.128	3.15±0.85[fg]	1.39±0.48[efg]	11.34±10.17[h]
2nd sowing date	T.W.C.352	6.11±0.85[c]	3.05±0.5[ab]	20.53±15.59[c]
	S.C.168	4.53±0.92[de]	2.72±0.67[bc]	16.13±10.02[e]
	S.C.122	4.11±1.26[def]	1.76±0.8[def]	12.1320±8.09[g]
	S.C.10	3.52±.73[efg]	1.2±0.49[efg]	8.53±6.22[i]
	S.C.128	2.35±0.72[gh]	0.96±0.42[fg]	7.07±6.4[j]
v3rd sowing date	T.W.C.352	2.91±0.57[fgh]	1.88±0.37[cdef]	11.07±4.89[h]
	S.C.168	2.29±0.7[gh]	1.44±0.98[efg]	7.6±6.26[j]
	S.C.122	1.72±0.54[h]	1.04±0.59[fg]	4.53±4.27[k]
	S.C.10	1.68±1.03[h]	1±0.4f[g]	3.87±2.33[l]
	S.C.128	1.49±1.06[h]	0.6±0.51[g]	2.67±2.06[m]
L. S. D.		0.95641957847	0.65654475735	0.65654475735

Means followed by the same letter do not differ significantly at the 5% level of significance (L.S.D. test).

Effect of five insecticides on the population density of *S. cretica*:

Data presented in Tables (5&6) illustrated the efficacy of five different insecticides from different groups (with a different modes of action) on the numbers of larvae of greater sugarcane borer, *S. cretica* which were recorded before and after 1, 4, 7 and 14 days of the treatment with these insecticides. It is clear that in post treatment observation after 1, 4, 7 and 14 days of treatment, there were significant differences among the treatments with respect to the mean number of larvae per plant and all the treatments were significantly superior over untreated control. The general means of reduction percentages of *S. cretica* populations caused by Lufenuron, Radiant, Chlorantraniliprole, Emamectin benzoate, and Dipel 2X were 67.41, 58.67, 77.38, 80.74 and 67.67 %, respectively in 2018 season and 69.16, 60.1, 80.01, 82.82 and 67.71 %, respectively in 2019 season. Among the tested insecticides, Emamectin benzoate and Chlorantraniliprole gave the highest reduction percentages (lowest number of *S. cretica* per plant) after 1, 4, 7 and 14 days of application as compared to the other insecticides (Dipel 2X, Radiant and Lufenuron). El- Sappagh, (2016) who tested different bio and chemical insecticides against *S. cretica* and found that all the treatments were effective in reducing the infestation rates by *S. cretica* and increasing the yield compared with control. The chemical insecticide Neomyl was found the followed by Bestban and Tempo Xl, respectively. While, Dipel 2X resulted the lowest reduction % of infestation compared with control. Also, Fediere *et. al* (1997) found that both chemical and microbial insecticides noticeably reduced the larvae of *S. cretica*. In this work, the bio-insecticides Dipel 2X ranked the last after other insecticides. Muresan, *et al* (2000) found that Dipel 2X significantly, reduced the attack of the European corn borer, *Ostrinia nubilalis* Hub. Data in Tables 7 and 8 also reveal that pre-treatment and post treatment observations on dead hearts plants caused by *S. cretica* after the application of five insecticides. Mean of infested plants in the pre spray observation ranged non-significant. However, number of infested plants from 4.75 to 6.06 and 3.19 to 3.94 were observed on fifty randomly selected plants in 2018 and 2019 seasons, respectively. It is clear that in post treatment observation after 1, 2 and 3 weeks of treatment, there were significant differences among all the treatment with respect to the number of dead heart plants. All the treatments were significantly superior over untreated control. Among the treatments, Chlorantraniliprole was recorded the effective treatment with the maximum reduction percentage of dead heart plants (92.37 and 92.81 %) followed by Emamectin benzoate (89.82 and 90.09 %), Lufenuron (83.7% and 85.32), Radiant (83.61 and 84.63) and Dipel 2X (77.17 and 81.13) in the 1st and 2nd seasons, respectively.

Table 5. Efficiency of five insecticides in control of greater sugarcane borer, *S. cretica* populations at 1, 4, 7 and 14 days after treatment under field conditions during 2018 season. (Mean numbers of larvae/plant and % reduction percentages)

Treatments	Pre spray	Post spray (days)				General mean
		1	4	7	14	
Control	1.72±0.39	1.89±0.16	2.2±0.5	2.49±0.5	3.28±0.43	
Lufenuron	1.56±0.28	0.46±0.16 (74.35±2.37)[c]	0.32±0.05 (83.58±2.95)[b]	0.82±0.27 (64.77±3.52)[a]	1.63±0.44 (46.91±3.38)[c]	(67.41±1.72)[b]
Radiant	1.93±0.33	0.69±0.23 (68.88±0.76)[d]	0.66±0.19 (73.93±0.66)[b]	1.32±0.41 (53.78±1.99)[b]	2.35±0.69 (38.08±0.75)[c]	(58.67±0.48)[c]
Chlorantraniliprole	1.76±0.2	0.14±0.09 (94.16±3.91)[a]	0.28±0.04 (87.33±2.46)[ab]	0.76±0.18 (70.64±2.43)[a]	1.48 ±0.4 (57.4±3.07)[b]	(77.38±0.73)[a]
Emamectin benzoate	1.7±0.33	0.28±0.11 (85.77±1.18)[b]	0.19±0.1 (91.17±4.75)[a]	0.51±0.17 (79.87±1.57)[a]	1.13±0.32 (66.18±4.04)[a]	(80.74±2.19)[a]
Dipel 2X	1.86±0.38	0.32±0.07 (84.39±1.42)[b]	0.53±0.14 (77.88±1.23)[b]	1.06±0.23 (60.75±2.4)[c]	1.86±0.24 (47.67±2.93)[c]	(67.67±0.73)[b]
F- values		85.804	24.718	64.214	50.304	170.182
L. S. D.		(3.3659)	(4.22265)	(3.72515	(4.58605)	(2.0337)

Means followed by the same letter(s) within the same column are nonsignificantly different ($P \leq 0.05$)

Table 6. Efficiency of five insecticides in control of greater sugarcane borer, *S. cretica* populations at 1, 4, 7 and 14 days after treatment under field conditions during 2019 season. (Mean numbers of larvae/plant and % reduction percentages)

Treatments	Pre spray	Post spray (days)				General mean
		1	4	7	14	
Control	2.03±0.35	2.24±0.39	2.49±0.45	3.24±0.38	3.66±0.4	
Lufenuron	2.16±0.39	0.44±0.05 (81.35±2.39)^{b}	0.38±0.08 (85.92±1.72)^{ab}	1.19±0.22 (65.75±0.68)^{c}	2.19±0.26 (43.61±2.98)^{c}	(69.16±0.83)^{c}
Radiant	2.28±0.23	0.65±0.22 (75.4±3.35)^{c}	0.71±0.2 (75.43±2.82)^{c}	1.75±0.5 (53.44±1.4)^{d}	2.65±0.32 (36.1±1.6)^{d}	(60.1±0.96)^{d}
Chlorantraniliprole	1.76±0.36	0.13±0.03 (93.48±1.8)^{a}	0.25±0.08 (88.72±0.93)^{a}	0.61±0.26 (79.53±1.48)^{b}	1.34 ±0.34 (58.32±2.57)^{b}	(80.01±0.56)^{b}
Emamectin benzoate	1.91±0.35	0.21±0.08 (90.11±2.78)^{a}	0.3±0.19 (88.38±6.56)^{a}	0.5±0.14 (83.74±3.07)^{a}	1.07±0.22 (69.07±1.45)^{a}	(82.82±1.37)^{a}
Dipel 2X	2.36±0.38	0.61±0.06 (76.03±2.5)^{c}	0.5±0.1 (82.71±2.92)^{b}	1.22±0.16 (67.57±1.21)^{c}	2.34±0.2 (44.57±1.21)^{c}	(67.71±0.96)^{c}
F values		39.414	9.478	186.615	136.735	371.857
L. S. D.		(3.93775)	(5.3621)	(2.65205)	(3.40025)	(1.4613)

Means followed by the same letter(s) within the same column are nonsignificantly different ($P \leq 0.05$)

Table 7. Effect of insecticides on dead hearts caused by greater sugarcane borer, *S. cretica* at 1, 2 and 3 weeks after treatments under field conditions during 2018 season. (Mean numbers of dead heart plants/50 plant and % reduction percentages)

Treatments	Pre spray	Post spray (weeks)			General mean
		1	2	3	
Control	4.94±1.09	8.06±0.8	10.94±0.31	14.56±0.88	
Lufenuron	4.75±0.98	0.69±0.24 (91.32±2.015)^{b}	1.81±0.43 (82.92±3.39)^{b}	3.38±1.18 (76.87±0.52)^{c}	(83.7±1.83)^{c}
Emamectin benzoate	6.06±0.43	0.38±0.14 (96.37±0.94)^{a}	1.44±0.43 (89.55±2.53)^{a}	3.06±0.77 (83.52±1.36)^{b}	(89.82±1.04)^{b}
Radiant	5.13±1.05	0.69±0.24 (91.99±1.57)^{b}	2±0.35 (82.45±2.33)^{b}	3.63±0.83 (76.39±2.68)^{c}	(83.61±0.75)^{c}
Dipel 2X	4.81±0.38	0.56±0.13 (92.9±1.7)^{b}	2.56±0.52 (76.53±3.02)^{c}	5.63±1.56 (62.09±1.51)^{d}	(77.17±2.03)^{d}
Chlorantraniliprole	5.06±0.47	0.19±0.13 (97.64±1.78)^{a}	0.94±0.24 (91.8±1.66)^{a}	1.88±0.32 (87.67±1.49)^{a}	(92.37±1.24)^{a}
F values		11.488	21.152	137.358	66.695
L. S. D.		(2.489)	(3.99915)	(2.50455)	(2.1988)

Means followed by the same letter do not differ significantly at the 5% level of significance (L.S.D. test).

Table 8. Effect of insecticides on dead hearts caused by greater sugarcane borer, *S. cretica* at 1, 2 and 3 weeks after treatments under field conditions during 2018 season. (Mean numbers of dead heart plants/50 plant and % reduction percentages)

Treatments	Pre spray	Post spray (weeks)			General mean
		1	2	3	
Control	3.88±1.11	5.88±0.97	8.75±0.2	12.38±1.13	
Lufenuron	3.19±0.69	0.31±0.24 (94.74±4.08)^{a}	0.88±0.32 (88.52±1.99)^{a}	2.94±1.03 (72.68±2.62)^{c}	(85.32±1.59)^{b}
Emamectin benzoate	3.94±0.88	0.31±0.24 (94.49±4.1)^{a}	0.81±0.24 (90.99±2.72)^{a}	2±0.61 (84.79±1.21)^{b}	(90.09±1.82)^{a}
Radiant	3.81±1.09	0.38±0.14 (93.75±1.19)^{a}	1.38±0.32 (83.97±3.86)^{b}	3±1.08 (76.17±3.92)^{c}	(84.63±2.61)^{b}
Dipel 2X	3.75±0.54	0.31±0.24 (95.07±3.31)^{a}	1.69±0.69 (81.69±1.46)^{b}	4.19±1.25 (66.64±2.47)^{d}	(81.13±0.83)^{c}
Chlorantraniliprole	3.5±0.41	0.19±0.24 (96.9±4.11)^{a}	0.63±0.14 (92.13±2.68)^{a}	1.19±0.24 (89.4±3.19)^{a}	(92.81±2.26)^{a}
F values		0.439	11.364	42.099	23.291
L. S. D.		(5.3408)	(4.01955)	(4.26315)	(2.89815)

Means followed by the same letter do not differ significantly at the 5% level of significance (L.S.D. test).

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تأثير مواعيد الزراعة وهجن مختلفة لمحصول الذرة الشامية *Zea mays* L. وتطبيق بعض المبيدات الحشرية علي الكثافة العددية لحشرة ثاقبة القصب الكبيرة *Sesamia cretica* Led.

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أجريت تجربتان حقليتان بأحد مزارع منطقة النوبارية، محافظة البحيرة، جمهورية مصر العربية خلال موسمي 2018 و 2019م لدراسة تاثير زراعة هُجن مختلفة لمحصول الذرة في مواعيد زراعة مختلفة علي الكثافة العددية لحشرة دودة القصب الكبيرة *Sesamia cretica*. هُجن محصول الذرة التي تم اختبارها كانت كالأتي هجين ثلاثي اصفر 352، هجين احادي أصفر 168، هجين أحادي ابيض 122، هجين أحادي أبيض 10، هجين أحادي أبيض 128. تم زراعة هذه الهُجن في ثلاث مواعيد زراعة كالأتي الأول من ابريل ومنتصف ابريل وأول مايو. أوضحت النتائج أن الكثافة العددية للحشرة كانت عالية في موعد الزراع المبكر (الأول من ابريل) بينما كانت الكثافة العددية أقل ما يمكن في موعد الزراعة المتأخر (الأول من مايو). وكذلك فإن النتائج بينت أنه لا يوجد من بين الأصناف المختبرة صنف منيع أو شديد المقاومة للحشرة وأن الهجين الفردي 128كان أعلي الأصناف في مقاومته للحشرة وضررها في حين سجل الهجين الثلاثي الأصفر 352 الهجين الأعلي حساسية بين الأصناف وقد أمكن ترتيب الهجن المختبرة تنازليا حسب الكثافة العددية لبيض ويرقات الحشرة علي نباتات الذرة وكذلك شدة الاصابة بظاهرة القلب الميت لنباتات الذرة كالآتي T.W.C.352، S.C.168 ، S.C.122، S.C.10 وأخيرا S.C.128. هذا وقد تكررت هذه النتائج في موسمي الدراسة المتتاليين. وقد تم أختبار كفائة خمس مبيدات حشرية تنتمي لمجاميع مختلفة ضد حشرة ثاقبة القصب الكبيرة تحت ظروف الحقل. كل المعاملات كانت فعالة في خفض تعداد اليرقات وخفض معدل الاصابة بين نباتات الذرة الشامية بالمقارنة بالكنترول. المبيد الحشري Emamectin benzoate كان أفضل المبيدات المختبرة من حيث خفض تعداد يرقات الحشرة ويليه المبيد الحشري Chlorantraniliprole ثم Lufenuron وكانت اقلهم افضلية هو مبيد Radiant. من ناحية أخري فإن افضل المبيدات المختبرة والتي أعطت افضل نسبة خفض لمعدل اصابة نباتات الذرة بالحشرة فكان مبيد Chlorantraniliprole متبوعا بمبيد Emamectin benzoate. ولذلك فإنه يمكن التوصية باستخدام هذه المبيدات في مكافحة الحشرة وخاصة المبيد الحيوي Emamectin benzoate .