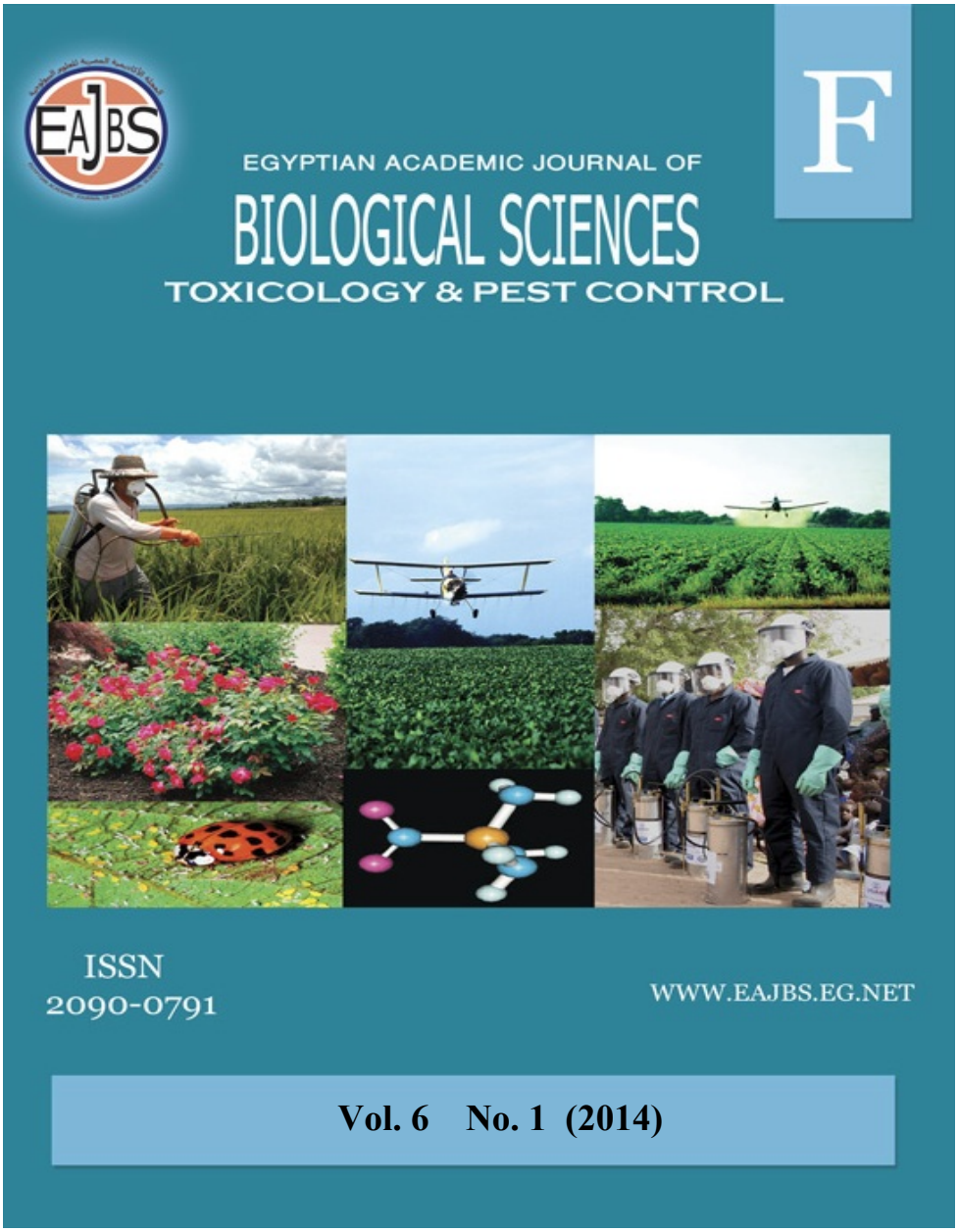

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Effect of certain pesticides alternative against *Sesamia cretica* (led.) And *Ostrinia nubilalis (hub)*. In maize fields. Beni- Suef Governorate.

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ABSTRACT

Two experiments were conducted in maize fields in Beni Suef Governorate to evaluate some insecticides alternatives to control the pink stem borer, *Sesamia cretica* and European corn borer, *Ostrinia nubilalis* at an early planting date during April and late planting date at the end of May.

The results showed , The plant extract Tagetes oil was the most effective against the pink corn borer, followed by the algal metabolite C (the algal metabolites of *Chlorella vulgaris*) as a compared with the stander biocide Spintor 24% . The average percentage reduction of perforated leaf plants and dead heart plants were (86.53 & 79.50), (61.95 & 54.23) and (89.56& 91.07 %) for early planting date and were (81.11 & 78.33), (46.67& 63.33) and (86.67 & 80.71 %) for late planting date, respectively.

Concerning on the efficiency of these treatments on the infestation of European corn borer, *O. nubilalis*. The plant extract Tagetes oil was the most effective followed by the algal metabolite C as a compared with the stander biocide Spintor 24%. The seasonal average percentage reduction of tunnel holes and diapouse larvae were (69.66 & 55.26), (49.48 & 34.82) compared with (76.34 & 67.76 %) for stander biocide Spintor 24% and were (73.47 & 53.90), (52.68 & 41.74) compared with (76.59 & 63.15 %) for stander biocide Spintor 24% at an early and late planting date, respectively.

The algal metabolite A (the algal metabolites of *Apanocapsa pulchra*) was the least effective against *S. cretica* and *O. nubilalis* followed by B (the algal metabolites of *Aphanocapsa elachista*) as a compared with the stander biocide Spintor 24%.

On the other hand, the effect of these treatments on the actual yield were studied. The plant extract Tagetes oil and the stander biocide Spintor 24% gave the highest grain yield of maize in the early and late plantations. The average actual yield were (19.28, 16.89) and (22.19, 17.74) ardab / feddan indicating an increase of (33.27, 39.27%) and (42.02, 42.18 %) than control for early and late planting date, respectively.

INTRODUCTION

Maize is considered one of the most important cereal crops in Egypt. It is mixed with wheat flour in bread industry; it is used in several industries which have economic importance to Egypt. It attacked by many insects such as the two corn borers, *Sesamia cretica* Led and *Ostrinia nubilalis* Hub. (Abd El- Gawad *et al*., 2002).

These two pest species are regarded among the major factors affecting the productivity of growing maize plants and causing great damage and yield loss.

The pink stem borer, *S. cretica* is one of the main corn stem borer in Egypt. The female moths prefer laying most of eggs on plants about 20- 30 days after plantation. As the infested seedlings are perforated leaf and a dead hearts in the same stage, consequently causing a great reduction in the yield. European corn borer, *O.nubilalis* may cause damage to corn ears that begins before or during the silk stage. It may begin development in the whorl or tassel or larvae may hatch during silking and move directly into ears from oviposition site on flag leaves to the ear or on silk. Larvae enter ears through the silk channel, or by tunneling through the husk from the side or base (Adams and Clark, 1995).

The main way for controlling these pests is still by using chemical insecticides. There are many problems which have appeared with the repeated use of insecticides including hazards to human and his animals by environmental pollution and also, the appearance of resistant strains of insect pests to insecticides, therefore it is very important to find out alternative control methods. (Rinkleff *et al*., 1995).

The present study aimed to assay the efficacy of some insecticides alternative applied in maize fields, against *S. cretica* and *O. nubilalis*, in addition to assess the effect of the tested treatments on corn grain yield.

MAERIAL AND METHODS

Two experiments were conducted at Benij suef Governorate, Naser city, El- Ryad during early and late season 2012. Each was cultivated with single hybrid (Hytic 2031) maize variety on April 20, for the early and on June 27, for late season plantation. Maize fields were subjected to normal agriculture practices such as land preparations, irrigation, mechanical weed control and fertilization. Seven treatments were used including different insecticides alternative as follows:

Algal metabolites.

Three metabolites of algal species were isolated from different Egyptian species.

1- The metabolites of *Aphanocapsa pulchra* (A).

2- The metabolites of *Aphanocapsa elachista* (B).

3- The metabolites of *Chlorella vulgaris* (C).

These algal metabolites were obtained from the algal Departement, Faculty of Science. Beni- Suef University. The rate of application 1.5 liter/ feddan.

4- Tagetes oil.

Tagetes oil: Plant origin oil was extracted from leaves and flowers of *Tagetes minuta* plants by steam distillation according to (Wells *et al*., 1992 and Weaver *et al*., 1994) the samples were placed in flasks of 500 ml and water was added to cover the sample, distillation took 180 minutes to obtain all the oil in the sample. Emulsifier (El- Sisi 6) was used at 0.3 % to dissolve the oil in water .The rate of application 1 liter / feddan.

5- Spintor 24 SC (Spinosad): The spinosyns , a new class of highly active natural insecticides were discovered in 1989 from a culture of the actinomycete *Saccharopolyspora spinosa* containing a naturally occurring mixture of spinosyn A ($C_{41}H_{65}NO_{10}$) and spinosyn D ($C_{42}H_{67}NO_{10}$). The insecticide was introduced by Dow Agro Sciences for control lepidopterous pests in cotton under the trade name (Tracer). (Thompson *et al*. 1997). The rate of application was 50 cm^3 / fed.

6- The control (check).

Design of the field experiments:

An area of about half feddan (2100 m^2) was chosen and divided into experimental plots (1/50 feddan). Each plot was separated from the adjacent one by a half meter belt (barrier) to minimize the interference of spray drift from one treatment to another. The three replicates of the six treatments were arranged in completely randomized blocks design.

Spraying of each material was applied three times. The first started 15 days after sowing and the second after 8 days later to control *S. cretica*. The third spray after 45 days from planting to control *O. nubilalis*.

The perorated leaf plants and dead heart plants were estimated per plots after 40 days from sowing.

At harvest time for early and late season, thirty ears were picked at random from each treatment (10 ears / plot). Each ear was husked and calculated number of tunnel holes and diapouse larvae (Hazzard *et al*., 2003).

At harvest time, ears of each plot were collected, dried, shelled, weighted and adjusted to fined out the yield (ardab / feddan).

Statistical analyses:

The obtained data were corrected by Abbott's formula (1925) and subjected to the analysis of variance and the means were compared using the LSD test at P< 0.05.

RESULTS AND DISCUSSIONS

Efficiency of insecticides alternative against borer *S. cretica* and *O. nubilalis*

The results presented in Tables (1 and 2) demonstrated that the efficacy of insecticides alternative against the two corn borer *S. cretica* and *O. nubilalis* in early and late planting date.

The early planting date.

Data presented in Table 1 and illustrated in Fig. 1 show the efficiency of some insecticide alternatives on the infestation of corn borer, *S. cretica* and *O. nubilalis* in maize fields.

Table 1: Effect of different insecticides alternative on the average % population reduction of the pink borer *Sesamia cretica* and European borer *Ostrinia nubilalis* in corn fields, during the early planting date,2012 season.

Treatments	Rat of application fed.	*Sesamia cretica*				*Ostrinia nubilalis*	
		Perforated leaf plants		Dead heart plants		Av. % reduction	
		Av. counts	reduction♀♀ Av.%	Av. counts	reduction♀♀ Av.%	Tunnel holes	Diapouse larvae
Algal metabolites A	1.5 liter	7.67	20.88 ± 2.3 d	6.67	16.34 ± 5.2 e	9.29 ± 3.4 c	7.67 ± 3.2 c
Algal metabolites B	1.5 liter	4.67	32.19 ± 3.8 c	3.33	35.40 ± 3.7 d	38.17 ± 8.9 b	20.49 ± 4.1 c
Algal metabolites C	1.5 liter	3.67	61.95 ± 2.7 b	3.67	54.23 ± 3.7 c	49.48 ± 8.5 b	34.82 ± 8.6 b
Tagetes oil	1 liter	1.33	86.53 ± 4.1 a	1.67	79.50 ± 5.6 b	69.66 ± 3.8 a	55.26 ± 7.7 b
Spintor 24 %	50 ml	1.00	89.56 ± 1.2 a	0.67	91.07 ± 7.8 a	76.34 ± 3.4 a	67.76 ± 5.3 a
Control	---	9.67	0.00	8.00	0.00	0.00	0.00
L.S.D.	5 % level		7.91		8.45	13.45	20.88

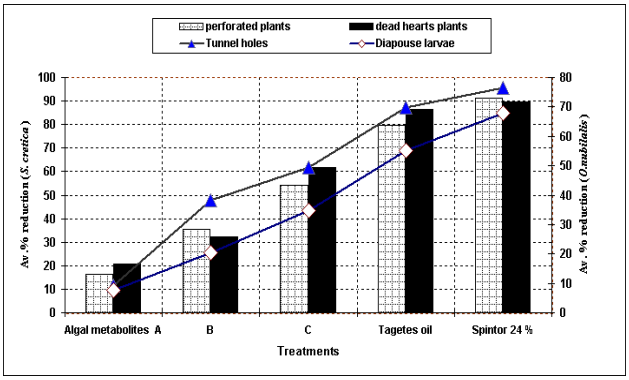

Fig. 1: Effect of different insecticides alternative on the average % population reduction of the pink borer *S. cretica* and European borer *O. nubilalis* in maize fields, during the early planting date.

A: the algal metabolites of *Ahanocapsa pulchra.*

B: the algal metabolites of *Ahanocapsa elachista*

C: the algal metabolites of *Chlorella vulgaris*.

S. cretica

Perforated leaf plants and dead hearts leaves:

The plant extract Tagetes oil was the most effective against the pink corn borer, followed by the algal metabolite C (the algal metabolites of *Chlorella vulgaris*) as a compared with the stander biocide Spintor 24%. The average percentage reduction of perforated leaves and dead heart plants were

(86.53 & 79.50), (61.95 & 54.23) and (89.56& 91.07%), respectively. The algal metabolite B (the algal metabolites of *Apanocapsa elachista*) and A (the algal metabolites of *Apanocapsa pulchra.*) were the least effect as a compared with the stander biocide Spintor 24%.

The average % reduction of perforated leaves and dead hearts were (32.19 & 35.40), (20.88 & 16.34) compared with (89.56& 91.07 %) for stander biocide Spintor 24%, respectively. El-Hosary *et al.* (2010) mentioned that protecto achieved the highest percentage reduction of plants containing perforated leaves and dead hearts.

***O. nubilalis*:**

Tunnel holes and diapouse larvae:

Concerning on the efficiency of these treatments on the infestation of European corn borer, *O. nubilalis*. The plant extract Tagetes oil was the most effective against the pink corn borer, followed by the algal metabolite C (the algal metabolites of *Chlorella vulgaris*) as a compared with the stander biocide Spintor 24% . The seasonal average percentage reduction of tunnel holes and diapouse larvae were (69.66 & 55.26), (49.48 & 34.82) compared with (76.34 & 67.76 %) for stander biocide Spintor 24%, respectively. The algal metabolite A (the algal metabolites of *Apanocapsa pulchra.*) was the least effective against *O. nubilalis* followed by B (the algal metabolites of *Apanocapsa elachista*) as a compared with the stander biocide Spintor 24%. The seasonal average percentage reduction of tunnel holes and diapouse larvae were (9.29 & 7.67), (38.17 & 20.49) compared with (76.34 & 67.76 %) for stander biocide Spintor 24%, respectively.

Abdel – Hafez and Mohamed (2009) mentioned that Spintor, Spinetoram and the plant extract ,Tagetes oil reduced the damage of cotton leaves up to 6 days after spraying and they can replace the hand picking of *S. littoralis* egg masses in Egypt. Blagovesta *et al* (2005) studied the biological activity of essential oil volatiles from *Tagetes minuta* L. (Mexican marigold) against three aphid species in a series of laboratory experiments. The aphid species studied were Acyrthosiphon pisum (Harris) (pea aphid), *Myzus persicae* (Sulzer) (peach-potato aphid), and *Aulacorthum solani* (Kaltenbach) (glasshouse and potato aphid). *Tagetes minuta* oil volatiles significantly reduced aphid reproduction (up to 100% after 5 days of exposure). The effect depended on the quantity of essential oil used, and varied with the aphid species tested. Pea aphids were the most susceptible. The study demonstrates that *T. minuta* oil volatiles have potential for aphid control.

The late planting date.

Data presented in Table 2 and illustrated in Fig 2 show the efficiency of some insecticide alternatives on the infestation of corn borer, *S. cretica* and *O. nubilalis* in maize fields.

S. cretica

Perforated leaf plants and dead hearts leaves:

The plant extract Tagetes oil was the most effective against the pink corn borer, followed by the algal metabolite **C** (the algal metabolites of *Chlorella vulgaris*) as a compared with the stander biocide Spintor 24% . The average percentage reduction of perforated leaves and dead heart plants were (81.11 & 78.33), (46.67& 63.33) and (86.67 & 80.71 %), respectively. The algal metabolite **B** (the algal metabolites of *Apanocapsa elachista*) and **A** (the algal metabolites of *Apanocapsa pulchra.*) were the least effect as a compared with the stander biocide Spintor 24%.

Table 2: Effect of different insecticides alternative on the average % population reduction of the pink borer *S. cretica* and European borer *O. nubilalis* in corn fields, during the late planting date, 2012 season.

Treatments	Rat of application per fed.	*Sesamia cretica*				*Ostrinia nubilalis*	
		Perforated leaf plants / plot		Dead heart plants/ plot		Av. % reduction	
		Av. counts	Av. % reduction	Av. counts	Av. % reduction	Tunnel holes	Diapouse larvae
Algal metabolites A	1.5 liter	3.67	16.11 ± 3.2 c	2.67	21.33 ± 8.8 c	26.12 ± 2.9 d	22.36 ± 6.7 d
B	1.5 liter	3.00	34.44 ± 3.9 b	2.00	58.33 ± 7.6 b	46.63 ± 5.3 b	25.34 ± 7.7 d
C	1.5 liter	3.33	46.67± 5.3 b	1.67	63.33 ± 5.3 b	52.68 ± 3.9 b	41.74 ± 4.8 c
Tagetes oil	1 liter	1.00	81.11 ± 1.9 a	1.00	78.33 ± 2.9 a	73.47 ± 1.9 a	53.90 ± 2.3 b
Spintor 24 %	50 ml	0.67	86.67 ± 4.6 a	0.67	80.71 ± 1.5 a	76.59 ± 2.9 a	63.15 ± 2.7 a
Control	---	5.33	0.00	4.67	0.00	0.00	0.00
L.S.D.	5 % level		17.58		20.75	6.87	8.52

A : the algal metabolites of *Ahanocapsa pulchra.*

B: the algal metabolites of *Ahanocapsa elachista*

C: the algal metabolites of *Chlorella vulgaris*.

The values marked with the same letter are not significantly different according to L. S. D. test at 5 % level.

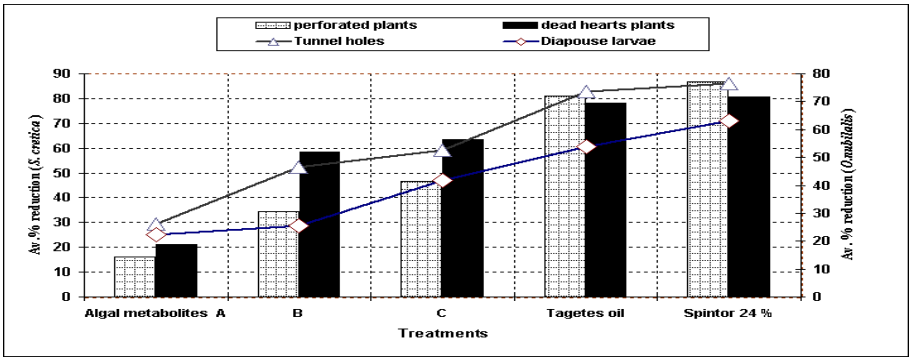

Fig. 2: Effect of different insecticides alternative on the average % population reduction of the pink borer *S. cretica* and European borer *O. nubilalis* in maize fields, during the late planting date.

A : the algal metabolites of *Ahanocapsa pulchra.*

B: the algal metabolites of *Ahanocapsa elachista*

C: the algal metabolites of *Chlorella vulgaris*.

The average % reduction of perforated leaves and dead hearts were (34.44 & 58.33), (16.11& 21.33) compared with (86.67& 80.71 %) for stander biocide Spintor 24%, respectively.

***O. nubilalis*:**

Tunnel holes and diapouse larvae:

Concerning on the efficiency of these treatments on the infestation of European corn borer, *O. nubilalis*. The plant extract Tagetes oil was the most effective against the pink corn borer, followed by the algal metabolite **C** (the algal metabolites of *Chlorella vulgaris*) as a compared with the stander biocide Spintor 24%. The seasonal average percentage reduction of tunnel holes and diapouse larvae were (73.47 & 53.90), (52.68 & 41.74) compared with (76.59 & 63.15 %) for stander biocide Spintor 24%, respectively. The algal metabolite A (the algal metabolites of *Apanocapsa pulchra.*) was the least effective against *O. nubilalis* followed by B (the algal metabolites of *Apanocapsa elachista*) as a compared with the stander biocide Spintor 24%. The seasonal average percentage reduction of tunnel holes and diapouse larvae were (26.12 & 22.36), (46.63 & 25.34) compared with (76.59 & 63.15 %) for stander biocide Spintor 24%, respectively. The authors suggested that jojoba oil can play an important role in an IPM program against *A. gossypii*, also, Othman *et al.* (2000) evaluated the efficiency of *Tagetes minuta*

extract against *A. gossypii* and *T. tabaci*. The results revealed that the oily extract of *T. minuta* showed a good level of efficiency against cotton aphids and thrips within the first two days after application and persisted for at least to 5 days after spraying under field condition, also, Abdel- Aziz and Abdel-Raouf (2002) studied the efficiency of four algal metabolites species, two related to chorophyta (*Chlorella vulgaris* & *Dunaliella sp*.) and the other related to cyanophyta (*Aphanocapsa elachista* & *A. pulchra*) against *Tetranychus uritca*. The metabolites *A. pulchra* exhibited the high repellency 80 %. On the other hand, the total mortality % of the total immature stages of mite recorded high level 60% after treatment by *A. elachista*.

The resultant yield:

Data presented in Table 3 and illustrated in Fig. 3 show that all tested treatments increased the grain yield of maize in the early and late plantations. The plant extract Tagetes oil and stander biocide Spintor 24% gave the highest grain yield of maize in the early and late plantations. The average actual yield were (19.28, 16.89) and (22.19, 17.74) ardab / feddan indicating an increase of (33.27, 39.27%) and (42.02, 42.18 %) than control for early and late planting date, respectively.

Table 3: Average dry maize yield (ardab / fed.) grained from the different treatments in early and late planting dates in maize fields.

Treatments	Rat of application per feddan	Average actual yield ardab / fed			
		1st planting date		2nd planting date	
		Av. counts	% increase	Av. counts	% increase
Algal metabolites A	1.5 liter	13.35 ns	3.60	11.29 ns	9.14
B	1.5 liter	14.60 ns	13.44	12.95 *	16.47
C	1.5 liter	16.36 **	21.36	14.20 **	27.76
Tagetes oil	1 liter	19.28 **	33.27	16.89 **	39.27
Spintor 24 %	50 ml	22.19 **	42.02	17.74 **	42.18
Control	---	12.87	0.00	10.26	0.00
L.S.D.	5 % level.	2.04		1.80	

** very significant * significant n.s non- significant

A : the algal metabolites of *Ahanocapsa pulchra.*

B: the algal metabolites of *Ahanocapsa elachista*

C: the algal metabolites of *Chlorella vulgaris*.

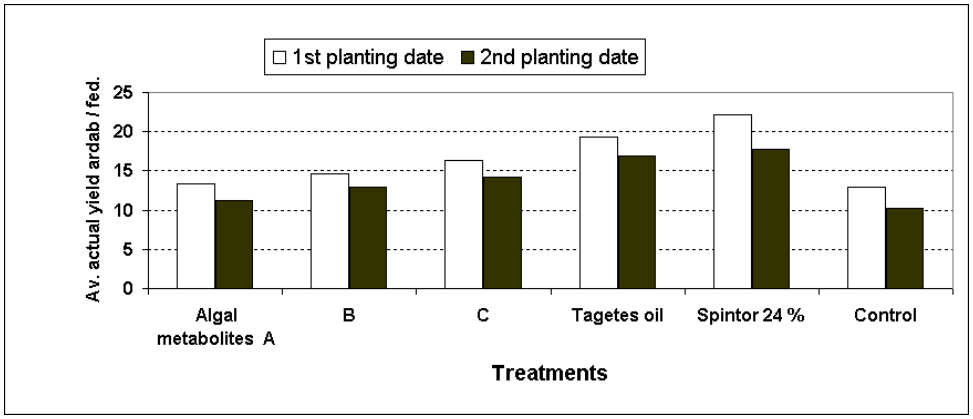

Fig. 3: Average dry maize yield (ardab / fed.) grained from the different treatments in early and late planting dates in maize fields.

The algal metabolite A (the algal metabolites of *Apanocapsa pulchra.*), B (the algal metabolites of *Apanocapsa elachista*) and C (the algal metabolites of *Chlorella vulgaris*) gave the lowest grain yield in the early and late planting date. The average actual yield were (13.35, 14.60, 16.36) and (11.29, 12.95, 14.20) ardab / feddan

indicating an increase of (3.60, 13.44, 21.36%) and (9.14, 16.47, 27.76%) than control for early and late planting date, respectively.

Many researchers have attempted to quantify the relation ship between infestation level and corn yield reduction. Bohn *et al.* (1999) found that *O. nubilalis* infestation reduced average maize grain yield by 0.28 % for each 1% of damaged plants and 6.05 % for each *O. nubilalis* larvae per plant. *Sabra et al. (2005)* found that, the actual losses of grain yield caused by *O.nubilalis* were 0.38 and 0.31 Kg /100 plants. El – Hosary *et al.* (2010) mentioned that there were significant negative correlation between yield and *S. cretica* traits (average count of egg masses , number of larvae, number of plants containing perforated leaves and number of dead hearts plants

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ARABIC SUMMARY

تأثير بعض بدائل المبيدات الحشرية ضد دودة القصب الكبيرة ودودة الذرة الأوربية في حقول الذرة الشامية في محافظة بني سويف.

عصام محمد محمد احمد ، حسين عبد الحميد ، المدثر عبد العظيم وهبة
معهد بحوث وقاية النباتات – مركز البحوث الزراعية- الجيزة- مصر

أجريت تجربتان حقليتان في حقول الذرة الشامية بمحافظة بني سويف لتقييم بعض بدائل المبيدات لمكافحة دودة القصب الكبيرة ودودة الذرة الأوربية في موعد زراعة مبكر خلال شهر ابريل وموعد زراعة متأخر في نهاية مايو.

أوضحت النتائج أن معاملات المستخلص النباتي Tagetes oil والنواتج الإيضية لطحلب *Chlorella vulgaris*. كانت أفضل المعاملات في خفض أضرار دودة القصب الكبيرة حيث كانت النسبة المئوية للخفض في أوراق الذرة المصابة وظاهرة القلب الميت للنباتات (86.53 و 79.50) و (61.95 و 54.23) بالمقارنة ب (89.56 و 91.07 %) للمبيد الحيوي Spintor 24 % في ميعاد الزراعة المبكر ، بينما كانت (81.11 و 78.33) و (46.67 و 63.33 %) في ميعاد الزراعة المتأخر مقارنة (86.67 و 80.71 % لمبيد Spintor 24 % على التوالي.

وبالنظر إلى تأثير المعاملات على أضرار دودة الذرة الأوربية بلغت النسبة المئوية للخفض في عدد الثقوب / 100 عقلة و المئوية للخفض في تعداد اليرقات الساكنة (69.66 و 55.26) و (49.48 و 34.82) مقارنة ب (76.34 و 67.76) للمبيد الحيوي Spintor 24 % في ميعاد الزراعة المبكر، بينما كانت في ميعاد الزراعة المتأخر (73.47 و 53.90) و (52.68 و 41.74) مقارنة ب (76.59 و63.15%) للمبيد الحيوي Spintor 24 % على التوالي.

بينما أظهرت معاملات النواتج الإيضية لطحلب A *Apanocapsa pulchra* و B *Apanocapsa elachista* تأثيراً ضعيفاً على أضرار دودة القصب الكبيرة ودودة الذرة الأوربية.

ومن ناحية أخرى تم دراسة هذه المعاملات على كمية المحصول. أوضحت النتائج أن معاملات المبيد الحيوي والمستخلص النباتي Tagetes oil و المبيد الحيوي Spintor 24 % كانت أفضل المعاملات في كمية الإنتاج حيث بلغت (19.28 و 19.89) و (22.19 و 17.74) مقارنة ب (12.87 و 10.26) إردب / فدان للمقارنة بنسبة زيادة (33.27 و 39.27) و (42.02 و 42.18 %) عن المقارنة في موعد الزراعة المبكر والمتأخر على التوالي . بينما كانت معاملات النواتج الإيضية للطحالب اقل تأثيراً بالنسبة لكمية الإنتاج للفدان.