EFFICIENCY OF SOME PLANT EXTRACTS, BIOPESTICIDES, AN INSECT GROWTH REGULATOR AND THEIR MIXTURES IN CONTROLLING *SESAMIA CRETICA* LED. IN CORN FIELDS

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Abstract

The efficiency of water and acetone extracts of radish *Raphanus raphanistrum* L. and turnip *Brassica rape* were tested separately and their mixtures with some biopesticides (Protecto – Biosect) and an insect growth regulator (Runner) agnist *Sesamia cretica* throughout early summer season 2009. Data demonstrated that treatment with Runner alone, mixture of water radish extract and Protecto achieved the highest percentage reduction in number of *Sesamia cretica* egg-masses, number of larvae, also the for mentioned treatments achieved the highest percentage reduction of plants containing perforated leaves and dead hearts. In addition the highest yield was obtained as a result of treating plants with the previously mentioned treatments. Data showed that there were significant negative correlation between yield and each of *S. cretica* traits.

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.

The pink stem borer Sesamia cretica Led. (Lepidoptera: Noctuidae) may be, fairly considered the most serious, as infestation to plants in the seedling stage cause dead heart and subsequently, rotten of plants (Gentry, 1965 and Awadallah. 1974).

Chemical insecticides are used for controlling this pest, but the frequently using of pesticides due to pollution and hazard consequences, together with the pressing need to satisfactory advocate pest management, it is necessary to look safer facilities for insect pest suppression. In spite of chemical control by using pesticides give effective control against pests, but unfortunately the use of pesticides are very danger to human, animals and beneficial insects, therefore it is very important to find out alternative control methods have distinguishing and effective as pesticides without any problems in applied. Many crude plant extracts and derivatives of several plant species (as pesticide) have been reported by Jacobson (1989).

MATERIALS AND METHODS

Field experiments

In 2009 early summer season of corn, about 1/4 feddan was chosen and divided into 60 plots and separated into 4 replicates, each was sown with Giza 2 corn seeds at 3 – 4 seeds / hill. El-Saadany (1965) and Awadallah et al., (1993). Plantations were arranged in complete randomized block design. The normal agriculture practices were followed. A hand sprayer (one liter) was used for applying the liquid material (approximately 2 cm3) in the whorl of each plant. Spraying was applied two times the first was 16 days after sowing, while, the second was 7 days later. Data concerning the infestation by S. cretica egg-masses (40 plants / plot and larvae / 20 plants per plot were recorded after 24 hours of spraying. The perforated leaves and dead hearts were estimated per 50 plants / plot, after 35 days from sowing. At harvest all maize ears of each plot were collected, weighed and adjusted to find out the ear yield per feddan expressed as (ardab / feddan).

Products used

Trade name	Active ingredient	Concentration (1)	Concentration (2)
Runner 24% Sc	Methoxyfenozide (IGR)	0.75 cm^3/ Liter 0.08%	0.38 cm^3 /Liter 0.04%
Protecto 9.4% WP	*Bacillus thuringiensis* var. *kurstaki*	3 gm / Liter 0.3%	1.5 gm / Liter 0.15%
Biosect 92 x 10^6 IU WP	*Beauveria bassiana*	2 gm / Liter 0.2%	1 gm / Liter 0.1%
Diazinox 5% Gr.	Diazinon	0.5 gm / plant	–

Preparation of materials

Extractions were prepared as stated by Emara *et al.,* (1994) by adding 500 ml of distilled water to 50 gm & 25 gm of dried powder part of plants. The extracts were allowed to stand for 24 hrs on 2°C. The dried powder leaves were mixed with organic solvents (acetone) at ratio of (1 gm powder) : (2 cm^3 solvent) and blended in high speed electric blender for 15 minutes then filtered. The obtained soluation was freezed at 4 °C until used. The solvent was evaporated by electric fan. A volume of 500 ml water was mixed with the residue of the dried extracts after adding (3 cm^3 approximately) of emulsifier solution to obtain as emulsion of the desired extract 10% W/V. The scientific and common name of plant species under investigation are used in following table:

Symbol	Solvents	Scientific name	Family name	Common name	used plant Parts
RW RA	Water & Acetone	*Raphanus raphanistrum*	Cruciferae	Wild radish	Leaf
TW RA	Water & Acetone	*Brassica rape* L.	Cruciferae	Turnip or rape	root

Preparation of mixtures

The lowest concentration of each plant insecticide was mixed with water and acetone extracts of each plant species as follow:-

1. RW 1% v/v + Runner 0.04%
2. TW 1% v/v + Runner 0.04%
3. RW 1% v/v + Protecto 0.15%
4. RA 10% v/v + Protecto 0.15%
5. RW 1% v/v + Biosect 0.01%
6. RA 10% v/v + Biosect 0.01%

Correlation coefficient between yield and S. cretica traits (average counts of egg-masses, larvae, plants containing perforated leaves and dead hearts) were calculated according to Snedecor and Cochran (1980).

Statistical analysis

All obtained results were statistically analyzed according to the analysis of variance. The proper "F" value was calculated as described by Ficher (1950) and Duncan's multiple range tests (1955).

The chemical components of tested plants

1. *B.rape* L.

Twenty-five acylated and nonacylated flavonoid glycosides and ferulic and sinapic acids were identified in host plant,

2. *R. raphanistrum*

Ten glucosinolates, potential allelopathic compounds, were identified in radish, including glucoiberin, progoitrin, glucoraphanin, glucoraphenin, glucosinalbin, gluconapin, glucotropaeolin, glucoerucin, glucobrassicin, and gluconasturtin.

RESULTS AND DISCUSSION

I . Field experiments results

a- Effect on egg-masses

As shown in Table (1), all treatments caused significant reductions in the number of *S. cretica* egg-masses, however the untreated plants harboured the highest number being 36 egg-masses / 40 plants. The highest efficiency among all treatments were achieved as plants treated with Runner formulation (0.08 %), the mixture of water radish extract + protecto (0.15 %) being 2 egg-masses / 40 plants, causing 94.4% reduction than control for both followed by Biosect formulation (0.2%), the mixture (RA + protecto) and (RW + Biosect) being 3 egg-masses / 40 plants as 91.6% reduction than control. The remaining treatments could be classified into two groups, the first had an intermediate effect including – descendingly – radish extract in acetone, turnip extract in acetone & water, protecto (0.3%) and the mixture water radish extract and Runner (0.04%) being 5, 6, 8, 8 and 8 egg-masses / 40 plants achieving 86.1, 83.3, 77.7, 77.7 and 77.7% reduction than control, respectively. The second group had the least efficacy could be fairly arranged in descendingly order as water radish extract, the mixture water turnip extract and Biosect (0.1%), the mixture water turnip extract and Runner (0.4%) and Diazinox being 10, 11, 12 and 19 egg-masses, respectively.

b- Effect on larvae counts

Larvae of *S. cretica* were counted on 20 random plants. Data in Table (1) clearly demonstrated that the highest percentage reduction, 93.1% with average 4 larvae / 20 plants and was obtained when plants treated alone with Runner 0.08% and water radish extract + protecto 0.15% being high significant with the untreated plants which harboured 58 larvae / 20 plants.

On the contrary, the least effective treatments were acetone radish mixed with Biosect 0.1% and water turnip extract + Runner 0.04% having 36 and 40 larvae / 20 plants, respectively. While, protecto 0.3% and acetone radish extract achieved intermediate efficacy level with 20 and 24 larvae as 65.5 and 58.6% reduction than control, respectively. The remaining treatments ranged from 8 larvae to 18 larvae / 20 plants as 86.2 and 68.9%, respectively.

c- Perforated leaves

As shown in Table (1), all the treatments caused significant reductions in plants containing perforated leaves. The untreated plants achieved the highest average infestation as 50 plants. While, treatments caused the highest efficacy were, Runner 0.08%, water and acetone radish extract and Biosect 0.2% being 1,2, 2 and 2 plants containing perforated leaves as 98, 96, 96 and 96% reduction than control,

respectively. The remaining treatments could be classified in two groups, the first one had intermediate effect including acetone turnip extract, the mixture water radish extract + Biosect (0.01%), water radish extract + protecto (0.15%) water radish extract + protecto (0.15%) , protecto (0.3%), water turnip extract and Diazinox causing 92, 92, 90, 90, 90, 86 and 86% reduction than control, respectively.

The second group had the least efficacy (reduction ranged between 72 and 62%) including the mixture water turnip + Runner (0.04%), radish water extract + Runner (0.04%) and water radish extract + Biosect (0.1%) as 72.64 and 62% reduction than control, respectively.

d- Number of dead hearted plants

From the same table the least number of dead hearted cases was plants recorded in plants treated with Runner (0.08%), only one dead heart plant / 50 plants indicating 96% reduction than control. While, water and acetone radish extract, water radish + protecto (0.15%), water radish + protecto (0.15%) and biosect ranked the second position according to the efficacy causing significant difference (2 dead heat / 50 plants) as 92% reduction than control. On the other hand, treatments with water turnip extract + Runner (0.04%), water radish + Runner (0.04%) and water radish extract + Biosect (0.1%) were the least in reducing the number of dead hearted plants being 60, 56 and 32% reduction than control, respectively. The remaining treatments caused intermediate effect and could be arranged in descendingly order as acetone and water turnip extract, water radish extract + biosect (0.1%) and Diazinox (4, 5, 6 and 7 dead heart plants / 50 plants, respectively).

e- The resultant yield

All treatments caused an increasing in maize yield especially Runner 0.08% which achieved the highest yield 30.5 ardab / feddan, followed by the mixture water radish extract + protecto (24.8 ardab / feddan). On the contrary, water radish extract + protecto (0.15%) had the lightest yield 14.3 ardab / feddan only with 25.4% increase than control which achieved 11.4 ardab / feddan.

The remaining treatments caused increase in yield ranged from 15.2 to 20.9 ardab / feddan as 33.3 and 83.3% increase than control for (acetone radish extract + Biosect (0.1%) and (acetone radish extract, biosect 0.2%) and protecto 0.3%), respectively.

Correlation between the final yield and *S. cretica* triats

Data in Table (2), showed the correlation coefficient values between yield and each of average count of egg-masses and larvae of S. cretica also, number of plants containing perforated leaves and dead hearted plants. It is clear that there were

significant negative correlation values between yield and each of the previously mentioned aspects.

These results are in agreement with that of Jbilou et al. 2006 who studied the insecticidal effect of methanol R. raphanistrum on the stored grain pest Tribolium castaneum. They found that larvae growth was significantly inhibited when they were insects were fed with extract incorporated into the diet. Also, they revealed that the extract caused good insecticidal activity against T. castaneum larvae and adults. Finally, they found that plant extract of R. raphanistrum could be useful for managing populations of T. castaneum.

Table 1. Average counts of *S. cretica* egg-masses, larvae, plants with infested symptoms and dry maize yield after treated with different plant extracts, biopesticides, an insect growth regulator and their mixtures in corn field.

Treatment	Egg-masses		No. of larvae / 20 plant		No. of perforated leaves / 50 plants		No. of dead hearts / 50 plant		Calculated ears Yield ardab / feddan	
	Average No.	% reduction	Average No.	% reduction	Average counts	% reduction	Average counts	% reduction	Average counts	% increase
Radish water ext. (RW)	10 a	86.1	18 b	68.9	2 a	96	2 a	92	17.1 a	50
Radish acetone ext. (RA)	5 a	86.1	24 b	58.6	2 a	96	2 a	92	20.9 ab	83.3
Turnip water ext. (TW)	8 a	77.7	10 a	82.7	7 b	86	5 a	80	19 ab	66
Turnip acetone ext. (TA)	6 a	83.3	12 ab	97.3	4 ab	92	4 a	84	19 ab	66
RW + runner (0.04%)	8 a	77.7	16 b	72.4	18 d	64	11 b	56	19 ab	66
TW + runner (0.04%)	12 b	66.6	40 c	31	14 c	72	10 ab	60	16.2 a	42.1
Runner (0.08%)	2 a	94.4	4 a	98.1	1 a	98	1 a	96	30.5 c	167.5
RW + Protecto (0.15%)	2 a	94.4	4 a	93.1	5 b	90	2 a	92	24.8 b	117.5
RA + Protecto (0.15%)	3 a	91.6	8 a	86.2	5 b	90	2 a	92	14.3 a	25.4
Protecto (0.30%)	8 a	77.7	20 b	65.5	5 b	90	3 a	88	20.9 ab	83.3
RW + Biosect (0.01%)	3 a	91.6	16 b	72.4	4 ab	92	6 a	76	17.1 a	50
RA + Biosect (0.01%)	11 ab	69.4	36 c	37.9	19 d	62	17 c	32	15.2 a	33.3
Biosect (0.2%)	3 a	91.6	16 b	72.4	2 a	96	2 a	92	20.9 ab	83.3
Diazinox	9 b	47.2	17 b	70.7	7 b	86	7 ab	72	19 ab	66
Control	36 c		58 d		50 e		25 d		11.4 a	
F value	46.7		148.1		14.6		86.6		26.48	
L.S.D.	8.2		8		2.22		4.9		8.9	

Table 2. Simple correlation between yield and each of *S. cretica* traits average counts of egg-masses, larvae, plants containing perforated leaves and dead hearts) after treatment with different plant extracts, biopesticides and their mixtures in corn fields.

Traits	Correlation coefficient (r)
Egg-masses	– 0.61066**
No. of larvae	– 0 .66464**
No. of plants containing perforated leaves	– 0.58884**
No. of dead heated plants	– 0.63193**

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فعالية بعض المستخلصات والمركبات الحيوية وأحد منظمات النمو الحشرية وخلائطهما فى مكافحة دودة القصب الكبيرة فى حقول الذرة الشامية

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اختبرت فعالية مستخلصات نباتى الفجل واللفت فى الماء والاسيتون وكذلك خلائطهما مع بعض المركبات الحيوية (بروتكتو –بيوسكت) وأحد منظمات النمو الحشرية (رانر) ضـــد دودة القـــصب الكبيرة على نباتات الذرة الشامية خلال العروة الصيفية المبكرة أبريل ٢٠٠٩.

أظهرت النتائج ان مركب الرانر بمفرده بتركيز ٠,٠٨% وخليط المستخلص المائى للفجل ١٠ سم٣ / لتر ماء مع مركب بروتكتو١٥و% حققا أفضل نسبة نقص فى تعداد لطع البيض بمعدل ٢ لطعة / ٤٠ نبات ٩٤,٤% عن المقارنة (٣٦ لطعة / نبات) ، أعلى خفض فى تعداد اليرقات ٤ يرقة / ٢٠ نبات بمعدل خفض بلغ ٩٣,١% لكليهما وحققا كذلك اعلى نسبة خفض فى عدد النباتات المحتوية على ظاهرة القلب الميت (١ – ٢ نبات قلب ميت / ٥٠ نبات) بنسبة نقص ٩٦ – ٩٢% عـــن المقارنـــة (٥٠%) على التوالى. ،اعلى محصول ٣٠,٥، ٢٤,٨ أردب / فدان على التوالى فى حين المقارنة ١١,٤ أردب / فدان.

وأوضحت النتائج ان هناك ارتباط معنوى سالب بين المحصول ومظاهر الاصابة الحشرة على نباتات الذرة.