

**EFFECT OF CERTAIN BIO-AND CHEMICAL INSECTICIDES
ON THE POPULATIONS OF SUGARBEET FLY, *PEGOMYIA
MIXTA* VILL AND SUGARBEET BEETLE, *CASSIDA
VITTATA* DE VILLERS ATTACKING SUGARBEET.**

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ABSTRACT

This study was carried out during 2003/04 and 2004/05 sugarbeet seasons at Kafr El-Sheikh. Application of biocides, *Bacillus thuringiensis* var. *kurstaki* under the commercial name Dipel 2X, *Beauveria bassiana* Balsamo under the commercial name Biofly and chemical insecticide, Selecron reduced variably the populations of *Pegomyia mixta* and *Cassida vittata*.

Results showed that in 2003/04 and 2004/05 seasons, overall average reduction in *P. mixta* larval population due to Dipel 2X was 34.57 and 27.57 %, while due to Biofly was 38.00 and 38.57 % and that of Selecron was 91.86 and 100.00 %, respectively. Both Dipel 2X and Biofly, used as a biocide preparation were mainly effective after 7, 12 and 15 days from application against *P. mixta*.

In concern *C. vittata*, in the first and second seasons (2003/04 & 2004/05), overall average reduction in *C. vittata* larval and adult populations due to Dipel 2X was 23.71 and 26.29 %, while due to Biofly was 9.71 and 14.14 % and that of Selecron was 76.00 and 97.00 %, respectively. Preparation of Dipel 2X was efficient against *C. vittata*, but Biofly was inefficient against the insect.

INTRODUCTION

Sugarbeet, *Beta vulgaris* L. is one of two principle sugar crops and about 40 % of the world production and represents the second source, after sugar-cane. Sugarbeet plants attract numerous insect species during growing season, which cause economic loss in sugar yield (Bassyouny, 1993 and Mesbah, 2000).

The beet fly, *Pegomyia mixta* Vill (Muscidae-Diptera) and the tortoise beetle, *Cassida vittata* de Villers (Chrysomelidae-Coleoptera) are the most dangerous insects of sugarbeet plants (Cooke and Scott, 1993).

Traditionally, chemical pesticides are used for controlling all insect pests attacking sugarbeet crop in Egypt. In order to minimize the quantitative of chemical pesticides used for crop protection within the frame of the strategies in integrated pest management (IPM), biological control, especially microbial control, of insect pests became an important in such strategies as an effective alternative. Particularly the entomopathogenic bacterium, *Bacillus thuringiensis* (Berl.) and the fungus, *Beauveria bassiana* Bals. (Vuill.) as biological control agents against some sugarbeet insects under field conditions (Abo Aiana, 1991; El-Khouly, 1998; Mesbah et al 2004; Metwally et al 2004 and El-Husseini et al, 2008).

The present study was carried out under field conditions for evaluating the efficacy of the bacterium, *B. thuringiensis* (Dipel 2X) the fungus, *B. bassiana* (Biofly) and the chemical insecticide (Selecron) to control sugarbeet fly, *P. mixta* and sugarbeet beetle, *C. vittata*.

MATERIALS AND METHODS

The experiment was carried out at the experimental farm of the Faculty of Agriculture, Kafr El-Sheikh University, during the two successive seasons 2003/04 and 2004/05, in an area of about half feddan.

Efficacy of the two biocides and one insecticide were tested against both of sugar-beet insects, *P. mixta* and *C. vittata*. These were Dipel 2X (6.4 % WP, 3200IU) a bio preparation of *Bacillus thuringiensis* var. *Kurstaki*, Biofly (3×10^7 conidia/ml) a bio preparation of *Beauveria bassiana*, Selecron 72 % at the rate: 750 ml/fed. The experimental area was divided into 12 plots (4 treatments x 3 replications), in addition to the control plots.

Sugar beet variety, Farida, was sown on 10th December in both seasons of study, and all agricultural practices were followed without insecticides applications.

When sugar beet plants reached 4 months old, the plants were treated with the considered preparations. Dipel 2X at a rate of 400 g/fed, and Biofly at a rate of 300 ml/fed., and Selecron at rate 750 ml/fed., using CP3 Knapsal sprayer. The effect of the three preparations on the population of *P. mixta* (larvae) and *C. vittata* (larvae + adults) were evaluated.

The sugar beet plants were examined after 1, 2, 3, 5, 7, 12 and 15 days after treatments in each examination, 5 plants/plot were inspected to count the a life occurring insects. Population reductions due to treatments were calculated and compared with the insect numbers in untreated plots (control). Percentage of infestation reduction of such cases was estimated according to the formula of **Henderson and Tilton (1955)** as follows:

$$\text{Reduction \%} = 1 - \left(\frac{\text{Treatment after} \times \text{Control before}}{\text{Treatment before} \times \text{Control after}} \right) \times 100$$

RESULTS AND DISCUSSION

1. Sugarbeet fly, *P. mixta*

Application of the biocides, Dipel 2X, Biofly and the chemical insecticide Selecron reduced variably the population of sugar beet fly, *P. mixta*.

Results in **Table (1)** showed that during 2003/04 season, the overall average reduction in *P. mixta* larval population due to Dipel 2X was 34.57 %, while that due to Biofly was 38.00 % and that of Selecron was 91.86 %. The corresponding values of reduction for the three compounds in 2004/05 season were 27.57, 38.57 and 100.00 %, respectively.

Dipel 2X was more effective against *P. mixta* larvae 12 and 15 days after application (63 % and 67 % reduction) in the first season, wherese in the second one, most of insects were reduced 7, 12 and 15 days after application (34, 35 and 30 % reduction).

Table (1): Efficacy of *B. thuringiensis* (Dipel 2X) and *B. bassiana* (Biofly) biocides and the chemical insecticide Selecron for the control of sugar beet fly, *P. mixta* at Kafr El-Sheikh region in two successive seasons.

Treatments	% reduction of larval population in days after treatment														Overall average	
	2003/04							Overall average	2004/05							
	24 hrs	48 hrs	72 hrs	5 days	7 days	12 days	15 days		24 hrs	48 hrs	72 hrs	5 days	7 days	12 days		15 days
Dipel 2X (400 g/fed.)	16	29	31	16	20	63	67	34.57	10	25	30	29	34	35	30	27.57
Biofly (300 ml/fed.)	4	19	35	26	56	61	65	38.00	8	24	32	33	66	68	39	38.57
Selecron 72% (750 ml/fed)	66	100	98	100	100	93	86	91.86	100	100	100	100	100	100	100	100.00

In case of Biofly, it was effective against *P. mixta* 7, 12 and 15 days after application in the first season (56, 61 and 65 % reductions). And in the second season the percentages of reductions recorded 66.68 and 39.00 %, respectively.

Selecron was more effective against *P. mixta* larvae than the two biocides. The overall average of reduction in the larval population were 91.86 and 100 %, in seasons 2003/04 and 2004/05, respectively.

Generally, it could be concluded that Dipel 2X and Biofly, used as a biocide preparation were mainly effective 7, 12 and 15 days after application.

Results of the current study are in line with those of Mesbah *et al* (2004) they found that Dipel 2X (*B. thuringiensis* var. *Kurstaki*) eliminated 15.82 & 38.42 % of *P. mixta* in the first season (1998/99) and in the second one (1999/2000) Biofly preparation suppressed 6.53 & 35.53 % of *P. mixta* population in the first and second seasons, respectively. They stated that both Dipel 2X and Biofly were mainly effective as biocides preparations between 72 hr and 7 days after application. Shalaby (2001) stated that both Dipel 2X and Biofly were mainly effective as biocide preparations between 72 hr and 7 days after application for *P. mixta*. El-Husseini *et al* (2008) reported that *P. huscaami* was unaffected by spraying conidiospores of *B. bassiana* and poorly affected by dusting of *B. bassiana* conidia. They indicated that the larvae mine the leaves in closed tunnels and thus are protected from both sprayed and dusted conidiospores.

2. Sugarbeet beetle, *C. vittata*

Results in Table (2) showed that application of Dipel 2X, Biofly and Selecron variably reduced the population of sugar beet beetle *C. vittata*.

In the first season 2003/04, overall average reduction in *C. vittata* larval and adult population due to Dipel 2X was 23.71 %, due to Biofly was 9.71 % while that of Selecron was 76.00 %. The corresponding values of reduction for the three compounds in the second season were 26.29, 14.14 and 97.00 %, respectively.

Table (2): Efficacy of *B. thuringiensis* (Dipel 2X) and *B. bassiana* (Biofly) biocides and the chemical insecticide, Selecron for the control of sugar beet beetle, *C. vittata* at Kafr El-Sheikh region, in two successive seasons.

Treatments	% reduction of larvae and adults population in days after treatment														Overall averages	
	2003/04							Overall averages	2004/05							
	24 hrs	48 hrs	72 hrs	5 days	7 days	12 days	15 days		24 hrs	48 hrs	72 hrs	5 days	7 days	12 days		15 days
Dipel 2X (400 g/fed.)	15	11	32	15	26	35	32	23.71	12	22	26	34	30	55	5	26.29
Biofly (300 ml/fed.)	11	23	7	5	13	2	7	9.71	16	11	15	20	19	7	11	14.14
Selecron 72% (750 ml/fed)	65	72	79	88	100	79	49	76.00	91	95	98	99	100	100	96	97.00

Results showed that Dipel 2X was more effective against *C. vittata* 12 and 15 days after application (35 and 32 % reductions) in the first season, 2003/04. Whereas, in the second season 2004/05, most of insect population were killed 5, 7 and 12 days after application (34, 30 and 55 % reductions).

Biofly preparation was less efficient against *C. vittata* in both seasons (overall reduction 9.71 and 14.14 %, respectively). The highest mortality of *C. vittata* due to Biofly was 23 % during 48 hrs after application in the first season, while in the second one, 5, 7 days after application (20 and 19 % reductions).

In case of Selecron, *C. vittata* population had higher mortality in the second season (97.00 %) than in the first season (76.00 %). The majority of *C. vittata* population was killed in Selecron treatment during 48 hr, 72 hr, 5 days, 7 day and 12 days after application (72, 79, 88, 100 and 79 % reductions) in the first season.

Whereas, in the second one, Selecron was more efficient against *C. vittata* population in a period from 24 hr to 15 days after application.

From previous experiments, preparation of Dipel 2X was efficient against *C. vittata*, but Biofly was inefficient against the insect.

Our results are in agreement with those obtained by **Abo-Aiana (1991)** who indicated that preparation of *B. bassiana* was not efficient against tortoise beetle, *C. vittata*. He found that Selecron was the most effective insecticide for controlling the larvae and adults of *C. vittata* in sugarbeet fields. **El-Khouly (1998)** indicated that application of *B. thuringiensis* preparations reduced the infestation by *C. vittata*. **Mesbah et al (2004)** indicated that Dipel 2X reduced 27.78 and 19.01 % of *C. vittata* in the first and second seasons, respectively. As for biofly, the preparations suppressed 27.42 and 29.65 % of *C. vittata* population in the first and second season, respectively. They stated that both Dipel 2X and Biofly were mainly effective as biocide preparation between 72 hrs and 7 days. **El-Husseini et al (2008)** showed that insects which presented most of the time at the lower surface of the sugar beet leaves were poorly affected with spraying conidiospores of *B. bassiana* but highly reduced in case of dusting for *C. vittata*.

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الملخص العربى

تأثير بعض المبيدات الحيوية والكيميائية على حشرتى ذبابة البنجر وخنفساء البنجر التى تهاجم بنجر السكر

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أجرى هذا البحث فى المزرعة البحثية بكلية الزراعة - جامعة كفر الشيخ خلال موسمين متتاليين ٢٠٠٣/٢٠٠٤ و ٢٠٠٤/٢٠٠٥ بغرض دراسة تأثير المبيد الحيوى البكتيرى دايبيل 2X والمبيد الحيوى الفطرى بيوفلاى مقارنة بالمبيد الكيمايى سليكرون على تعداد حشرتى ذبابة البنجر وخنفساء البنجر فى حقول بنجر السكر.

وكانت أهم النتائج المتحصل عليها كالاتى:

١. ذبابة بنجر السكر *P. mixta*

أدت المعاملة بالمبيد الحيوى البكتيرى Dipel 2X مستحضر لبكتيريا (*Bacillus thuringiensis*)- والمبيد الحيوى الفطرى Biofly مستحضر للفطر (*Beauveria bassiana*) والمبيد الكيمايى سليكرون إلى خفض تعداد ذبابة البنجر بنسب مختلفة.

فى الموسم الأول ٢٠٠٣/٢٠٠٤ كان المتوسط العام لنسب الخفض لتعداد ذبابة البنجر (اليرقات) فى حالة المبيد الحيوى البكتيرى Dipel 2X (٣٤,٥٧%) وفى المبيد الحيوى الفطرى Biofly (٣٨,٠٠%) وفى المبيد الكيمايى سليكرون (٩١,٨٦%). بينما فى الموسم الثانى ٢٠٠٤/٢٠٠٥ كانت نسب الخفض المناظرة كالاتى ٢٧,٥٧% ، ٣٨,٥٧% ، ١٠٠,٠٠% على التوالى.

ويمكن استخدام المبيد الحيوى البكتيرى والفطرى بكفاءة بعد ٧ ، ١٢ ، ١٥ يوم من المعاملة بالرش ضد ذبابة البنجر.

٢.٧. خنفساء البنجر *C. vittata*

أدت المعاملة بالمبيد الحيوى البكتيرى Dipel 2X - المبيد الحيوى الفطرى Biofly والمبيد الكيمايى سليكرون إلى خفض تعداد خنفساء البنجر بنسب مختلفة.

ففى الموسم الأول ٢٠٠٣/٢٠٠٤ كان المتوسط العام لنسب الخفض لتعداد خنفساء البنجر (اليرقات + الحشرة الكاملة) فى المعاملة بالمبيد الحيوى البكتيرى (٢٣,٧١ %) وفى المبيد الحيوى الفطرى ٩,٧١ % بينما فى المبيد الكيمىائى سليكرون (٧٦,٠٠ %).

وفى الموسم الثانى ٢٠٠٤/٢٠٠٥ كانت قيم الخفض المناظرة كالاتى: ٢٦,٢٩ ، ١٤,١٤ و ٩٧,٠٠ % على التوالى. وأظهر المستحضر الحيوى الفطرى Biofly كفاءة أقل ضد خنفساء البنجر فى كلا الموسمين، بينما كان المستحضر البكتيرى دايبيل 2X أكثر كفاءة ضد نفس الحشرة.