

EFFECT OF DIFLUBENZURON AGAINST THE BERSEEM GRASSHOPPER *Euprepocnemis Plorans Plorans* (Charp.) (Order: Orthoptera: Fam: Acrididae)

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ABSTRACT

The effect of the anti-moulting agent diflubenzuron were studied against the nymphal instars Berseem Grasshopper *Euprepocnemis Plorans Plorans* (Charp) .The tested rates of 40 / 20 / 10 gm. a.i /fed. were sprayed on alfa alfa *Medicago sativa*. Groups of 4th instar nymphs were continuously fed on the treated alfa alfa to the next moult to 5th instar. This treatment induced low percentages of failure in ecdysis to the 5th instar. The high percentages of failure in ecdysis and mortality were obtained within the 5th instar especially during metamorphosis to the adult stage . The prolonged duration of the treated 4th instar and the decreasing of the body weight of the resulting 5th nymphs and the corresponding adults, specially in the treatment with the high rate (40 gm.a.i/fed.) suggested that. Diflubenzuron was a rate dependent against grass hopper *E. Plorans Plorans*, and this compound could be a good preventive control tool against the nymphal instars of this insect pest in their breeding sites.

INTRODUCTION

Grasshoppers have become a serious pest in Egypt especially in the newly reclaimed area (EL-Garhy *et al*, 1988). The most economic species that caused a serious damage is the Berseem grasshopper, *E. Plorans Plorans* . This species caused 95% damage to planted crops of the Nile Delta (Nakhla, 1957) and (Abdel-Fattah, 2002). Existing control strategies depend on chemical insecticide to prevent damage to vegetation and these methods, though often effective, but not always appropriate. Effective alternative that offer improved safety could have repaid as favorable environmental and economic impact.

IGRs are substances that adversely affect insect growth and development, they effect on certain physiological regulatory processes essential to the normal development of insects or their progeny. The chitin synthesis inhibitors (CSIs) are usually classified in the IGRs because they are selectively suppress the growth and development of larvae and prohibit some reproductive potentials of adults. These compounds have a specific mode of action on insects and a lower toxicity against vertebrates than conventional insecticides (Gupta and Verma, 1992; Grenier and Grenier, 1993).

Elliot and Lyer, (1982) found that, the nymphal instar of grasshopper *Melanoplus sanguinipes* (Stap) were very sensitive to diflubenzuron. No stable layer of cuticle was deposit in the adult cuticle of *Schistocerca gregaria* (Forsk) and *Locusta migratoria* L., after treatment with diflubenzuron (Kerr, 1977). So, this compound induced high percentages of failure in ecdysis to

the last instar when given to the 4th instar nymphs of *S. gregaria* (EL-Gammal and Taha,1984).

Seyoum (2001) studied a disruption of the lamellae pattern in the cuticle of diflubenzuron – treated nymphs *S. gregaria* . Also, Santiago – Alvarez and Quesada–Morga (2002) stated that , there is no difference in response of male and female nymphs of the locust, *Docostaurus maroccanus* (Thunberg) to diflubenzuron, and the increase in mortality related to its rate of application . The duration of 5th instar nymphs was high in the treated once, compared to the control.

In the present study the anti–moulting effects of diflubenzuron were tested against the 4th nymphal instar of *E. Plorans Plorans* which were continuously fed on sprayed alfalfa with different doses of this compound under field conditions.

MATERIALS AND METHODS

The efficiency of the anti–moulting agent diflubenzuron (1 - 4 - chlorophenyl)- 3 - (2- 6 - diflubenzyl) urea (ODC - 45) was evaluated against the 4th nymphal instar of *E. Plorans Plorans* under semi field condition. diflubenzuron was used at three rates (40 , 20, 10 gm. a.i./fed), each rate was sprayed into 120 square meters, each plot was planted with alfalfa, another plot was sprayed with diesel oil as an untreated control plot. An ULVA 3 spinning disk was used to spray the treated plots. Three groups of *E. Plorans Plorans* 4th instar 0-1 day after moulting 20 nymphs each, were fed daily on treated clover of each diflubenzuron rate, as well as control plot, feeding on treated clover continued till the next moult then feed on untreated clover.

Both mortality and failure to ecdysis were recorded daily. Also fresh nymphal weights and duration of 4th and 5th nymphal instar were recorded. Another three groups each ten 4th nymphal instar individuals were fed on each treated clover plot as previous those nymphs were kept to calculate the cuticle dry weight and to determine the % of chitin inhibition, cuticle dry weight was determined as described by Al-Mokhlef *et, al.*(2012) while chitin was determined according to Hackman and Goldberg (1971). Percentage of chitin and cuticle inhibition was calculated according to the equation:

$$\% \text{ inhibition} = (a - b) / b \times 100$$

Where : a= chitin or cuticle content in treated nymphs

b= chitin or cuticle content untreated nymphs

RESULTS AND DISCUSSIONS

The biological activity of the anti – chitin synthesis compound diflubenzuron was evaluated on 4th instar nymphs with different rates sprayed on alfalfa plants under field conditions. Groups of *E. Plorans Plorans* nymphs were continuously fed on the treated plants up to the next moult.

After ward the produced 5th instars nymphs and the corresponding adults were fed on untreated clover plants.

Table (1) shows that diflubenzuron in treated induced low percentages of mortality and failure in ecdysis to 5th instar. The percentages of mortality and failure in ecdysis were directly related to diflubenzuron doses.

The mortality percentages in related 4th nymphs were 10.4, 7.6, 6.5 for the rates 40, 20, 10 gm.a.i./ fed, respectively. Failure in ecdysis to 5th instar were 10.1, 9.5, 5.2 for the same rates, respectively. High percentages of the produced 5th instar nymphs were failed in ecdysis to the adult stages during metamorphosis. The tested three rates produced 70.2, 68.5, 63.1 percent of failure in ecdysis of the adults stages, respectively. These 5th instar nymphs were died exuviate. Their mortality percentages were 91.7, 85.6, 74.8 for each rate, respectively. Low percentages of malformed adults were produced, the percentages were 8.3, 14.2 and 25.2% for each tested rate, respectively.

Table (1): Effect of the Anti – moulting agent diflubenzuron on the nymphal stage of *E. Plorans Plorans*

Rates g. a. i/Fed	No. of treated nymphs	4 th instar		%failure in last ecdysis	%total mortality	% malformed adults
		% mortality	% Failure			
40	48	10.4	10.1	70.2	91.7	8.3
20	54	7.6	9.5	68.5	85.6	14.4
10	45	6.5	5.2	63.1	74.8	25.2
control	50	1.3	0.0	0.0	1.3	0.0

Also, the duration of the treated 4th instar and the corresponding 5th instar nymphs were studied after feeding on the treated alfa alfa by the tested rate of diflubenzuron 40, 20, and 10 gm. a. i./ fed. Results in Table (2) indicated a prolongation in the two stadium, these duration were 10.5, 12.3, 11.8 days in the treat 4th nymphal instar for each rate respectively compared to 6.2 days in the control groups. The durations of the produced 5th instar nymphs were slightly affected only with the high rates 40 and 20, they were 12.7 and 11,5 days respectively, compared 9.4 for untreated control.

Table (2):Effect of the Anti – moulting agent diflubenzuron on the duration of 4th and 5th nymphal instars of *E. Plorans Plorans*

Rates g. a. i/Fed	4th nymphal instar *	5th nymphal instar *
40	12.3 a	12.7 a
20	11.8 a	11,5 a
10	10.5 b	10.9 ab
control	6.2 c	9.4 b

*Duration in days, means followed by same letter are not significantly differ.

The obtain results illustrated in Figure (1) revealed that inhibition of chitin synthesis in treated nymphs was 64.7, 47.17 and 5.5 % for each tested

rate 40, 20, 10 gm.a.i. / fed respectively. These results suggested that the biological effects of diflubenzuron were dose dependent effects of diflubenzuron against the nymphal of *E. Plorans Plorans*

The obtained results in the present study coincide with several other studies such as Santiago and Quesada (2002) who found that the response of the nymphal instars of the locust *Docioستاurs marocamus* increase in mortality occurring from moulting to 5th instar was directly related in diflubenzuron rate. Also Seyoum (2001) observed disruption of the lamellae pattern in the cuticle of diflubenzuron 4th instar nymphs.

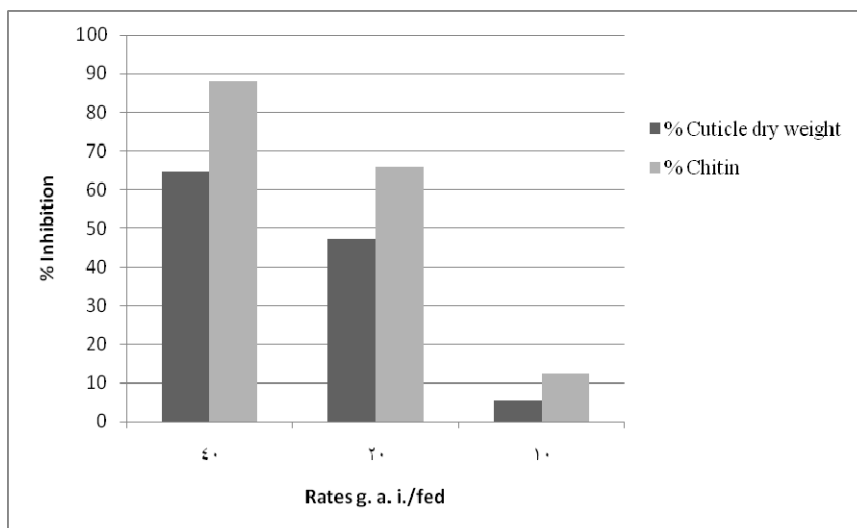


Figure (1) : Inhibition percentage in cuticle dry weight and chitin content in 5th instar in *E. Plorans Plorans* treated with Diflubenzuron

REFERNCES

- Abdel-Fattah, T. A. (2002): Toxicological effects of certain entomopathogenic fungi on the grasshopper, *Euprepocnemis Plorans Plorans* (Charp.) Ph. D. Thesis, Plant Pro. Dep. Faculty Of Agriculture, Zagazig University.
- Al-Mokhlef, A.A., F.M.Mariy., A.K.Emam. and Gehan, A.M (2012): Effect of teflubenzuton on ultrastructure and components of the integument in *Schistocerca gregaria* (Forsk.) 5th instar nymphs
- El-Garhy, M.S., El-Sayed and M. F. Harb (1988): Insecticidal efficiency of certain toxicants against desert locust and grasshopper insects on potted maize . Agriculture Developmental Research Ain Shams University, Proc. 2th Con : 170-177.
- El-Gammal, A.M. and M.A. Taha (1984): The morphogenetic effects of diflubenzuron on the desert locust, *Schistocerca gregaria* (forsk). J.Fac. of Educat, Ain-Shams Univ. 11:275-286.

- Elliot , R.H. and R. Lyer (1982): Toxicity of diflubenzuron to nymphs of the migratory grasshopper, *Melanoplus sanguips* (Orthoptera: Acridae). Cam. Entomol. 10, 114: 479-484.
- Grenier, S. and Grenier, A.M. (1993): Fenoxycarb, a fairly new insect growth regulator. A review of its effects on insects. Ann. Appl. Biol. 122, 369–403.
- Gupta, D. and Verma, A.K. (1992): Effect of three benzoylphenyl urea compounds on larvae of rice moth, *Corcyra cephalonica* (Stainton). Indian J. Plant Protec. 20, 174–177.
- Hackman, R.H. and Goldberg, M., (1971): Studies on the hardening and darkening of insect cuticles. J. Insect Physiol. 17 (2), 335–347.
- Kerr, R.F. (1977): Investigation of insect cuticle using the insecticide diflubenzuron . J. Insect. Phsiol.23:39-48.
- Nakhla , N.B. (1957): The life history ,habits and control of the berseem grasshopper *E.Plrans Plorans* Charp, in Egypt. Bull. Ent. Soc.Egypt, xli. 421-427.
- Santiago – Alvarez , C. and E.Quesada – Morgan (2002): Laboratory evaluation of acute and chronic toxicity of diflubenzuron against 5th instar Mediterranean locust, *Dociostarus maroccanus* (Thunberg). Entomological 36: 147 – 155.
- Seyoum, E. (2001): The synergistic effects of *metarhizium anisopliae* with the acyl urea insecticide teflubenzuron and diflubensuron for *Schistocerca gregaria* (Orthoptera:Acrididae). Sinet, Ethiopian, J.Scince, 1:113-125.

تأثير مانع الأنسلاخ دايفلوبنزيرون ضد نشاط البرسيم العادى (رتبة مستقيمة الأجنحة، فصيلة الجراد والنطاطات ذات القرون القصيرة)

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تم دراسة تأثير مانع الأنسلاخ دايفلوبنزيرون ضد الطور الحورى لنطاط البرسيم العادى وذلك برش ثلاثة معدلات من هذا المركب وهى ٤٠، ٢٠، ١٠ جرام مادة فعالة / فدان على نباتات البرسيم تحت الظروف الحقلية، وتم تغذية حوريات العمر الرابع على النباتات المعاملة حتى إنسلاخها إلى العمر الخامس.

وتم تقييم تأثيرات هذه المعاملة على نسبة الموت ، نسبة الفشل فى الإنسلاخ، وطول العمر والنمو الجسمى للعمر الحورى وكذلك تقدير نسبة التثبيط للكيوتيكل حيث أحدثت الجرعات الثلاثة نسب منخفضة من الفشل والموت أثناء الأنسلاخ إلى العمر الحورى الخامس.

وقد أدت المعاملة إلى زيادة فترة العمر الحورى الرابع والخامس عن الحوريات غير المعاملة كما أن النمو الجسمى قد أنخفض خلال العمر الحورى الخامس وخاصة التى عوملت بالمعدل المرتفع حيث أحدثت تثبيط للكيوتيكل مقارنة بالحشرات الغير معاملة وذلك يوضح أن تأثير هذا المركب يعتمد على المعدلات المستخدمة منه، ولذا يمكن استخدام كوسيلة للمكافحة الوقائية ضد الأطوار الحورية لهذه الأفة.