EVALUATION OF THE ANTI - MOULTING ACTION OF TEFLUBENZURON (CME) ON *SCHISTOCERCA GREGARIA* (FORSK.)

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Abstract

The anti - chitin synthesis action of the urea derivative compound, teflubenzuron (CME) was tested against the last nymphal instars of *Schistocerca gregaria* by leaf dipping technique . Fresh leaves of *Sesbania aegyptiaca* were dipped in different concentrations of 200, 100, 75, 50, 37.5 , 25, 18.7, 12.5 , 9.3, 4.6, and 2.3 ppm from CME then offered to 4th and 5th instar nymphs for one day. The treatments prolonged the stage of the treated instars and a positive correlation between concentrations and failure in ecdysis to the next instar was observed. The percentages of failure in ecdysis to 5th instar female nymphs ranged from 56.7 to 20 while were 73.3 to 43.3 during ecdysis to 5th instar male nymphs.

Failure in ecdysis to adult females ranged from 90 to 46.7% while ranged from 53.3 to 13.3 % during ecdysis to adult males.

INTRODUCTION

Mulder and Gijiswigt (1973) showed that the death caused by diflubenzuron was a result of the rupture of the newly formed cuticle in treated insects. Ker (1977) found that no stable layer of cuticle was deposited in the pharate adult cutic-

le of *Schistocerca gregaria* and *Locusta migratoria* after treatment with diflubenzuron which is known to interfere with chitin formation. El Gammal and Taha (1984) and Taha and El - Gammal (1985) found that diflubenzuron induced high percentage of failure in ecdysis to the last instar when given to the fourth instar of *S. gregaria.*

The present study deals with the morphogenetic effects of another anti-chitin synthesis compound, teflubenzuron (CME) against the last nymphal instar of *S. gregaria.*

MATERIALS AND METHODS

The stock colony of *Schistocerca gregaria* (Forsk.) was maintained under the crowded conditions of Hunter - Jones (1961) in the Locust Research Section, Plant protection Research Institute, Dokki, Egypt.

The newly moulted 3rd instar nymphs were segregated then kept in 30x 30x 30x cm wooden cages. The cages were cheked daily to select the newly moulted 4th and 5th instar nymphs for chemical treatment.

Leaves of *Sesbania aegyptiaca* plants were dipped in various aqueous concentrations of teflubenzuron 15% S. C. (1- (3, 5-dichloro - 2, 4- diflurophenyl)-3- (2,6 - diflurobenzol) - urea . The treated leaves were allowed to dry then offered for one day to 1 - day old 4th and 5th instar nymphs. Food was renewed and the nymphs were observed daily for toxic symptoms, injury and mortality. The concentrations used were, 200 , 100 , 75 , 50, 37.5, 25, 18.7, 12.5, 9.3, 4.6, and 2.3 ppm.

Fourth and fifth instar nymphs were treated with the above mentioned concentrations by feeding for 24h on the treated leaves during the first day of their life. The anti-moulting action was observed at the next moult. The percentages of failure in ecdysis and mortality were estimated based on the whole number of treated nymphs, their duration was calculated by Dembester's equation (1957).

RESULTS AND DISCUSSION

Table 1 shows the effects of different concentrations on females and males of 4th instar. nymphs. The 4th instar duration of both sexes was prolonged by all the concentrations . There was a positive correlation between concentrations and failure in ecdysis. Percentages of failure in ecdysis were 56.7 , 53.3, 50.5, 46.7, 43.3, 43.3, 36.7, 33.3, 30.0, 26.7, and 20.0 for 4th instar female nymphs for each dose, respectively. On the other hand , these percentages were , 73.3 , 70.0, 70.0, 63.3, 63.3, 60.0, 60.0, 53.3, 53.3, 50.0, and 43.3 for 4th instar male nymphs , respectively . All affected nymphs were unable to shed their exuviae and died.

Table 2 demonstrates the action of the same concentrations against 5th instar female and male nymphs. The female numphs were more sensitive to teflubenzuron than the males, the prolongation in their life and percentages of failure in ecdysis were higher than with males. The duration of the 5th instar female nymphs were 16.8 , 16.3, 16, 12.3 , 13.5, 12.0, 16.0, 14.8, 13.0 and 12.6 days for each concentration , respectively , whereas the duration of the untreated nymphs lasted 11.7 days. The duration of the treated 5th instar males were 13.0, 13.0, 13.8, 13.5, 13.6, 13.0, 12.0, 12.5, 12.7, 12.0, and 12.0 days for each dose, respectively compared with 11.2 days in the control (Table 2) . On the other hand, the concentrations of 200, 100, 75, 50, 37.5, 25, 18.7, 12.5, 9.3, 4.6, and 2.3 ppm of teflubenzuron (CME) induced 90.0 , 83.3 , 83.3 , 80.0. 76.7, 73.3, 73.3, 70.0 63.3, 56.7 and 46.7 percentages of failure in ecdysis to the adult female, respectively. The treated 5th instar male nymphs exhibited 56.7, 53.3, 53.3, 50.0, 46.7, 46.7, 40.0, 40.0, 36.7, 26.7 and 13.3 percentages of failure to the adult stage, repectively.

It is concluded that the female 5th instar nymphs were more sensitive than the males, and all the affected nymphs died in their old cuticle (Fig. 1).

The findings of the present study go in line with several srudies on the effects of benzoylphenyl ureas in inhibiting chitin synthesis in insects. Miyamoto *et al.* (1983) found five possible modes of action of these compounds . Potent metabolism, disruption of accessibility of substrate removal of inhibitory UDP, inhibition of proteolytic activity required for activation of presumed zymogenic chitin synthesis and interference with a delicate and sensitive control mechanism of chitin synthetase activity. Retnakaran *et al.* (1985) reported that diflubenzuron interferes with the moulting process by inhibiting the biosynthesis of chitin .

Table 1. Effect of teflubenzuron (CME) against the 4th instar nymphs of *S. gregaria.*

Concentration ppm	4th instar female nymphs			4th instar fmale nymphs		
	%failure in ecdysis	Duration in days	% perfect 5th instar	%failure in ecdysis	Duration in days	% perfect 5th instar
200 (30)	56.7 (17)	8.6	43.3 (13)	73.3 (22)	7.31	26.7 (8)
100 (30)	53.3 (16)	8.5	46.7 (14)	70.0 (21)	8.20	30.0 (9)
75 (30)	50.0 (15)	9.23	50.0 (15)	70.0 (21)	8.47	30.0 (9)
50 (30)	46.7 (14)	9.00	53.0 (16)	63.3 (19)	7.10	36.7 (11)
37.5 (30)	43.3 (13)	7.10	56.7 (17)	63.3 (19)	8.00	36.7 (11)
25 (30)	43.3 (13)	7.55	56.7 (17)	60.0 (18)	8.80	40.0 (12)
18.7 (30)	36.7 (11)	9.38	63.3 (19)	60.0 (18)	8.60	40.0 (12)
12.5 (30)	33.3 (10)	7.50	66.7 (20)	53.3 (16)	7.00	46.7 (14)
9.3 (30)	30.0 (9)	9.50	70.0 (21)	53.3 (16)	8.80	46.7 (14)
4.6 (30)	26.7 (8)	9.30	73.3 (22)	50.0 (15)	8.70	50.0 (15)
2.3 (30)	20.0 (6)	7.20	80.0 (24)	43.3 (13)	8.09	56.7 (17)
Control(20)	0.00	4.55	100.0	0.00	4.50	100.0

- Each treatment was repeated three times with 10 nymphs per each replicate.
- The numbers in parentheses indicate the resulting numbers of treated nymphs per each concentration.
- The duration was calculated by Dembster's equation(1957)

Table 2. Effect of teflubenzuron (CME) against the 5th instar nymphs of *S. gregaria.*

Cpncent-ration PPm	5th instar female nymphs			5th instar fmale nymphs		
	%failure in ecdysis	Duration in days	% perfect adults	%failure in ecdysis	Duration in days	% perfect adults
200 (30)	90.0 (27)	16.8	10.0 (3)	56.7 (17)	13.0	43.3 (17)
100 (30)	83.3 (25)	16.3	16.7 (5)	53.3 (16)	13.0	46.7 (14)
75 (30)	83.3 (25)	16.5	16.7 (5)	53.3 (16)	13.8	46.7 (14)
50 (30)	80.0 (24)	16.0	20.0 (6)	50.3 (15)	13.5	50.0 (15)
37.5 (30)	76.7 (23)	12.3	23.3 (7)	46.7 (14)	13.6	53.3 (16)
25 (30)	73.3 (22)	13.5	26.7 (8)	46.7 (14)	13.0	53.3 (16)
18.7 (30)	73.3 (22)	12.0	26.7 (8)	40.0 (12)	12.0	60.0 (18)
12.5 (30)	70.0 (21)	16.0	30.0 (9)	40.0 (12)	12.5	60.0 (18)
9.3 (30)	63.3 (19)	14.8	36.7 (11)	36.7 (11)	12.70	63.3 (14)
4.6 (30)	56.7 (17)	13.0	43.3 (13)	26.71 (8)	12.0	73.3 (22)
2.3 (30)	46.7 (14)	12.6	53.3 (16)	31.3 (4)	12.0	86.7 (26)
Control(30)	0.00	11.7	100.0	0.00	11.2	100.0

- Each treatment was repeated three times with 10 nymphs per each replicate.
- The numbers in parentheses indicate the resulting numbers of treated nymphs per each concentration.
- The duration was calculated by Dembster's equation(1957).

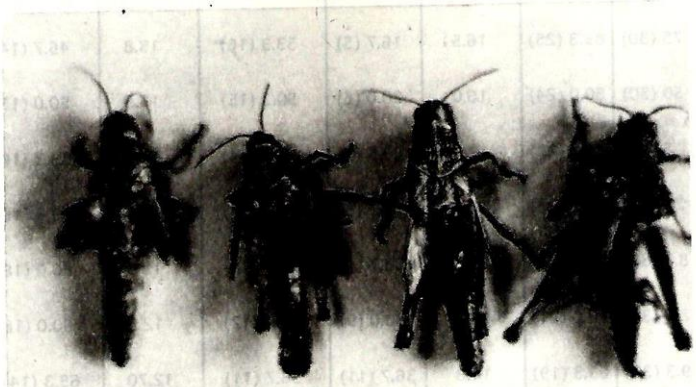

Fig 1. Failure in last ecdysis as a result of anti-chitin synthesis (CME) application against 5th instar nymphs.

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تقييم فعل مضاد تخليق الكيتين تفلوبنزيرون (CME) علي الجراد الصحراوي

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تم اختبار فعل أحد مشتقات اليوريا والمضاد لتخليق الكيتين (CMF) في الحشرات ضد حوريات العمرين الأخيرين للجراد الصحراوي بواسطة معامله الغذاء المقدم لهذه الحوريات خلال اليوم الأول ، حيث غمرت اوراق السيسبان في تركيزات مختلفه من هذا المركب وهي ٢٠٠، ١٠٠، ٥٠، ٢٧,٥، ١٨ ، ٧,٢٥ ، ١٢,٥، ٩,٣، ٤,٦، ٢,٣، جزء في المليون وقدمت هذه الأوراق بعد جفافها الي حوريات العمر الرابع والخامس كل علي حدة لمدة ٢٤ ساعة فقط.

أدت هذه المعامله الي اطاله العمر المعامل بصوره واضحه وكذلك أظهرت ارتباطا واضحا بين تأثير هذا المركب وتركيزه المستعمل حيث تراوحت نسب الفشل في انسلاخ إناث حوريات العمر الرابع الي العمر الخامس من ٥٦,٧ الي ٢٠٪ بينما تراوحت من ٧٣,٣ الي ٤٣,٣ ٪ للذكور .

ولقد تراوحت نسب الفشل في الانسلاخ الي الحشرات الكامله بعد معامله حوريات العمر الخامس ما بين ٩٠ – ٤٦,٧ ٪ للأناث، ٥٣,٣ الي ١٣,٣٪ للذكور

اوضحت هذه النتائج أن ذكور حوريات العمر الرابع واناث حوريات العمر الخامس اكثر حساسيه لهذا المركب.