LATENT EFFECT OF INSECT GROWTH REGULATORS AGAINST THE RICE - MOTH *CORCYRA CEPHALONICA* (STNT.) (LEPIDOPTERA-GALLERIIDAE).

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Abstract

Single- pair crosses and their recipocals were set up by moths produced from larvae treated at various concentrations with the insect growth regulators IKI- 7899 and S - 31183.

The following biological activites were sutdied : mean number of eggs/ female, percent hatchability, and longevity of males and females .

The results revealed that IKI- 7899 significantly decreased the mean number of eggs prouced by crosses originating from treated larvae. Percent hatchability was affected, and sterility occurred. High concentration of IKI-7899 affected the longevity of males and females in the cross (♀T x ♂T) followed by (♀U x ♂T), then (♀ T x ♂ U).

The high doses of S-31183 significantyl decreased the mean number of eggs / female produced by the cross (♀U x ♂T) Percent hatchability was affected in all the crosses. The lowest hatchability was achieven with (♀U x ♂T) originating from laravae treated with the highest dose (0.008 ug / ul) . The highest percent sterility was observed in the cross (♀U x ♂T) originating from the same tratment . The longevity of adult males was affected in the crosses (♀U x ♂T) at the dose of 0.04 ug/ul ,(♀U x ♂T) at the dose 0.008 ug/ul and (♀T x ♂T) at the same dose. The longevity of the female was not affected by pre - treatment of larvae at all the doses used.

INTRODUCTION

Insect growth regulators (IGRs) with juvenile hormone activity cause a

disruption in normal life processes of some insects resulting in arrested development, suppression of reproduction or lethal morphogenetic effeects. Their relative safety in terms of toxic effects to man and the environment make them potentially useful as a grain protectants for many stored grain pests. Their use against these pests had been reported by Bhatnagar - Thomas (1972 & 1973), Strong and Diekman (1973), Hoppe (1975), David (1979) and Lal and Mulla (1983). Reported here are the latent effects of IKI - 7899 and S - 31183 on fecundity and egg hatchability of *Corcyra cephalonica* (Stnt.) under laboratory conditions.

MATERIALS AND METHODS

The original colony of the rice moth *corcyra cephalonica* was maintained in the laboratory at 28±2 ^{o}C and 60 - 70% R.H.

Adequate number of males and females of rice moth were placed in one litre capacity lantern glasses as mating cages covered with muslin and having a bottom of glazed paper fixed with rubber bands. The cages were kept in the incubator. The eggs were collected daily from the paper introduced into a rearing media in clean glass jars that were kept in the incubator to supply the last instar larvae on request. The last instar larvae were obtained by placing rolls of corrugated papers in the jars. The corrugated papers containing larvae were removed after 35 days for larval treatment .

Appropriate concentrations of the two IGRs were prepared in acetone solutions and topically applied in one ul droplet to the dorsal thoracic region of larvae by a micrometer- driven syringe . The doses 0.01, 0.02 and 0.04 ug/ul were used for IKI - 7899 while the doses 0.002 and 0.008 ug/ul were used for S-31183.

A large number of last instar larvae of *C. cephalonica* was treated topically with these concentrations. Each group was placed in clean jars , containing sterile wheat flour and covered with a piece of muslin secured in position by a rubber band . The jars were placed in the incubator , and observed daily for moth emergence. The emerged moths were taken every morning to ensure that only virgin females were used for the experiment . The following single - pair matings were set up:

Untreated male x Untreated female, Untreated male x Treated female, Treat-

ed male x Untreated female and Treated male x Treated female. Ten replicates were made for each cross.

Each single - pair was placed in a plastic vial (3.5cm x 10 cm) covered with a piece of netting colth secured in position by a rubber band . The cage was held upside down on a plastic sheet so the female can lay the eggs through the netting material into the cover. Egg number was recorded daily, the obtained eggs wee incubated for three days , then examined under a binocular microscope. The percentage of hatching for each group was recorded daily.

The longevity of males and females was recorded for each replicate and at each dose. Percentage sterility of females was caluclated according to the following equation : Percentage sterility = $100 - (\frac{ab}{AB} \times 100)$

were:

a = Mean number of eggs laid per female in treatment.

b = Percent mean hatch in treatment.

A = Means number of eggs laid per female in control.

B = Percent mean hatch in control.

RESULTS AND DISCUSSION

Last instar larvae of *C. cephalonica* were treated with various concentrations and the resulting adult moths were separated in single pairs representing different sex combinations.

The crosses were put under observation for fecundity , egg hatchability and longevity of males and females.

Results of single pair corsses after treatment with IKI-7899 are presented in Table 1. Three doses were used for larval treatment (0.01 , 0.02 and 0.04 ug/ul).

Data in Table 1 show that at the treatment 0.01 ug/ul, the average number of eggs of the crosses (φ U x δ T) , (φ T x δ U) and (φ T x δ T) were 165.6, 174.6 and 67, tespectively . The average number of eggs for the control cross (φUxδU) was

Table 1. Effect of IKI 7899 on the reproduction potential of *C. cephalonica* females produced from treated larvae.

Dose ug/ul	Sex combinations	Mean no. of eggs / female	Hatching %	Sterility %
0.01	T ♀ x T ♂	67.0	38.69	84.8
	T ♀ x U ♂	174.6	60.27	38.2
	U ♀ x T ♂	165.6	40.89	60.25
0.02	T ♀ x T ♂	31.5	30.09	94.4
	T ♀ x U ♂	114.1	59.01	60.5
	U ♀ x T ♂	175.6	42.49	56.18
0.04	T ♀ x T ♂	93.5	28.7	84.2
	T ♀ x U ♂	196.7	28.26	67.4
	U ♀ x T ♂	184.2	22.6	57.6
Control	U ♀ x U ♂	192	88.4	

192.6 eggs.

As a result of larval treatment with 0.02 ug/ul, the corresponding values were 175.6, 114.1 and 31.5, respectively. Larval treatment at 0.04 ug/ul resulted in 184.2 196.7, and 93.5 eggs, respectively.

Statistical analysis of the results of the various reciprocal crosses showed four cases that singificantly affected oriposition. These were (♀ T x ♂ T) at the dose 0.02 Ug/ul, (♀ T x ♂ T) at the dose 0.01 ug/ul , (♀ T x ♂ U) at the dose 0.02 ug/ul then (♀ T x ♂ T) at the dose 0.04 ug/ul. As demonstrated in Table 1, treatment of larvae at 0.01 ug/ul resulted in percentage hatching of 10.89 , 60.27 and 38.69 for eggs obtained from the crosses (U ♀ x T ♂) (♀ T x ♂ U) and (♀ T x ♂ T) , respectively. The percent hatching for eggs obtained from the control (♀ U x ♂ U) was 88.4 % . Larval treatment at 0.02 ug/ul resulted in percent hatching of 22.6 , 28.26 and 28.7% , respectively . It is evident that larval treatment resulted in reduction of hatchability at all doses used .

The highest level of sterility was abtained with the cross T♀ x T♂ at the dose 0.02 ug/ul (94.4%) followed by the cross T ♀ x T ♂ at the dose 0.01 ug/ul . Asimilar level of sterility was also indicated with the same cross at the higher dose 0.04 ug/ul (Table 1).

It was also observed that some larvae died inside the egg shell at the higher dose. This type of failure was among the eggs obtained from crosses between treated parents or between treated females crossed with normal males.

As for male adult longevity, the longest was obtained with the cross ♀T x ♂U (4.9 days) at the concentrations 0.01 and 0.04mg/ul. . This longevity was nearly similar to that of the control (Table 2) . The male longevity decreased to 3.1 , 3.8 and 3.8 days with the cross ♀T x ♂T at the concentrations 0.04 , 0.01 and 0.02 ug/

Table 2. Effect of treating the last instar larvae of *C. cephalonica* with IKI - 7899 on the longeyity of the resulting male moths.

Dose ug/ul	Average			
	♀U x ♂T	♀T x ♂U	♀T x ♂T	♀T x ♂U
0.01	4.0	4.9	3.8	—
0.02	4.5	4.0	3.8	—
0.04	3.2	4.9	3.1	—
Control				4.7

ul, respectively (Table 2).

The Lowest mean of female longevity in days was 2.7 for the cross ♀ T x ♂T at the highest concentration 0.04 ug/ul . The means reached 3.6 with the concentrations 0.01 and 0.02ug/ul . Treatment of male only increased female longevity to 5.8 and 5 days with the concentrations 0.02 and 0.04mg/ml, respectively . Female lon-

Table 3. Effect of treating the last instar larvae of *C. cephalonica* with IKI - 7899 on the longevity of the resulting female moths.

Dose ug/ul	Average			
	♀U x ♂T	♀T x ♂U	♀T x ♂T	♀T x ♂U
0.01	4.5	5.3	3.6	—
0.02	5.8	3.7	3.6	—
0.04	5.0	2.8	2.7	—
Control				4.5

gevity with the lowest concentrations was similar to that of the control. With the cross ♀ T x ♂ U, the highest concentration apparently reduced the longevity of the female adult in a manner similar to that obtained with the ercipracol cross. A similar pattern was also observed with the concentration 0.02 ug/ul (Table 3).

The effect of S-31183 on the reproduction of *C. cephaloica* females resulting from treated larvae is shown in table 4. The highest percentage sterility (99.50%) obtained was with the cross ♀ U x ♂ T at the concentration 0.008 ug/ul. A 95. 30% sterility was also obtained when the female was treated at the larval stage with the same concentration. At the lower concentration 0.004 ug/ul, 75.30 and 62.50% sterility were obtained with the crosses ♀ T x ♂ U and ♀ U x ♂ T , respectively. The other levels of sterility ranged between 48.05 to 19.07% with the other crosses

Table 4. Effect of S - 31138 on the reproduction potential of *C. cephalonica* females produced from treated larvae.

Dose ug/ul	Sex combinations	Mean no. of eggs / female	Hatching %	Sterility %
0.002	♀ T x ♂ T	249.6	55.4	19.07
	♀ T x ♂ U	217.8	54.5	30.50
	♀ U x ♂ T	234.0	55.9	23.40
0.004	♀ T x ♂ U	195.8	21.57	75.30
	♀ T x ♂ U	218.2	56.15	28.29
	♀ U x ♂ T	151.9	42.13	62.50
0.008	♀ T x ♂ U	204.9	3.88	95.30
	♀ T x ♂ U	161.3	55.03	48.05
	♀ U x ♂ T	20.07	4.14	99.50
Control		226.2	75.54	

Table 5. Effect of treating the last instar larvae of *C. cephalonica* with S - 31183 on the longevity of the resulting male moths.

Dose ug/ul	Average			
	♀ U x ♂ T	♀ T x ♂ U	♀ T x ♂ T	♀ T x ♂ U
0.002	4.6	5.9	5.3	—
0.004	3.8	5.4	4.4	—
0.008	4.0	4.9	4.0	—
Control				5.7

resulting from treatment with the Various doses.

The results of treatment with S-31183 on the longevity of male moths is indicated in Table 5. The male adult longevity evidently decreased with the crosses ♀ Ux ♂T at the dose 0.004 ug/ul , ♀ U x ♂ T at the dose 0.008 ug/ul and ♀ T x ♂ T at the dose 0.008 ug / ul .

With regard to the effect on female longevity (Table6), statistical analysis of the average longevity of female in days resulting from the various crosses at the different concentrations revealed no significant difference compared with the untreated control.

Table 6. Effect of treating the last instar larvae of *C. cephalonica* with S - 31183 on the longevity of the resulting adult females.

Dose ug/ul	Average			
	♀ U x ♂T	♀ T x ♂U	♀ T x ♂T	♀ T x ♂U
0.002	5.0	5.2	4.8	—
0.004	4.5	5.6	4.8	—
0.008	4.6	4.8	4.8	—
Control	—	—	—	5.4

In general, it could be concluded that the insect growth requlators IKI - 7899 and S - 31183 were potent against the rice moth *Corcyra Cephalomica* since they drastically affected egg production and adult longevity.

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التأثير المتأخر لاثنين من منظمات النمو علي حشرة فراشة الأرز *Corcyra cephalonica*

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تم اجراء التزاوج الفردي وتبادلاته المختلفة للفراشات ذكوراً واناثاً والناتجة عن يرقات معاملة بجرعات مختلفه من منظمات النمو IKI7899 - ، S - 31183 وقد تم دراسة الأنشطة البيولوجيه الآتيه :

أولا : عند استعمال مادة الـ IKI - 7899

١ – أظهر التحليل الاحصائي لنتائج التزاوجات المختلفة نقصا معنويا في متوسط عدد البيض عند تزاوج ذكر وأنثي ناتجة عن يرقات معامله بمادة الـ IKI - 7899 ، كما تأثرت في هذه الحالة نسبة الفقس وبالتالي حدوث نسب محسوسه من العقم.

٢ – عند استعمال الجرعات العالية من الماده تأثرت فترة حياة كل من الذكر والأنثي عند احداث التزاوجات الآتيه: ♀T x ♂T يتبعها ♀T x ♂U ثم ♀U x ♂T .

ثانيا : عند استعمال مادة الـ S - 31183:

١ – لوحظ أنه عند استعمال الجرعات المرتفعة من المادة انخفض معنوياً متوسط عدد البيض للأنثي وذلك عن التزاوج ♀T x ♂U بينما تأثرت نسبة الفقس في التزاوجات الأخري وكان أقلها في الفقس التزاوج ♀T x ♂U الناتج عن يرقات معامله بالجرعة المرتفعة ٠,٠٠٨ ميكروجرام لكل ميكروليتر .

٢ – لوحظ أن أعلي نسبه تعقيم كانت عند التزاوج ♀T x ♂U الناتج عن يرقات عوملت بالجرعه ٠,٠٠٨ ميكروجرام لكل ميكروليتر .

٣ – تأثرت فترة حياة الذكر الناتج عن التزاوجات الصادرة من يرقات عوملت بالجرعات المذكورة لمادة ال S - 31183:

♀T x ♂U عند الجرعة ٠,٠٤ ميكروجرام / مكروليتر

♀T x ♂U عند الجرعة ٠,٠٠٨ ميكروجرام / مكروليتر

♀T x ♂T عند الجرعة ٠,٠٤ ميكروجرام / مكروليتر

لم تتأثر فترة حياه الأنثي لحشرة فراشة الأرز الناتجة عن اليرقات المعامله بكل جرعات الماده السابقة.