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EFFICACY OF SOME INSECTICIDES ON CERTAIN SMALL POWDER POST BEETLES (FAMILY: BOSTRYCHIDAE) INFESTING MANGO TREES

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Abstract

Toxicity and remedial effect of some insecticides on certain bostrychid borers, *Dinoderus minutus* F., *Enneadesmus obtusedentatus* Lesne and *Sinoxylon Sudanicum* Lesne, were studied under lab. conditions of 31.8°C and 67.2% RH.

The comparative toxicity of tested insecticides based on toxicity index (T.I.) obtained from LC_{50} and LC_{90} values differed according to tested borers. On *D.minutus*, basudin has highly effect as compared with sumicidin, cidial and sumithion. On *E.obtusedentatus*, T.I. $_{50}$ revealed distinctly that sumithion drive basudin, cidial and sumicidin, while T.I.$_{90}$ evident that cidial more toxic than sumicidin, basudin and sumithion, respectively. On *S.sudanicum*, Insecticides arranged based on T.I. $_{50}$ to basudin, sumithion, sumicidin and cidial, while they were arranged based on T.I.$_{90}$ to cidial, basudin, sumicidin and sumithion.

The percentages of infestation reduction with each of *D.minutus*, *E.obtusedentatus* and *S.sudanicum* beetles emerged from infested mango cuttings showed highly significant differences between different insecticidal treatments.

Highly effective group (75% - 62% reduction) on *D.minutus* was for basudin 3600 and 1800 ppm, cidial 3000 ppm and sumicidin 3600 ppm, the same treatments gave reduction of 77.8% - 63.5% for *S.sudanicum*, while highly effective group (81.6% - 67.3% reduction) on *E.obtusedentatus* was for basudin, cidial and sumicidin each at rate of 6300 ppm.

INTRODUCTION

The bostrychid beetles, *Dinoderus minutus* F., *Enneadesmus obtusedentatus* Lesne and *Sinoxylon sudanicum* Lesne infest mango trees and are widely distribued on other different hosts (Willcoks 1924; Nour 1963; Attia and Kamel 1965; Hindy 1965; Helal 1969 and 1977; Ezzat *et al.* 1975; Alfieri 1976; Okil 1982; El-Sebay 1984, Helal and El-Sebay 1985; Batt 1989). The damage occurs from both the larvae and beetles reducing the infested parts to post powder. In Egypt little available studies on chemical

control of bostrychid beetles, such as: *Bostrychopsis reichei* Mars and *Dinoderus bifoveolatus* woll. (El-Sebay 1984) and *Sinoxylon sudanicum* Lesne (Okil 1982), therefor, the aim of this investigation is to study the comparative toxicity and remdial effect of some insecticides on *D.minutus, E.obtsedentatus* and *S.Sudanicum.*

MATERIALS AND METHODS

Chemical used: The tested insecticides were chosen from those known to have contact and stomach effect.

1. Basudin 60EC. (Diazinon) 0.0-diethyl 0-2- isopropyl - 6 - methylpyrimidin-4-yl phosphorothioate.

2. Cidial L50 EC. (phenothoate) S-a-ethoxycarbonylbenzl 0.0-dimethyl phosphorodithioate.

3. Sumicidin 60EC (Fenvalerate) (Rs) -a-cyano-3-phenoxybenzyl (Rs) -2- (chlorophenyl) -3- methylbutyrate.

4. Sumithion 50 EC (Fenitrothion) 0.0-dimethyl 0-4- nitro-m-tolyl phosphorothioate.

Toxicity effect: To determine the toxicity of used insecticides against the attacked beetles of *D.minutus, E.obtusedentatus* and *S.sudanicum* (where they find their way inside the host making entrance holes and galleries to lay the eggs through wood pores), the following method was applied on each species.

Three concentrations of each insecticide were used. Chemicals were dissolved in distilled water as follows: 1.5 ml, 3 ml, 6 ml. insecticide/litre water. Each 15 of healthy mango cuttings (each of 10 cm. long and 2cm diameter) were sprayed with one concentration in use. Each five treated cuttings were dried in open air for one hour and put in glass jar (35 cm. height and 18 cm. diameter), then exposed to 25 couples of newly emerged beetles (25 females and 25 males), three replicates were used for each insecticidal dilution and untreated check. Jars were covered with muslin cloth and fixed with rubber bands. Closed observations were made through 1, 2, 4, 6 and 12 hours after exposure to record the initial kill of beetles, then during the successive days until complete death of beetles. Percentages of adult mortality were estimated and LC_{50} & LC_{90} values were subjected to probit analysis (Finney 1952). Toxicity index (T.I.) was determined based on LC_{50} and LC_{90}.

Remedial effect: To evaluate the effeciency of tested insecticides against the emerged beetles and probability influence on immature stages, the infested mango branches with each species of beetles under test (chosen from the trees containing one species only in each case after internal examination to some infested parts) were sprayed by the previous insecticides at the same concentrations. Random samples of infested treated and untreated mango cuttings were chosen, each three cuttings of each concentration put in glass jars and covered with muslin cloth. The numbers of emeged beetles from each concenration and check were counted and recorded until the end of emergence (about 45 days). Percent reduction of infestation was calculated as follows:

$$\% \text{ Reduction of infestation} = \frac{C - T}{C} \times 100$$

where : C = Total number of emerged beetles in untreated check.

T = Total number of emerged beetles in treated cuttings.

RESULTS AND DISCUSSION

Toxicity effect

1. *Dinoderus minutus*: Data in Table 1 show the toxicity of tested insecticides at different concentration estimated by mortality percentaages through the successive hours after treatment unit until full death.

Statistical analysis detected significant differences among different treatments (Chi-square value, X^2, = 114.2), the different concentrations of insecticides could be arranged to three groups as follows:

a. Highly effective group (93% - 99% mortality) included basudin 3600 ppm and 1800 ppm, cidial 3000 and 1500 ppm, sumicidin 3600 ppm and sumithion 3000 ppm (X^2 = 8.9).

b. Moderate effective group (79% - 89% mortality) included: basudin 900 ppm, cidial 750 ppm, sumicidin 1800 and 900 ppm and sumithion 1500 ppm. (X^2 = 6.47).

c. Least effective group (64% mortality) included: sumithion 750 ppm.

Table 2 show the response of *D.minutus* beetle to different tested insecticides. Data evident that Lc_{50} values ranged between 296 ppm (basudin) to 751 ppm (cidi-

al), while Lc_{90} values ranged between 1104 ppm (basudin) to 2274 ppm (sumithion). Comparative toxicity based on T.I. obtained from Lc_{50} values arranged the insecticides as follows: basudin, cidial, sumicidin and sumithion, where T.I. values were 100, 83.1, 58.8 and 39.4, respectively, while T.I. values obtaineed from Lc_{90} values were 100, 86.2, 59.5 and 48.5 for basudin, cidial, sumicidin and sumithion, respectively.

El-sebay 1984 listed three recommended insecticides against bamboo borer *Dinoderus bifoveolatus* and suggested to be applied by brushing wood with their solutions dissolving in kerosene as follows: cidial 0.8%, hostathion 1% and sumicidin 1-4%.

2. *Enneadesmus obtusedentatus* : Toxicities of different insecticides to adult of *E.obtusedentatus* are give in Table 3. Statistical analysis indicated that highly significant differences were found between the different treatments (X^2=108.3). The used insecticides could be arranged in the following groups:

- Highly effective group (92%-99% mortality) included: cidial 3000 ppm. sumicidin 3600 ppm and basudin 3600 ppm (X^2= 5.54).

-Moderate effective group (79%-90% mortality) included: sumithion 3000 ppm and 1500 ppm, cidial 1500 ppm, sumicidin 1800 ppm and basudin 1800 ppm (X^2=7.33).

-Least effective group (58%-73% mortality) included: cidial 750 ppm. basudin 900 ppm sumicidin 900 ppm and sumithion 750 ppm (X^2= 6.17).

Data in Table 4 indicated clear differences in response of *E. obtusedentatus* beetle to different tested insecticides, Lc_{50} values ranged between 152 ppm (sumithion) to 386 ppm (basudin) while Lc_{90} values ranged 3104 ppm -7063 ppm for the same mentioned insecticides. The T.I. values obtained based on the Lc_{50} values were 100, 39.4, 31.1 and 29.3 for sumithion, basudin, cidial and sumicidin, respectively, while T.I. values bsed on Lc_{90} were 100, 56.6, 44.3 and 19.5 for cidial, sumicidin, Basudin and sumithion, respectively.

3 -*Sinoxylon sudanicum*: Mortality percentages in Table 5 show toxicity of different insecticides to adult of *S.sudanicum.* Statistical analysis elucidated significant differences between treatments (X^2=120.9). Three groups were obtaineed as follows:

a. Highly effective group (89%-97% mortality) included: cidial 3000 ppm, basudin 3600 ppm , sumicidin 3600 ppm and sumithion 3000 ppm (X^2=7.15)

b. Moderate effecticve group (79%-88% mortality) included: basudin 1800 ppm, cidial 1500 ppm and sumicidin 1800 ppm (X^2=3.13)

c. least effective group (58% - 72% mortality) included: basudin 900 ppm, sumithion 1500 ppm and 750 ppm, cidial 750 ppm and sumicidin 900 ppm (X^2 = 4.73).

Table 6 shows the response of *S.sudanicum* beetle to different insecticides. Obtained LC_{50} values ranged between 449 ppm (basudin) to 748 ppm (cidial), while LC_{90} values ranged 1679 ppm (cidial)-358 ppm (sumithion). Comparative toxicity according to T.I. differed based on LC_{50} and LC_{90} values. T.I. obtained from LC_{50} values were 100, 70.5, 68.4 and 60.03 for basudin, sumithion, sumicidin and cidial, respectively, while T.I. obtained from LC_{90} values were 100, 81.9, 63.9 and 46.8 for cidial, basudin, sumicidin and sumithion, respectively.

Okil 1982 studied the toxicity of some insecticides (xylophane 100%, chlordane 75%, azodrin 40%, thimul 35%, hostathion 40% and dephane 37.5) on *S.sudanicum* by brushing of poinciana cuttings and found that all concentration of chemicals used gave more than 99% mortality after 24 hours except dephane.

Remedial effect: Number of emerged beetles of *D.minutus, E.obtusedentatus* and *S.sudanicum* from infested mango cuttings treated with different insecticides and from check are given in Table 7.

1. ***D.minutus***: According to the percentages of infestation reduction, the treatments could be statistically arranged in the following groups (X^2 = 149.12).

a. Highly effective group (75%-62.5% reduction): basudin 3600 ppm and 1800 ppm, cidial 3000 ppm and sumicidin 3600 ppm.

b. Moderate effective group (56.3% - 21.8% reduction): cidial 1500 ppm, sumicidin 1800 ppm and sumithion 3000 ppm.

c. Least effective group (37.5% - 24.1% reduction): sumithion 1500 ppm and 750 ppm, basudin 900 ppm, cidial 750 ppm and sumicidin 900 ppm.

2. ***E.obtusedentatus***: Statistical analysis showed significant differences between treatments, the following groups could be obtained (X^2 = 181.49).

a. Highly effective group (81.6% - 67.3% reduction): basudin 3600 ppm, cidial 3000 ppm and sumicidin 3600 ppm.

b. Moderate effective group (61.2% - 49% reduction): basudin 1800 ppm, cidial 1500 ppm, sumithion 3000 ppm and sumicidin 1800 ppm.

c. Least effective group (35.7-21.4% reduction): basudin 900 ppm, sumithion 1500 ppm and 750 ppm, cidial 750 ppm and sumicidin 900 ppm.

3. ***S.sudanicum***: Highly significant differences between used concentrations of insecticides to reduct infestation of *S.sudanicum* (X^2 = 156.39. Concentrations could be divided to four groups:

a. Highly effective group (77.8% - 63.5% reduction): basudin 3600 ppm and 1800 ppm, cidial 3000 ppm and sumicidin 3600 ppm.

b. Moderate effective group (57.1%-41.3% reduction): cidial 1500 ppm, sumithion 3000 ppm and 1500 ppm and sumicidin 1800 ppm.

c. Less effective group (39.7-23.8 % reduction): basudin 900 ppm, cidial 750 ppm and sumicidin 900 ppm.

d. Least effective group (17.5% reduction): sumithion 750 ppm.

فعالية بعض المبيدات علي بعض الخنافس الساحقة الصغيرة (فصيلة بوستريكدي) التي تصيب أشجار المانجو

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السمية والتأثير العلاجي لبعض المبيدات علي خنافس *Sinoxylon sudani-* ،*Dinoderus minutus* *cum, Enneadesmus obtusedentatus* درست باستعمال مبيدات الباسودين، السيديال، السوميسيدين، السومثيون والتي اظهرت النتائج التالية:

- السمية المقارنة علي الخنافس تختلف تبعا لاختلاف دليل السمية المتحصل عليه من قيم LC_{50} ، LC_{90} حيث وجد أن دليل السمية لقيم LC_{50} ، LC_{90} على خنفساء *D. minutus* اظهر ان الباسودين له اعلى تأثير بالمقارنه بكل من السوميسيدين والسيديال والسومثيون على الترتيب، بينما فى حاله خنفساء *E. obtusedentatus* أظهر دليل السمية لقيم LC_{50} ان السومثيون يتفوق على الباسودين والسيديال ثم السوميسيدين فى حين ان دليل السمية لقيم LC_{90} أظهر ان السيديال كان اكبر سمية من السوميسيدين والباسودين والسومثيون على الترتيب .. اما بالنسبة لخنفساء *S.sudanicum* فان دليل السمية المحصل لقيم LC_{50} يرتب المبيدات تنازليا الى الباسودين والسومثيون السوميسيدين ثم السيديال، بينما ترتب هذه المبيدات تبعا لدليل السمية لقيم LC_{90} الى السيديال والباسودين والسوميسيدين ثم السومثيون

هذا وقد اظهر التأثير العلاجى ان النسبة المئوية لانخفاض الاصابة بكل من الخنافس السابقةعند استعمال المبيدات المختبره تختلف اختلافا معنويا باختلاف المعاملات المختلفة لهذه المبيدات .. وقد وجد ان أعلى نسبة لانخفاض الاصابة بخنفساء *D.minutus* تتروح بين ٦٢,٥٪الى ٧٥٪ عند استعمال الباسودين ١٨٠٠ و ٣٦٠٠ جزء فى المليون والسيديال ٢٠٠٠ جزء فى المليون والسوميسيدين ٣٦٠٠ جزء فى المليون .. وقد اعطت نفس المعاملات انخفاضا فى الاصابة بخنافس *S.sudanicum* يتروح بين ٦٣,٥٪الى ٧٧,٨٪ .. اما أعلى نسب لانخفاض الاصابة بخنفساء *E.obtusedentatus* فقد تراوحت بين٦٧,٣٪ الى ٨١,٦٪ سجلت عند استعمال الباسودين والسيديال والسوميسيدين كل بمعدل ٣٦٠٠ جزء فى المليون .