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POTENTIAL OF PYRETHROID INSECTICIDES AND PLANT EXTRACTS ON FECUNDITY AND EGG VIABILITY OF *TRIBOLIUM CASTANEUM* (HERBST)

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Abstract

Context: Sythetic pyrethroid and two botanical may reduce the fecundity and egg viability of red flour beetle, *Tribolium castaneum* (Herbst) and can be used in grain protection.

Objective: To determine the effect of cypermethrin, fenitrothion, *Murraya paniculata* L. and *Jatropha gossypifolia* L. plant extracts on fecundity and egg viability of *T castaneum*.

Materials and Methods: Newly hatched *T. castaneum* larvae were kept in a petridish containing 30 g either fresh or treated flour separately. After pupation the pupae were sieved and sexed by microscopic examination and kept separately for adult emergence. Twenty five pairs (1♂: 1♀) adults were paired from treated and one pair from untreated media and placed in a glass vial containing 2 g of food either treated or untreated for oviposition in an incubator at 30 ± 0.5°C. Eggs were collected and counted after every three days over a period of 45 days. The eggs laid by the first 15 pairs from each treatment were collected from the experimental vials and kept in separate petridish for hatching. Eggs were regularly observed with a microscope and hatched larvae were counted.

Results: The females of all treated media laid less number of eggs than the untreated females. Both insecticides and botanicals affected oviposition significantly ($P<0.001$) at all doses levels. All the treatments of both the insecticides and botanicals significantly ($P < 0.001$) reduced the fertility of eggs laid by *T. castaneum* females in comparison to those of the control.

Conclusion: The plant extracts of kamini and jamalgota can effectively reduced the fecundity and egg viability against stored product insect pests with low mamalian toxicity

Keywords: *Tribolium,* cypermethrin, fenitrothion, kamini, jamalgota, fecundity, egg viability.

Introduction

Fecundity in *Tribolium* is influenced by different environmental factors including moisture, temperature food (Park and Frank 1948, Holdaway 1932), flour medium (Khalequzzaman *et al.* 1994) and conditioning of the medium by the beetles living in it (Mondal and Port 1985). A healthy *Tribolium* fertile female lays no egg in the first three days of adult life, and then they lay egg at an increasing rate upto 18 per day (Ashford 1970).

Oviposition in *Tribolium* is also reduced in insecticide treated medium (Taher and Cutkomp 1983, Hasnat 2003) and botanicals (Banu 2004, Khanom 2004). Some conventional insecticides (Taher and Cutkomp 1983) reduced the progeny production of *Tribolium* species.

However, there is no information regarding the effects of cypermethrin, fenitrothion, *Murraya paniculata* L. and *Jatropha gossypifolia* L. on both fecundity and egg viability of *Tribolium castaneum.* So, the present study was undertaken.

Materials and Methods

T. castaneum adults were mass reared on fresh flour medium in a glass jar kept in an incubator at 30±0.5°C temperature without light and humidity control. Newly hatched larvae were kept in a glass petridish containing 30 g of either fresh or treated media. Food medium was treated with different low doses of

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cypermethrin and fenitrothion(0.2 ppm, 0.4 ppm and 0.8 ppm) and leave extracts of *M. paniculata* and *J. gossypifolia* (400 ppm, 800 ppm and 1200 ppm) separately. After pupation, the pupa were sexed by microscopic examination (Halstead 1963).

Ten-days old adults resulted from treated and untreated groups were used for oviposition experiment and same numbers were also used for control. Each pair was kept in a glass vial (20 cc) containing 2 g of food. The top of the vials were plugged with cotton wool and vials are kept in an incubator at 30 ± 0.5°C. Eggs were collected after every three days by seiving the flour media over a period of 45 days. The numbers were recorded and after hatching dead eggs were also recorded.

Results

The results and statistical analyses are shown in Table 1. The females of all treated media laid less number of eggs than the untreated females. Both insecticides (cypermethrin and fenitrothion) and botanicals (*M. paniculata* and *J. gossypifolia*) affected oviposition significantly (P< 0.001) at all dose levels. Both insecticides are more effective than botanicals in reducing fecundity of *T. castaneum* in comparison to that of the control. All the treatments of both insecticides and botanicals also significantly (P < 0.001) reduced the fertility of eggs laid by *T. castaneum* females in comparison to those of the control.

Table 1. The average number of eggs laid and percentage of egg hatching in *T. castaneum* females reared on fresh medium (control) and medium treated with different doses of insecticides and plants extracts.

Treatment	Dose (ppm)	Mean eggs laid/day/ female/ (SE)	% Egg hatched
Control		10.63 ± 1.52^{a}	88.56
Cypermethrin	0.2	6.33 ± 1.07^{b}	59.56
	0.4	5.42 ± 0.87^{c}	51.87
	0.8	4.69 ± 1.10^{d}	41.86
Fenitrothion	0.2	7.69 ± 0.92^{a}	62.97
	0.4	6.60 ± 2.07^{b}	58.93
M. paniculata	400	8.46 ± 0.65^{b}	71.91
	800	7.53 ± 1.65^{b}	66.23
	1200	6.35 ± 1.77^{c}	58.44
J. gossypifolia	400	8.72 ± 0.82^{b}	71.84
	800	7.37 ± 1.99^{c}	63.35

Treatments indicated by the same letter in each column do not vary significantly by DMRT

Discussion

The reduced rate of egg hatching due to leaf extracts of *M. paniculata* and *J. gossypifolia* in the present experiment is similar to the findings of Mannan *et al*. (1993) and Khanam and Talukdar (1993) who reported the reduced fertility in *T. castaneum* and *T. confusum* due to botanicals like Bishkatali (*Polygonum hydropiper* L.), Neem (*Azadarata indica*), Nishinda (*Vitex negundo* L.) and Royna (*Aphanamixis polystachya* W & A). The reduced larval hatching in *T. castaneum* in the present experiment due to insecticides (cypermethrin and fenitrothion) is similar to the finding of Mondal (1987) and Rahman (1992) who reported significantly (P<0.005) reduced fertility of *Tribolium* due to the effect of pirimiphos methyl.

In the present experiment, the lowest percentage of hatching in single dose was found in the treatment of fenitrothion and highest percentage was found in cypermethrin. Similarly, in botanicals the lowest hatching percentage was in the leaf of Jamalgota and the highest in Kamini.

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