Journal of Tropical Agriculture 39 (2001) : 149-150

OVIPOSITION DETERRENCE OF *ACORUS CALAMUS* L. ON MELON FLY, *BACTROCERA CUCURBITAE* COQ.

Shakunthala Nair and Jim Thomas
College of Horticulture, Thrissur 680 656, India

Abstract: Laboratory experiments were conducted to assess oviposition deterrence of *Acorus. calamus* L. extracts to the melon fly, *Bactrocera. Cucurbitae* COQ. Laboratory reared flies of uniform age were provided with substrates (2.5 cm^3 pumpkin pieces) treated with the extracts for oviposition and observations were taken on the mean number of ovipunctures and mean fecundity realization. Both aqueous and solvent extracts showed the deterrent effect, the latter being more effective. The mean numbers of ovipunctures, as well as the mean fecundity realization were inversely proportional to the increase in concentration of the extracts.

Key words: *Acorus calamus, Bactrocera cucurbitae,* fecundity realization, oviposition deterrence, ovipunctures

INTRODUCTION

Acorus calamus L. is a plant with several insecticidal and insectistatic principles and effects and it has been tried and tested on various pest species. Among its major effects, oviposition deterrence and ovicidal action, reduced hatching and delayed hatching are important from the IPM point of view. Therefore, laboratory experiments were conducted to assess the ovipositional deterrence of *A. calamus* to melon fly, one of the most serious pests of cucurbits.

MATERIALS AND METHODS

Laboratory reared adult flies of uniform nature were used for the experiments. Pieces of pumpkin fruit of size 2.5 cm^3 were provided for oviposition by the mated adult female flies. Rhizome extracts of *A. calamus* were prepared using cold steeping method (Teotia and Pandey, 1979). A stock solution of strength 10% was first prepared and for further dilutions, the required quantity of the stock was taken, the solvent evaporated and the extract re-dissolved in acetone. Concentrations of extracts used are given in Table 1. Each concentration under test was replicated five times with a fresh set of flies. Oviposition deterrence was assessed by determining the number of ovipunctures on the substrate and fecundity realization, by observing the hatching of eggs into maggots under both no-choice and multiple-choice tests.

The test substrates, namely, the pumpkin fruit pieces were treated with 1 ml of the A. *calamus* extract taken in a glass dish. The piece was uniformly coated with the extract on all sides and then air dried under an electric fan. Mating pairs of flies were isolated and confined in glass chimneys with sugar for feeding and the treated substrates for oviposition. Untreated fruit pieces were provided to the flies as control. After 24 hours, the number of ovipunctures on each fruit piece was recorded and after 48 hours, the number of larvae hatched in each piece was recorded. The data were tabulated and statistically analyzed.

RESULTS AND DISCUSSION

Data on mean number of ovipunctures on substrates treated with various concentrations of the extract is given in Table 2 and data on fecundity realization in Table 3. The results showed an increased deterrence with increasing concentration of the extracts. Both aqueous and solvent extracts showed the deterrent effect, but the latter were more effective.

Number of ovipunctures

In both no-choice and multiple-choice tests, using aqueous extracts, the least number of ovipunctures was seen with the 10% concentration indicating that it had the most deterrent effect. The other treatments were almost on par with each other and significantly different from the control (12.4 and 9.8 respectively). The solvent extracts showed a similar trend, with the maximum deterrence seen with 1.0% concentration. The mean number of ovipunctures recorded with this concentration was 0.8 in the no-choice test and 0.2 in the multiple-choice test, as opposed to 12.6 and 11.6 in the control.

Fecundity realization

The lowest fecundity realization in all tests was again obtained in the substrates with the least number of ovipunctures. In no-choice and multiple-choice tests using aqueous extract, the mean numbers of larvae emerging

were 1.2 and 1.4 respectively; and in the tests with solvent extracts, they were 1.4 and 0.4 respectively. The untreated control substrates recorded a fecundity realization of 20-25.

Table 1. Concentrations of *A. calamus* extract used to test oviposition deterrence to *B. cucurbitae*

Sl. No.	Aqueous extract (%)	Solvent extract (%)
1	0.1	0.10
2	0.5	0.25
3	1.0	0.50
4	5.0	1.00
5	10.0	-.-

Table 2. Mean number if ovipunctures made by female melon flies *(B. cucurbitae)* on substrates* treated with graded doses of *A. calamus* extracts

Treatments	Dose (%)	Mean number of ovipunctures made in 24h	
		No-choice test	Multiple-choice test
Aqueous extract			
OWA 1	0.10	10.2^{b}	3.6
OWA 2	0.50	7.8^{c}	2.6
OWA 3	1.00	7.0^{c}	1.0
OWA 4	5.00	6.6^{c}	0.6
OWA 5	10.00	0.6^{d}	0.4
OWA 6	Control	12.4^{a}	9.8
CD (0.05)		1.75	1.9
Methanol extract			
OSA 1	0.10	4.8^{b}	2.4^{b}
OSA 2	0.25	3.2^{c}	2.0^{b}
OSA 3	0.50	2.6^{c}	1.2^{bc}
OSA 4	1.00	0.8^{d}	0.2^{c}
OSA 5	Control	12.6^{a}	11.6"
CD (0.05)		1.59	1.39

*2.5 cm^3 piece of pumpkin treated with 1 ml of extract; Treatment means followed by common letters do not differ significantly at 5% level.

It can also be noted that the deterrence shown by the solvent extracts was considerably more than that of the aqueous extracts of similar concentration. The reduced oviposition on treated substrates may be related to the repellent effect of the extracts to the gravid adults. The flies were found to probe the substrate thoroughly using chemoreceptors in their mouthparts and ovipositors prior to oviposition. During such probing, they intercept the extracts and thus avoid oviposition on the treated surface. The oil of *A. calamus* is also reported to have oviposition deterrent properties on several species of stored grain pests, like *Callosobruchus chinensis.* The reduction in oviposition is attributed to the repellency of the calamus oil to these pests also. Egg hatching was also significantly lower at the tested concentrations. This was found to be not only because of the reduced oviposition but also because of the ovicidal action of the calamus oil. Microscopic examinations of the unhatched eggs revealed that majority of the eggs were killed at the very early stages of development (Chander and Ahmed, 1986).

Table 3. Mean fecundity realization of melon flies (*B.cucurbitae*) from substrates* treated with graded doses of *A. calamus* extracts

Treatments	Dose (%)	Mean number of ovipunctures made in 24h	
		No-choice test	Multiple-choice test
Aqueous extract			
OWA 1	0.10	18.2^{a}	10.0^{b}
OWA 2	0.50	13.4^{b}	5.8^{bc}
OWA 3	1.00	13.0^{b}	4.4^{c}
OWA 4	5.00	10.4^{b}	2.2^{c}
OWA 5	10.00	1.2^{c}	1.4^{c}
OWA 6	Control	21.2^{a}	21.2^{a}
CD (0.05)		3.4	4.5
Methanol extract			
OSB 1	0.10	10.2^{b}	5.8^{b}
OSB 2	0.25	5.0^{c}	3.8^{bc}
OSB 3	0.50	3.2^{cd}	2.2^{cd}
OSB 4	1.00	1.4^{d}	0.4^{d}
OSB 5	Control	25.4^{a}	20.0^{a}
CD (0.05)		2.42	2.74

*2.5 cm^3 piece of pumpkin treated with 1 ml of extract; Treatment means followed by common letters do not differ significantly at 5% level.

ACKNOWLEDGEMENT

The paper forms a part of the M.Sc.(Ag.) thesis of the first author submitted to the Kerala Agricultural University, Thrissur.

REFERENCES

Chander, H. and Ahmed, S.M. 1986. Efficacy of oils from medicinal plants as protectants of green gram against the pulse beetle, *Callosobruchus chinensis.* Entomon. 11: 21-28

Teotia, T.P.S. and Pandey, G.P. 1979. Insecticidal properties of rhizomes of sweet flag, *Acorus calamus* against rice weevil, *Sitophilus oryzae* L. *Indian J. Ent.* 41: 91-94