*Uttar Pradesh J. Zool. 19(3) : 197 - 200, 1999* ISSN 0256 - 971X

# SCREENING OF RESPONSES OF ADULT KHAPRA BEETLE, *TROGODERMA GRANARIUM* E. ON TEN PLANTS SPECIES FOR POSS!BLE REPELLENT ACTION

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Ten aboregional plant species were screened to observe possible repellent/deterrent action against a stored product pest insect. The "Y" shaped olfactometer test differentiated 05 plant species as potent repellents including leaf extracts of *Withania somnifera* and *Argemone mexicana* prepared in acetone and pet-ether solvents proved to be best repellent against Khapra beetle, *T. granarium*.

## INTRODUCTION

The insects are responsible for incalculable harm to human beings in several ways. It would not be an exaggeration to say that insects have been directly or indirectly responsible for more loss of life and destruction of food products than that caused by wars, floods, earthquakes, fires and famines in the history of man. Every year they have been destroying our agriculture products as well as stored commodities in different ways; cost of which runs into million of rupees. Work has already been done on large number of harmful insects in respect to their binomical characters and physiological activities. Nevertheless, continued research work is desirable to take effective defence measures against these pests, the enemies of social and economic progress.

In recent past, special efforts have been made to screen materials of plant origin for their deterrent action (Munakata, 1970 & 1977; Reed *et al.*, 1981), so as to locate safe and biodegradable alternatives to synthetic insecticides.

The Indian *neem* tree (*Azadirachta indica* A. Juss) an old medicinal plant appears to be the only plant exclusively used in the screening programmes for its deterrent activity (Jacobson, 1958, 1975 & 1981; Warthen, 1979; Kraus *et al.*, 1981).

In the light of the above literature it was thought desirable to screen some more plants having potent oviposition deterrent action on the Khapra beetle which could be utilized to protect stored food products from infestations by the species. This report deals with the result obtained during the initial screening of 10 species of aboregional plants. Aim of this phase of investigation was to identify such plants which would be promising for further intensive studies in laboratory, although the primary goal was to identify plants having possible oviposition deterrent properties but screening process revealed a few plants possessing attractant qualities, which could also prove to be useful as bait for *T. granarium*.

## MATERIALAS AND METHODS

Acetone and pet-ether extracts of ten aboregional plants (Table II) were evaluated for their repellent property against khapra beetle using "Y" shaped olfactometer (Reed *et al.*, 1970). Each arm of olfactometer was 6" in length and 1" in diameter. A piece of sponge was soaked in 1ml of plant extract of 100 per cent concentration and kept in experimental arm, while the other (control) arm contained spongy piece soaked in the same amount of solvent (acetone, pet-ether). Thirty

**Table I :** Repellent action of some plant extract (in acetone and pet-ether) against *Trogoderma granarium*.

| Name of Plants | Average number of non-reacting insects | | Average number of insects in control arm | | Average no. of insects in experimental arm | | Percentage of insects in control arm | | Percentage of insects in experimental arm | |
|---|---|---|---|---|---|---|---|---|---|---|
| *W. somnifera* | 4.66 ±0.07 | 7.33±0.76 | 17.66±0.01 | 21.0±0.33 | 7.66 ± 0.77 | 1.33± 0.00 | 58.86±0.4 | 71.77±0.07 | 25.55±0.07 | 5.0±0.07 |
| (Seed) | | | | | | | S | S | NS | NS |
| *C. album* | 7.0±0.04 | 6.66±0.28 | 10.0±0.72 | 10.33±0.01 | 13.33±0.78 | 13.0±0.01 | 33.33±0.02 | 34.44±0.01 | 45.55±0.78 | 43.33±0.27 |
| (Leaf) | | | | | | | NS | NS | NS | NS |
| *C. occidentalis* | 3.66±0.01 | 5.0±0.0 | 14.33±0.01 | 15.66±0.77 | 12.0±0.0 | 9.33±0.01 | 47.77±0.08 | 51.11±0.07 | 40.0±0.0 | 31.10±0.48 |
| (Leaf) | | | | | | | NS | S | NS | NS |
| *W. somnifera* | 4.33±0.46 | 6.33±0.01 | 23.33±0.02 | 22.33±0.02 | 2.33±0.06 | 1.33±0.01 | 77.77±0.02 | 74.44±0.28 | 7.77±0.28 | 6.66±0.02 |
| (Leaf) | | | | | | | S | S | NS | NS |
| *H. annuus* | 6.33±0.01 | 6.33±0.02 | 10.33±0.68 | 11.33±0.72 | 13.33±0.68 | 12.33±0.01 | 34.44±0.78 | 37.77±0.23 | 44.44±0.01 | 38.88±0.01 |
| (Leaf) | | | | | | | NS | NS | NS | NS |
| *V. rosea* | 6.0±0.01 | 7.33±0.02 | 11.0±0.28 | 13.33±0.67 | 13.0±0.98 | 9.33±0.01 | 36.66±0.25 | 44.44±0.90 | 43.32±0.23 | 31.11±0.01 |
| (Leaf) | | | | | | | NS | NS | NS | NS |
| *A. mexicana* | 1.33±0.21 | 4.33±0.18 | 27.66±0.04 | 25.33±0.01 | 1.0±0.01 | 0.33±0.01 | 92.22±0.07 | 84.44±0.82 | 3.33±0.61 | 1.11±0.01 |
| (leaf) | | | | | | | S | S | NS | NS |
| *L. camara* | 6.66±0.01 | 6.33±0.72 | 9.0±0.70 | 10.33±0.01 | 14.33±0.23 | 13.0±0.01 | 29.99±0.92 | 35.55±0.80 | 47.77±0.01 | 43.33±0.01 |
| (Leaf) | | | | | | | NS | NS | NS | NS |
| *D. metels* | 3.66±0.02 | 7.0±0.86 | 22.33±0.71 | 19.33±0.63 | 4.0±0.54 | 3.66±0.34 | 74.44±0.01 | 64.44±0.08 | 13.33±0.78 | 12.22±0.26 |
| (Leaf) | | | | | | | S | S | NS | NS |
| *C. sinensis* | 8.33±0.01 | 8.66±0.04 | 19.0±0.76 | 20.33±0.81 | 2.66±0.72 | 1.0±0.28 | 63.33±0.10 | 67.77±0.02 | 26.66±0.08 | 9.99±0.26 |
| (Pericarp) | | | | | | | S | S | NS | NS |
| *P. guajava* | 8.33±0.01 | 8.33±0.01 | 8.33±0.72 | 9.0±0.01 | 13.33±0.92 | 12.66±0.01 | 27.77±0.01 | 29.99±0.82 | 44.44±0.28 | 42.22±0.01 |
| (Leaf) | | | | | | | NS | NS | NS | NS |

Data represent mean ± standard deviation; S = Significant; NS = Non-significant.

newly adult of *T. granarium* (15 males + 15 females) were introduced in the base arm of olfactometer and was left for 30 minutes. The number of individuals in experimental, control and base arms were counted. Five replica were run in each experiment. The data were statistically analysed by calculating standard deviation and chi-square test (Shukla *et al.*, 1989).

## RESULTS AND DISCUSSION

To study the repellency of botanicals the leaf extracts were prepared (Table II) in two solvents *viz.* acetone and pet-ether and were assayed separately.

**Table II :** List of plants used to prepare extracts in acetone and pet-ether.

| Name of the plant used & Family | Vernacular name | Part of the plant used | Active principle | Collection site |
|---|---|---|---|---|
| *Argemone mexicana* | Bharband | Leaves | Glycoside, amide | Sanganer, Jaipur |
| (Papaveraceae) | | | | |
| *Cassia occdentalis* | Kasondi | Leaves & seeds | Potash, Tannic | University |
| (Caesalpiniaceae) | | | acid | campus, Jaipur |
| *Chenopodium album* | Bethusag | Leaves | Cholestrol, | Amber, Jaipur |
| (Chenopodiaceae) | | | ammonia | |
| *Citrus sinensis* | Santara | Paricarp | Citrin glycoside | Vegetable |
| (Rutaceae) | | | | market, Jaipur |
| *Datura metel* | Sadahdhatura | Leaves | Hyoscyamine | University |
| (Solanaceae) | | | hyoscine, atropine | campus, Jaipur |
| *Helianthus annuus* | Surajmukhi | Leaves | Malonic, saponic, | Univ. Botanical |
| (Compositae) | | | fumaru | Garden, Jaipur |
| *Lantana camara* | -- | Leaves | Sesquiterpene | Univ. campus, |
| (Verbenaceae) | | | | Jaipur |
| *Psidium guajava* | Amrud | Leaves | Catechol, tanin | Orchard, |
| (Myrtaceae) | | | | Sanganer |
| *Vincea rosea* | Sadhabahar | Leaves | Vincain | Univ. Botanical |
| (Apocynaceae) | | | | garden, Jaipur |
| *Withania somnifera* | Ashwagandh | Leaves & seeds | Withanie, | Univ. campus, |
| (Sloanaceae) | | | somniferine | Jaipur |

Acetone and pet-ether extracts of *Withania somnifera* (seed and leaf) and leaf extract of *Cassia occidentalis*, *Argemone mexicana* and *Datura metel* and pericarp of *Citrus sinensis* in pet-ether exhibited promising repellent action, which can be attributed to withanine, glycosidal and essential oil contents respectively in them.

However, the plant extracts of *Chenopodium album*, *Helianthus annuus*, *Vinca rosea*, *Lantana camara* and *Psidium guajava* exhibited moderate repellent action against *Trogoderma granarium.* These findings are further supported by the observations recorded by Pandey *et al.* (1986) and Malik & Naqvi (1984).

Significant repellent properties have been reported in *Chenopodium* sp. against *Tribolium castaneum* (Malik & Naqvi, 1984) but against *Trogoderma*, *Chenopodium* shows moderate repellent action. It is noteworthy that *Chenopodium* leaves are rich in terpenoids which belong to the same category of chemicals as rotenoids.

Both acetone and pet-ether leaf extracts of *Withania somnifera* and *Argemone mexicana* proved to be best repellent/deterrent against khapra beetle.

## ACKNOWLEDGEMENTS

The first author thankfully acknowledges University of Rajasthan, Jaipur for an award of fellowship to carry out this part of research work.

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