REPELLENT ACTIVITY OF ETHANOLIC EXTRACT OF *ARGEMONE MAXICANA* AGAINST THREE MAJOR STORAGE INSECT PESTS

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Abstract: Ethanolic extract of leaves of *Argemonemexicana*was studied for its repellency, against three major stored-product insect pests*viz.*, *Triboliumcastaneum, Sitophilusoryzae*and *Rhyzoperthadominica*. The filter paper bioassay technique was used to determine the response of insects to potential repellents by measuring their movement. At the longest time interval (24 hrs), filter paper treated with *A. mexicana* was effective repellent to adults of *T. castaneum*(15%)and *S. oryzae*(55%). But fail to show moderate repellency to *R. dominica*.

Keywords: ***Argemone****mexicana*, Extract, Repellent, Stored product insect**.**

Introduction: Food grain production in India has reached 250 million tones in the year 2010-2011, in which nearly 20–25% food grains are damaged by storage pests [1]The control of these insect pests relies heavily on use of synthetic insecticides and fumigants, which has led to problems such as disturbance of environment, increasing costs of application, pest resurgence, pest resistance to pesticides and lethal effects on non-target organisms, in addition to direct toxicity to users. An alternative to synthetic pesticides is the use of natural compounds, such as essential oils that result from secondary metabolism in plants. The toxicity of large number of essential oils and their constituents have been evaluated against number of stored-product insects [2]. Essential oils are commercially used in four primary aspects: as aromas in fragrances and perfumes, as Flavouring food additives, as pharmaceuticals, and as insecticides. They recently have received much attention due to their multi-functions as antimicrobial, antifungal, anti-tumor and insecticidal agents [3]. Nowadays, pest management ecological studies and evolutionary biology are combined to control insect pests.

Material and Methods:

Rearing of*Triboliumcastaneum*(Herbst.): Adults of *T. castaneum* were collected from naturally infested wheat from farmer's store. The insects were reared on 100 gm sterilized wheat flour mixed with 5 per cent yeast, and kept for oviposition. After four days, the adults were removed and wheat flour with eggs was transferred into fresh plastic containers, thus maintaining a succession of rearing containers for the regular supply of adults of known age for the various tests. The culture was maintained at room temperature of 30 ± 5°C and 70 ± 5% RH throughout the period of study.

Preparation of plant extracts:he leaves of *A. Mexicana* plants were utilised for preparation of extracts. The leaves were dried in glass house for 2 – 3 days and grind into fine powder using mortar and pestle and subjected to ethanolic extract preparation. Ten grams of grinded leaf was extracted with 100 ml of ethanol kept on rotary shaker for 24 hrs. Thereafter, it was filtered and centrifuged at 5000 rpm for 15 min. The supernatant was collected and the solvent was evaporated to make the final volume one-fifth of the original volume (17 ml). It was stored at 4° C in air tight bottles for further studies.

Repellency test: The *in vitro* insect repellent activity of *A. Mexicana* tests were carried out against *T.castaneum*. Filter-paper circles of 9 cm diameter were cut into two equal halve. One ml extracts were uniformly applied with a pipette on one half at the concentration of 30 %. Another half was treated with acetone alone served as control. The treated half-circles were air-dried until the solvent was totally evaporated. The treated and the untreated half-circles was attached lengthwise, edge-to-edge to a control strip with cellulose tape on the reverse side and kept on the Petri dishes. Ten adult insects were released on each dish. Weevils present in each half circle were counted at 1, 3, 5, 7, 9 & 24 hours after treatment. Each treatment was replicated four times.

Data were converted to express percentage repulsion (PR) using the following formula: PR (%) = (Nc – 50) x 2, where Nc is the percentage of weevils present in the control half. The experiment was replicated four times for each treatment.

Results and Discussion: Repellent activity of *A. mexicana*was tested at 30% concentration against *T. castaneum*, *S. oryzae*and *R. dominica*. Overall repellency of ethanol extracts (30%) of *A. mexicana* against various storage insectsis shown in Table 1. Results revealed that the test plant material showed < 35% average repellency in 1, 3, 5, 7, 9 and 24 hour time interval against *T.castaneum*. At 10% concentration, repelled maximum (35%) *T. castaneum* beetles in 1 hour and minimum (15%) in 5, 7, 9 and 24 hours. Very low repellent activity of test plant was observed against *R. dominica*. Among all the time intervals, only after 5 and 7 hrs little

repellency (5%) could be observed towards *R. dominica*. The maximum repellency was exhibited by the extracts of *A. mexicana*against the *S. oryzae*after 24 hrs which showed 55.0 percent average repellency. However, the repellency towards *S. oryzae* was only 10 % after 1 hr which fluctuated 30-40 % from 2 to 9 hrs and showed its peak after 24 hrs.

The results of preliminary investigations suggest that, *A. Maxicana* extract was found most effective in the repellency against *S. oryzae*. Repellency values generally altered from one exposure time to the other and appeared to stabilize with longer exposure time i.e., 10, 40, 30, 40, 35 and 55 per cent at 1, 3, 5, 7, 9 and 24 hour respectively. The maximum repellency was observed with increase in time. It may be because of plant containing maximum flavonoids, alkaloids and other secondary metabolites which are responsible for repelling the insects.

No past work was found in the literature where the same type of plant extracts, which were used in the present study, was used previously against test insect. However, results of some previous research work may be comparable with the present findings. It is of worth mentioning that variations may exist in this comparison which may be due to several reasons e.g. the laboratory and environmental conditions, insect species, commodity differences etc.

Pretheep Kumar *et al*. [4] found that an extract of protein enriched bean flour had a high level of repellency on *S. oryzae*. They found 76.3% and 91.2% of repellency with a concentration of 0.1% and 1% of extract, respectively. After 48 h assay was initiated. Ethanol extract of *Clerodendruminerme*L. (Verbenaceae) and *Withaniasomnifera*L. (Solanaceae) can be used for the protection of stored wheat from infestations of *S.oryzae*[5] Leaf extract at 2.5% in *C. rotundus*showed that the lowest repellency percentage of 6.78 and followed by *S. melongena*13.3 against *S. oryzae*. On the other hand the higher repellency effects were obvious at higher concentrations in both the plants (51.7 and 56.6, respectively at 50%)[6].

Some of the botanicals were evaluated to test the repellent activity against three stored pests. Lemon grass showed maximum repellency of 39.75% against *Oryzaephilussurinamensis*. Habulas extract showed maximum repellency of 64.05% against *T. castaneum*and Datura extract showed maximum (31.67%) repellency against *Callosobruchuschinensis*[7]. Muhammad [8] evaluated some of the indigenous medicinal plants as a repellents *viz.*, *Amaranthushybridus*(Cholai), *Calotropisprocera*(Ak), *Salsolabaryosma*(Kharbooti) and *Cuminumcyminum*(Zeera) was evaluated against redflour beetle, *T. castaneum*. Out of which *C. cyminum*exhibited the maximum repellency (90%) followed by *S. baryosma, C. procera, A. hybridus*(80%, 70 % and 65% respectively).

In another study, Shayesteh and Ashouri[9] evaluated the repellency of four powdered spices, black pepper (*Piper nigrum.*), chili pepper (*Capsicum annuum*), cinnamon (*Cinnamomumaromaticum*) and turmeric (*Curcuma longa*), against *R. domonica*. The results showed that, at the highest concentrations and intervals, wheat grains treated with cinnamon powder were the most repellent to adults of *R. dominica*(up to 58.75% after 24 h). These findings do not agree with the results observed in the present work, in which *A. maxicana* extract showed very little repellent activity.

We can conclude that ethanol extracts obtained from leaves of *A. maxicana* has moderate effect of repellency on adults of *T. castaneum* and *S. oryzae*butvery least on *R. dominica*.

Table 1: Mean percentage repellency of *A. mexicana*extract against *Triboliumcastaneum, Sitophilusoryzae*and *Rhizoperthadominica*

Insect pests	**Mean Percentage Repellency (PR)* value after**					
	1 hr	3 hrs	5 hrs	7 hrs	9 hrs	24 hrs
T. castaneum	35	20	15	15	15	15
R. dominica	00	05	05	00	00	00
S. oryzae	10	40	30	40	35	55

*PR (%) = (Nc – 50) x 2, where Nc is the percentage of weevils present in the control half.

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