

Studies on the repellent properties of *Calotropis gigantea* R. Br. plant parts against important storage insect pests

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Abstract : Repellent activity of the milkweed plant, *Calotropis gigantea* R.Br. was evaluated against important storage pests such as *Callosobruchus maculatus* (Fab.), *Sitophilus oryzae* Linn, and *Tribolium castaneum* (Herbst). Leaf, flower, stem, root and whole plant were Soxhlet extracted by using petroleum ether solvent and repellency test was carried out using glass olfactometer. Whole plant extract at 5 per cent concentration had maximum repellent effect followed by leaf, flower, stem and root extracts.

Keywords: Milkweed plant, plant part powders, storage insect pests, repellency.

Introduction

Biopesticides obtained from plant sources are safer, devoid of residue problems and almost negligible application risks as compared to synthetic chemical pesticides (Banerji *et al.*, 1985). *Calotropis gigantea* R.Br. (Family: *Asclepiadaceae*) grows profusely with a wide distribution in India and the world over. It is known to have insecticidal (Solunke and Deshpande, 1991), antifeedant (Pari *et al.* 1998) and nematicidal properties (Philip *et al.* 1993). Stored grains were damaged by various species of insect pests among which the most important pests were pulse beetle, *Callosobruchus maculatus* (Fab.) (Pereira, 1983), rice weevil, *Sitophilus oryzae* Linn. (Koura and El Halfway, 1967) and the red flour beetle, *Tribolium castaneum* (Herbst) (Malek, *et al.* 1996).

Materials and Methods

Fresh *C. gigantea* whole plants were collected and they were shade dried for three months. Leaf, flower, stem and roots were separated, soxhlet extracted (using petroleum ether (bp-60°C) solvent and different concentrations (1 to 5%) were prepared separately. Whole plant extract was prepared by mixing equal

proportion of leaf, flower, stem and root extracts.

Test insects such as *C. maculatus*, *S. oryzae* and *T. castaneum* were reared in cowpea, maize and wheat flour respectively. A glass olfactometer was used to find the repellent properties of the plant extracts against *T. castaneum*. The olfactometer consisted of a middle glass chamber (60 mm diameter) from which six equally spaced tubes (20 cm length and 2.5 cm diameter) project outwards. The middle chamber had an opening of 2.5 cm diameter. The distal end of each arm was attached with a glass beaker (7 cm diameter and 9 cm height). Seeds such as cowpea, maize and groundnut were taken for conducting experiments for *C. maculatus*, *S. oryzae* and *T. castaneum* respectively.

Five grams of above said seeds were dipped in different concentrations (1 to 5 per cent) of Soxhlet extracts of *C. gigantea* plant parts for 15 min separately and air-dried for 10 min. After air drying, treated seeds were placed in the arms of olfactometer and five days old sixty above said insects were released. In control, seeds were dipped in water. Each

Table 1. Impact of *C. gigantea* plant extracts on the orientation behaviour of test insects

Test Insects	Plant parts used for extraction	EPI values (%) at concentrations					Control
		1	2	3	4	5	
<i>C. maculatus</i>	Leaf	- 0.6957	- 0.7727	- 0.8140	- 0.8571	- 0.9024	0.02
	Flower	- 0.6098	- 0.6500	- 0.7368	- 0.7838	- 0.8333	0.01
	Stem	- 0.5789	- 0.6210	- 0.6667	- 0.7143	- 0.7647	0.04
	Root	- 0.4857	- 0.5294	- 0.5758	- 0.6250	- 0.7333	0.02
	Whole plant	- 0.7647	- 0.8000	- 0.8750	- 0.9565	-1.0000	0.01
<i>S. oryzae</i>	Leaf	- 0.7391	- 0.7778	-0.8182	- 0.8605	- 0.9048	0.05
	Flower	- 0.6667	- 0.7073	- 0.7500	- 0.7949	- 0.8421	0.02
	Stem	- 0.5787	- 0.6216	- 0.6667	- 0.7143	- 0.7647	0.03
	Root	- 0.5000	- 0.5429	- 0.5882	- 0.6875	- 0.7419	0.01
	Whole plant	- 0.7500	- 0.7872	- 0.8261	- 0.9091	- 0.9535	0.02
<i>T. castaneum</i>	Leaf	- 0.5455	-0.6585	-0.7436	-0.8378	-0.9429	-0.03
	Flower	-0.4359	-0.5263	-0.6000	-0.7500	-0.8667	-0.04
	Stem	- 0.3143	-0.4375	-0.4839	-0.6429	-0.7692	-0.05
	Root	- 0.2571	-0.4194	-0.4667	-0.6296	-0.7600	-0.01
	Whole plant	- 0.6250	-0.7333	-0.8140	-0.9024	-1.0000	-0.02

EPI = Excess Proportion Index Values are the mean of four replications

treatment was replicated four times. The repellent property of the *C. gigantea* was tested by choice test. After three hours, the number of beetles present in each concentration were recorded. From the values obtained the repellency was observed and defined in terms of Excess Proportion Index (EPI) according to Sakuma and Fukami (1985). EPI defined as follows.

$$EPI = \frac{NS-NC}{NS+NC}$$

Where,

NS = Number of insets in the sample side and

NC = Number of insets in the control side

EPI values were ranged from +1 to -1. These terms simply express polarity of the directional choice. Positive and negative values indicate positive and negative approaches respectively.

Results and Discussion

Results of the experiment were summarized in the Table 1. Which showed that All the test insects viz, *C. maculatus*, *S. oryzae* and *T. castaneum* avoided feeding on cowpea, maize and groundnut seeds treated with Soxhlet extracts of *C. gigantea* leaf, flower, stem, root and whole plant. The results clearly indicated

