
Evaluation of some plant products for their oviposition deterrent properties against the *Callosobruchus maculatus* (F.) on Chik pea seeds

Ravinder Singh*

Institute of Biotechnology and Allied Sciences, Piparali road Sikar, Rajasthan India.

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Investigated six plant extracts viz., kaner leaf extract (*Nerium indicum*), khejri leaf extract (*Prosopis cineraria*), neem leaf extract (*Azadirachta indica*), safeda leaf extract (*Eucalyptus globulus*), tomato leaf extract (*Lycopersicum esculentum*) and mustard seed extract (*Brassica campestris*) and four plant powders viz., black pepper powder (*Piper nigrum*), garlic clove powder (*Allium sativum*), tulsi leaf powder (*Ocimum sanctum*) and turmeric rhizome powder (*Curcuma longa*) were evaluated for their oviposition deterrence properties against *Callosobruchus maculatus* (F.). Three doses (0.5, 0.75 & 1.0ml/100gm or gm/100gm) of each plant product were tested in the present studies. The maximum oviposition deterrence (55.86%) was recorded with neem leaf extract at the highest dose level (1.0ml/100gm) and minimum (36.98%) with garlic clove powder at lowest dose level (0.5gm/100gm). An increase in oviposition deterrence was noted with an increase in treatment dose for various protectants. All the doses of different plant protectants showed significant reduction in fecundity of test insect in comparison to control. The reduction in fecundity may be attributed to the toxicity of plant extracts and plant powders, affecting the normal physiology of the insects.

Key words: Plant extracts, Plant powders, oviposition deterrence, *Callosobruchus maculatus*

Introduction

Chick pea (*Cicer arietinum*) is also known as Bengal gram or gram. It is one of the most important drought tolerant pulse crops grown in the arid and semi-arid regions of Rajasthan and north-western areas of India (Tropic areas). The bruchid *Callosobruchus maculatus* (F.) is one of the major pest of pulses capable of attacking wide range of legume viz., green gram, black gram, chick pea, pigeon pea and lentils (Sharma, 1984) and causes 50% damage during storage in 3 to 4 months (Caswell, 1981). The larvae bore into the pulse grains which become unsuitable for human consumption, decrease in seed germination

* Corresponding author: Ravinder Singh; e-mail: ravijeet_entomology@ymail.com

potential and commercial value (Booker, 1967). In India 7% of total pesticides production is used to control pests in pulses and oil seeds. Application of chemical insecticides and fumigants is not advisable as seeds are used for consumption (Talekar and Linn, 1932). The use of botanical pesticides in controlling insect pests is considered to be the most viable and environmentally safe approach to offset ever increasing danger caused by synthetic pesticides (Saxena, 1982). Various plant powders and their extracts have been reported to possess insecticidal, oviposition deterrent and ovicidal activity against bruchids and some other insects (Siskos, 2008 and Nymador, 2010). Hence the present study was undertaken evaluate the deterrent effect of plant extracts and plant powders ten indigenous plants on oviposition of *C. maculatus* in stored green gram seeds.

Materials and methods

Preparation of Plant Powders and Plant Extracts

Fresh leaves of neem, kaner, khejri, safeda, tomato and tulsi were collected from the plants in and around Khalsa College Campus, Sri Ganganagar, in polythene bags for testing prospective protectants against pulse beetle. The collected leaves were washed and shade dried for about one week. The fine powders of these plant materials were prepared by grinding in pestle mortar and used for extraction. Extracts were prepared by Soxhlet extractor, using 30 gm of leaf powder of each plant with 300 ml of acetone solvent. After eight hours of continuous extraction the final extract was kept as stock solution (100%). The stock solutions of different plant extracts were kept in glass bottles for experimental study. Other test materials *viz.*, black pepper, garlic clove and turmeric rhizome were purchased from the local market and dried under sun light for ten days. All the plant materials were grinded to powder, sieved and kept separately in polythene bags for testing as protectants against pulse beetle *Callosobruchus maculatus* (F.) infesting selected pulse. Mustard oil was purchased from local market.

The oviposition deterrent studies were performed by applying selected plant extracts *viz.*, kaner leaf extract (*Nerium indicum*), khejri leaf extract (*Prosopis cineraria*), neem leaf extract (*Azadirachta indica*), safeda leaf extract (*Eucalyptus globulus*), tomato leaf extract (*Lycopersicum esculentum*) and mustard seed extract (*Brassica compestris*) and plant powders black pepper powder (*Piper nigrum*), garlic clove powder (*Allium sativum*), tulsi leaf powder (*Ocimum sanctum*) and turmeric rhizome powder (*Curcuma longa*) in specific doses of each on chick pea seeds and kept along with control. Each treatment was replicated thrice. Sample of 250 seeds of each pulse was drawn from each

cloth bag and separated into five lots, each lot having 50 seeds was stored in glass jars (16x8cm) and five pairs of newly emerged (0-24 hours old) of *C. maculatus* (F.) were introduced in each container. Untreated seeds were used as control. After 15 days, number of eggs laid on treated and control seeds was recorded and the percentage of oviposition deterrence calculated using the formula.

$$\text{Percentage of O.D.} = \frac{\text{No. of eggs laid on control seeds} - \text{No. of eggs laid on treated seeds}}{\text{No. of eggs laid on control seeds}} \times 100$$

Where, O. D. = Oviposition Deterrence

Results and discussion

The per cent oviposition deterrent of *C. maculatus* (F.) after treatment with plant products under study recorded in green gram have been presented in Table 1 and depicted by Fig. 1. The mean per cent of oviposition deterrent of test insect at different dose levels ranged from 44.20 to 47.40 per cent. Regarding different plant extracts and plant powders, the mean oviposition deterrent property ranged from 45.01 to 48.40 per cent, being maximum percentage of oviposition deterrent in neem leaf extract treatment with (55.86) followed by khejri leaf extract, tulsi leaf powder, kaner leaf extract, mustard seed extract, tomato leaf extract, safeda leaf extract, turmeric rhizome powder, black pepper powder and garlic clove powder with 55.11, 53.77, 50.31, 48.44, 44.84, 42.87, 4.56, 38.54 and 36.98 per cent respectively. All the doses of different plant protectants significant increased in reducing fecundity of test insect in comparison to control.

Table 1. Effect of different plant protectants as oviposition deterrents of *Callosobruchus maculatus* in chick pea.

Dose ml/100 mg or mg/10 0 gm	Percentage Oviposition Deterrence										Mean
	Plant Powder and Plant Extracts										
	Kaner leaf Extracts	Khejri leaf Extracts	Mustard seed Extracts	Neem leaf Extracts	Safeda leaf Extracts	Tomato leaf Extracts	Black pepper Powder	Garlic clove Powder	Tulsi leaf Powder	Turmeric Rhizome Powder	
0.5	48.53 (44.04)	52.79 (46.39)	47.13 (43.41)	53.09 (46.63)	40.06 (39.24)	43.44 (41.23)	37.72 (37.86)	36.14 (36.93)	51.16 (45.64)	40.01 (40.92)	45.01 (42.23)
0.75	50.01 (45.09)	54.75 (47.71)	48.93 (47.71)	56.39 (48.68)	43.36 (41.18)	44.82 (42.01)	37.99 (38.02)	37.26 (37.61)	54.12 (47.00)	40.09 (38.85)	46.77 (43.39)
1.0	52.39 (46.38)	57.79 (48.68)	49.25 (48.68)	58.09 (49.66)	45.20 (42.23)	46.25 (42.83)	39.90 (39.45)	37.54 (37.76)	56.03 (48.48)	41.56 (40.17)	48.40 (44.43)
Mean	50.31 (45.17)	55.11 (47.59)	48.44 (46.60)	55.86 (48.32)	42.87 (40.88)	44.84 (42.02)	38.54 (38.44)	36.98 (37.43)	53.77 (47.04)	40.56 (39.98)	
				Sem ±	Sed	C.D. at 5%	C.V (%)				
Treatment				0.31	-	0.86					
Concentration				0.17	-	0.47	2.14				
Treat x Conc.				-	0.64	1.77					

Data based on 25 individuals (Five replications of 5 pairs each), Value in parenthesis () = percentage transformed to angle; out side values are its back transformation to percentage, Treat = Treatment, Conc.= Concentration

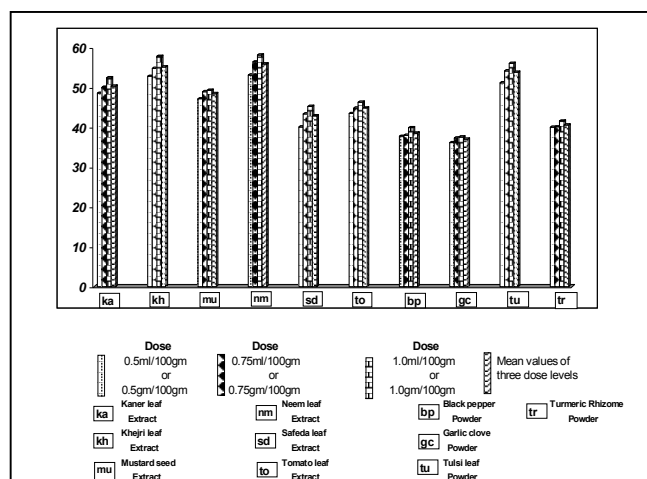


Fig.1. Effect of different plant protectants as oviposition deterrents of *Callosobruchus maculatus* in chick pea

The interaction between plant protectants and treatment doses was found to be significant. In all the plant extracts and plant powders the highest doses proved significantly effective over lower doses.

Neem plant parts in different forms have also been used by several workers (Jotwani and Sircar, 1965 and Mathur *et al.* 1985) in the studies of plant protectants for combating infestation of seeds by *C. maculatus* / *C. chinensis*. Mathur *et al.* (1985) observed a reduction in oviposition of *C. chinensis* by using neem kernel powder. High anti-ovipositional activity of neem oil has also been shown in *C. maculatus* by Naik and Dumbre (1984).

In present studies, all the doses of mustard seed brought significant reduction in oviposition of *C. maculatus*. These results get corroborated with the Verma and Pandey (1978) who observed the inhibition of the fecundity of *C. maculatus* by mustard oil at 0.3parts/100parts of green gram seeds. Bhargava and Meena (2000) also found significant reduction in oviposition of *C. chinensis* by mustard oil at 1.0ml/100gm on cow pea seeds. The significant reduction in oviposition of *C. maculatus* by *Eucalyptus* leaf extract has also been reported earlier by Gehlot and Singhvi (2006).

All the doses of turmeric rhizome powder, black pepper powder and garlic clove powder significantly reduced the oviposition of *C. maculatus* in the present investigation. These results are in agreement with that of Tripathi *et al.* (2002) who observed reduced oviposition of *Tribolium castaneum* by *Curcuma longa*. Mathur *et al.*, (1985) also reported similar effect of black pepper on *C. chinensis*. The treatment of garlic clove powder at 0.5, 0.75 and 1.0ml/100gm seed reduced the fecundity in *C. maculatus* in the present studies. Tulsi and khejri leaf extract at all concentrations level reduced the oviposition effectively

as compared to control. Not much work on the effect of tulsi and khejri on the percentage of oviposition deterrence of *C. maculatus* is available, except that of Gehlot and Singhvi (2006) who reported significant reduction in oviposition of *C. maculatus* with tulsi leaf extract and khejri leaf extract.

Effectiveness of kaner and tomato leaf extract were in reducing the fecundity of test insect in present investigation get corroborated with studies of Mathur *et al.* (1985) who reported significant reduction in oviposition of *Tribolium confusum* on *Oryza sativa* by kaner leaf extract.

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