

Repellent activity of *Callisobruchus maculatus* by *Annona squamosa* extract

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ABSTRACT

Annona squamosa is commonly known as custard apple. Chloroform extract showed *Callisobruchus maculatus* using Petridish method. The repellency lasted for 50 hours period in the plant extract these of for it declines. Preliminary phytochemical screening of the plant extract indicates the presence of sesquiterpene which is yet to be ascertained.

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Key words : *Annona squamosa*. *Callisobruchus maculatus*, Repellent activity, Extract.

INTRODUCTION

Insects are most abundant fauna on earth. Variety of them are harmful to man among which insect of family Bruchidae has obvious economic importance because they breed on grain legume and consume valuable protein that would otherwise be eaten by man. The organic insecticides although highly efficacious against target species of insect but can be detrimental to a variety of animal life including man. The spray of insecticide crop pest as well as to the stored grain to the godowns, through food grains reach to the human being which effect health adversely. Therefore, kind of safe insecticide or repellent for use on stored grains, in this direction, it was thought essential to investigate the natural products as potent biocidal compound to be used.

Repellency is another mode of insect control through natural plant products, which could induce toxic effects to

the target organism prior to their coming closure to the compound. Repellent property of neem seed (*Azadirachta indica*) to certain stored grain pest has been shown much earlier by Jotawani and Sircar (1965), Pandey *et al.*, (1976) who have described the use of some plant powders, oil and extracts as protectants and repellents against *Callosobruchus chinensis*. Bhuyan *et al.*, (1974) reported the repellent property of oil fraction of Garlic, *Allium sativum* against mosquito vector. Deshpande *et al.*, (1974), Kloke and Kubo (1982) and Koul (1983) have described the different fatty acids and terpenoids to possess biologically activities including repellency against various insect pests. The present report pertaining to repellent activity to *Ocimum sanctum* against *C. chinensis* is continuous effort for stored grain pest management (Dixit and Saxena *et al.*, 1990; Saxena and Saxena, 1992).

Almost all the insect pests of stored grains have a remarkably high rate of multiplication and within one season they may destroy 10-15 per cent of grains and contaminate the rest with undesirable odours and flavours. Various plant products reported to possess chemicals preventing insect attacks have been used as stored grain protectants. Merit reevaluation for their potential was environmentally safe and commercially viable compounds for their pest control.

The effectiveness of many secondary plant metabolites for use against grain pests have been reviewed by Burnett *et al.* (1974), Jscobson (1975) and Ketkar

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Table 1 : Percentage yield of crude extract by soxhlation

Sr. No.	Name of the plant	Solvent	Weight of powderd material (g)	Volume of solvent (ml)	Weight of extract (g)	Yield %
1.	<i>Annona squamosa</i>	Petroleum_ether	45g	410ml	2.45g	5.4%
		Chloroform	45g	400ml	3.14g	6.97%
		90 Methanol	45g	250ml	5.55g	12.3%
		Water	200g	400ml	10.90g	5.45%

(1976). Secondary metabolites belonging to the alkaloids, sesquiterpene lactones, steroids, phenyl propanes, coumarins, flavenoids and other class of compounds have shown of deter feeding of insects (Levinson 1976; Nawrot *et al.*, 1985; Jilani *et al.*, 1988; Zehnder and Warthen, 1988; Koul and Isman, 1990). Apparently some of the compounds are not only strong as antifeedants but also disturb insect as repellents due to their strong odoriferous nature.

Rodriquiz *et al.* (1976), Kielezewski *et al.* (1979), Nawrot *et al.* (1985) and Shrivastava *et al.* (1990) have reported that plant extracts containing constituents of sequiterpene lactones possessed the greatest feeding deterrent and repellent activity of *Sphaerathus indicus* L. (Asteraceae) extract against *Callosobruchus chinensis* a stored grain pest.

Kokate and Chintalwar (2003) have reported insect repellent activity of certain plant extract against pulse beetle *Callosobruchus chinensis*. Dixit and Saroj (1998), have reported insect repellent activity and juvenile mimicking activity of essential oil of *Tridax procumbens*.

Annona squamosa (Leaves). The compound isolated from this plant mainly consists of terpenoids which are extracted from the plant tissue, either in petroleum ether, or chloroform. The terpenoids are mainly present in essential oil which have volatile substance with characteristic odour and smell. Pest control and Ayurvedic Drug Research Laboratory has been engaged for the last two decades in isolation of pesticides compounds of plant origin and over twenty six plants of more than twelve families have been screened for biocidal activity on Dipterean, Coleopterean, and Lepidopterean insects.

Thus, the losses of pulses during storage due to these pests is a serious problem of our country. Therefore, the present study focused on the control of major obnoxious insect pests *viz.*, *Callosobruchus maculatus* by plant pesticides. The present paper report the repellent activity of *Annona squamosa* against *Callosobruchus maculatus*.

MATERIALS AND METHODS

The plant belonged to family Annonaceae were collected from the surrounding area. Leaves of *Annona squamosa* after collection were washed thoroughly in tap water and shade dried. Loss in weight was calculated. Percentage yield of crude extract was worked out (Table1).

Rearing of *Callosobruchus maculates*:

The seeds of green gram, black gram and Bengal gram were cleaned, washed with tap water air dried and subjected to a temperature of 60°C for 6hours to eliminate any insect infestation. Later, they were conditioned for 24 hours at 55-65 per cent R^H and 24⁺ -2°C temperature. A culture of pulse beetle, *Callosobruchus chinensis* was developed on conditioned green gram, black gram, Bengal gram seeds from a single gravid female. All experiments were conducted at temperature of 28⁺ -2°C and 60-70 per cent R^H.

Bioassay repellency activity:

The experiments were conducted in Petri dish containing filter paper (Whatsman no.1) divided in to two equal halves A and B section. A were treated with petroleum ether, chloroform and methanol at three different concentrations 1, 2 and 3. The treatments were replicated three times and 20 freshly emerged adult beetles were released in each trial. Repellency was measured by visual observation at every two hours intervals for period of total 50 hours.

RESULTS AND DISCUSSION

The results obtained from the present investigation are presented below:

Repellent activity of *Annona squamosa*:

When three different concentrations of *Annona squamosa* were used against the *Callosobruchus maculates* in *Phaseolus radiates* seeds, more than 50 per cent of adults were repelled from filter paper sections

Table 2 : Percentage of *Callosobruchus maculatus* beetles repelled from *Annona squamosa*

Extract	Concentration %	Average percentage of repellency at hour after treatment					Mean
		10	20	30	40	50	
Petroleum ether	1	65.00	56.66	51.66	43.33	38.00	50.93
	2	71.66	66.66	60.00	53.33	48.33	59.99
	3	86.00	73.33	76.66	68.33	61.66	73.19
Chloroform	1	63.33	56.66	48.33	41.66	35.00	49.00
	2	78.33	71.66	63.33	58.33	51.66	64.66
	3	88.33	80.00	76.66	70.00	63.33	75.66
Methanol	1	48.33	43.33	41.66	41.66	35.00	41.99
	2	61.66	61.66	56.66	50.00	51.66	56.32
	3	75.00	71.66	70.00	66.66	63.33	68.33

treated with 2 and 3 per cent concentration for entire 50 hours period.

It was seen that after 50 hours maximum repelled adult insects were seen in chloroform extract. 3 per cent concentration repelled 75.66 per cent, where as 2 and 1 per cent caused 64.66 per cent and 49.00 per cent repellency, respectively. Thus, the chloroform extract of *A* proved to be highly effective (Table 2).

Repellent activity of plant products in another form of insect control measure. The repellents are compound which keeps the insect away from the food or sources without killing them. This mode of insect control is effective for few hours to few days only. The repellent when given as a treatment deters the insect away from the sources. The repellent of plant origin may cause the insects to deter from the feeding of food grain for some times. Repellency varies from compound to plant. Repellent can be extracted from leaves, flowers and stem parts of plants. Repellents are generally essential oil with pungent oil odour.

Therefore, repellents are extracted in fresh tissue without necrosis using hydro distillation method. They were kept carefully in Refrigerator using toluene as preservative so as to avoid fungal infection. They are generally volatile compounds. The repellent experiment was conducted in Petri dish containing Whatman paper no. 1 divided into equal half A and B section. Section A was treated with petroleum ether, chloroform and methanol separately sprayed in Petri dish. Whereas section B was unsprayed of the compound, 20 freshly emerged adult beetles were released in each replicate using three different concentrations. The repellency was observed visually up to 50 hours of the treatment. The present findings have been mentioned in Table 2.

It was noticed that maximum repellency of 75.66 per cent was found in chloroform extract when average of

three replicates taken. Repellency in *Sphaeranthus indicus* extract against *Callosobruchus chinensis* reported by Baby (1997), who has noticed that isolated compound of plant showed strong repellent activity at 0.04 per cent concentration on filter paper test.

The difference in repellency as observed in the present study was due to use of crude extract. In present study maximum 75 per cent repellency was quite similar to Baby (1997). During the experiment, it was also noticed that *Callosobruchus maculatus* avoided going in to the treated arm of disc. It was noticed to be maximum case of chloroform extract (78.8 per cent). Repellent activity in various plant extracts against *C. chinensis* has reported by Kokate and Chintawar (2003). They have noticed maximum (80.83 per cent) repellency of crude extract of plants, *Mentha arvensis*, *Ocimum sanctum* and *Mentha azadirachta*, which have also equally good as a repellent. Shukla *et al.* (1989) have also described the repellency of volatile component in *Foeniculum vulgare* against *Tribolium castaneum*. The observations made in present study reported the additional information the adjusting literature that plant *Annona squamosa* may also be used for exploitation of repellent compound in the plant.

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