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Repellent Effect of Indigenous Plant Bhat (*Clerodendron Viscosum* L.) Leaf on *Tribolium Castaneum* Herbst

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Abstract

Repellent response of Bhat (*Clerodendron viscosum* L) to adult and larvae of *Tribolium castaneum* was studied. Results indicated that both the adults and larvae were repelled by contact with food medium treated with Bhat leaf dust conditioned with 100, 500, 1000 and 2000 ppm of flour.

Introduction

The flour beetle, *Tribolium castaneum* attacks a wide variety of food including maize, bran, rice, flour, wheat and wheat flour, barley flour, suji etc. Numerous workers have used chemical insecticides to control the pests with varying degrees of success.[1-4] All of them used chemical insecticides to control the pest. Many workers tried to explore the possibilities of using plant products as grain protectant.[5,6] Sreenivasamurthy and Krishnamurthy reported that turmeric (*Curcumma longa* L.) power have long been used as an ant repellent in India and Africa.[7] Jilani and Malik demonstrated repellency of water and ethanol extracts of neem (*Azadirachta indica* A.Juss) leaves and seeds against adult and larvae of red flour beetle, *Tribolium castaneum*.[8] Husain *et al*. worked on the effects of methanolic extracts of biskantali (*Polygonum hydropiper*) on *T. castaneum*.[5] Chemical control of insect pests of field crops and stored foods has run into increasing difficulties due to the development of resistance and other long term danger to both man and animals. To overcome the situtaion emphasis is now being on the screening of antifeedants. Insect antifeedants prevent or inhibit the feeding of insects. Such substances may be naturally present in plants. Screening of these plants is important in discovering safe and biodegradable alternatives to synthetic insecticides. It is, therefore, advisable to utilize non-chemical methods to reduce the amount of insect damage during storage. No published information is available on the effect of the indigenous plant, bhat (*Clerodendron viscosum*) against the flour beetle, *Tribolium*. In the present investigation, attempts were made to evaluate the repellent effect of this plant material used as grain protectant against *Tribolium* infestation. Repellent

effect of the material on *T. confusum* adults is also incorporated here.

Materials and Methods

Leaves of bhat were collected from the field, sun dried and powdered in grinding machine and then sieved through a 80 mesh sieve. The powder thus obtained was mixed with wheat flour to prepare 100, 500, 1000 and 2000 ppm concentrations.

Petri dishes (15 cm diameter, 2 cm deep) were used to study the response of *T. castaneum* to contact with bhat dust. For this experiment fresh food was treated with bhat leaf dust by adding the appropriate amount and mixing thoroughly in a blender. Concentra-tions of 100, 500, 1000 and 2000 ppm bhat dust were used in the experiment. The experiments were replicated five times for each treatment. Each replicate contained 20 adults and larvae separately. Fresh insects were used throughout the experiment. Wheat flour was used as food media in the experiments.

Experiments on the response to contact with bhat leaf were conducted in Petri dishes. The dish was divided into two equal halves by a mark on the outside surface. Using a partition, one half of the dish was loaded with untreated food medium (2g) and the other half with 2g of food treated with the plant dust. After loading, the partition was removed and 20 larvae were released at the middle of the dish. This provided an option for the larvae to select either the untreated medium or the medium treated with bhat. The petri dish was placed in an incubator set at 30^{O} C. The similar experiments were conducted with the adults.

After 24 hours the petridish was removed from the incubator and *Tribolium* larvae and adults were collected from each half, their numbers were counted and recorded.

Results and Discussion

The results of the experiment are shown in Tables I, II and III. Results were tested using chisquare analysis based on an expected distribution of 50:50 Both adults and larvae were found to be repelled by the medium treated with dust of bhat leaf.

From the results shown in Tables II and III, it was found that the adults were repelled by the flour medium treated with bhat dust at all concentrations of the medium, exception being with the 1000 ppm concentrations, where insignificant repulsion is observed. This repellent result of *Tribolium* agrees with the findings of Jilani and Malik[8] who reported that adult *Tribolium castaneum* was repelled by water and *Tribolim* adults and ethanol extracts of neem (*Azadirachta indica* A Juss). In the present experiment the *Tribolium* adults and larvae were in contact with the treated medium, so the repulsion may be due to contact with bhat leaf dust. The larvae were highly repelled particularly, the older larvae (Table I).

Table I. Number of *Tribolium castaneum* adults found on untreated flour and flour treated with different concentrations of bhat (*Clerodendron viscosum* L.)

Larval instar	Concentrations of dust (ppm)	Distribution of the lervae		χ^2(1df)
		Total numbers on treated flour	Total numbers on untreated flour	
First	100	40	60	4.00*
	500	41	59	3.24*
	1000	39	61	4.84*
	2000	40	60	4.00*
Second	100	37	63	6.67**
	500	38	62	5.76*
	1000	39	61	4.84*
	2000	40	60	4.00*
Third	100	33	67	11.56***
	500	32	68	12.96***
	1000	33	67	11.56***
	2000	36	64	7.84**
Forth	100	29	71	17.64***
	500	30	70	16.00***
	1000	35	65	9.00**
	2000	36	64	7.84**
Fifth	100	20	80	36.00***
	500	23	77	29.16***
	1000	24	76	27.04***
	2000	25	75	25.00***
Sixth	100	21	79	33.64***
	500	20	80	36.00***
	1000	22	78	31.36***
	2000	24	76	27.04***

Five replicates per test, each replicate consisting of 20 adults (N = 100)

*** Highly significant, P>0.001, ** Significant, P>0.01, * Significant, P>0.01

The results of the present experiment is similar to those of Pinniger[2] working with malathion and fenitrothion and Prickett and Ratcliffe[3] working with Pyrethrin, bioresmethrin, lindane and DDT, who reported that *T. castaneum* adults were repelled by the

Table II. Number of *Tribolium castaneum* adults found on untreated flour and flour treated with different concentrations of bhat (*Clerodendron viscosum* L.)

Concentrations of dust (ppm)	Distribution of the adults		χ^2(1df)
	Total numbers on treated flour	Total numbers on untreated flour	
100	40	60	4.00*
500	41	59	3.24*
1000	39	61	4.84*
2000	43	57	1.96 N.S

Five replicates per test, each replicate consisting of 20 adults (N = 100)

* Significant, P>0.01, N. S. = Insignificant, P<0.01

Table III. Number of *Tribolium castaneum* adults found on untreated flour and flour treated with different concentrations of bhat (*Clerodendron viscosum* L.)

Concentrations of dust (ppm)	Distribution of the adults		χ^2(1df)
	Total numbers on treated flour	Total numbers on untreated flour	
100	41	59	3.24*
500	40	60	4.00*
1000	36	64	7.84**
2000	37	63	6.66*

Five replicates per test, each replicate consisting of 20 adults (N = 100)

** Significant, P>0.01, * Significant, P>0.01

medium treated with these insecticides. A similar result was also reported by Mondal,[6] Mondal and Port,[9] Husain[10] and Hsain *et al*.[11] who reported that the larvae of *T. castaneum* were repelled by methylquinone, pirimphos-methyl. simbush and diazinon, respectively. The results also agree with of the studies of Husain *et al.*[5] who tested the repellent effects of the indigenous plants biskatali (*Polygonum hydropiper*) and ata (*Annona squamosa*) on *Tribolium castaneum.*

The results of the present experiment indicate the possible use of this indigenous plants with in secticidal properties, for the control of *T. castaneum* in warehouse as a repellent. Bags of grains or other stored products treated with this repellent compound may prevent *Tribolium* from attacking and infesting the food and thus the synthesis of this substances commercially may prove to be of practical value in Integrated Pest Management Programmes. The present work demonstrates that larvae *Tribolium* may survive during the treatment of bhat due to its repellent effect. In

a perenninal situation this repellent effect may reduce contact between insects and insecticides that causes a reduction on mortality which is a demerit from the control point of view.

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