

EFFECT OF BAKAIN (*Melia azadarach*) AND AK (*Calatropis procera*) AGAINST LESSER GRAIN BORER “*Rhyzopertha dominica* F.”

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Abstract: The leaves, bark and seeds of Bakain (*Melia azadarach*) and Leaves, bark of Ak (*Calatropis procera*) were tested for their deterrent/repellency in powder form against *Rhyzopertha dominica* F in wheat grain. The data showed that all of the treatments i.e. powders of Leaves, bark and seeds of Bakain and Leaves, bark of Ak significantly deterred/repelled the tested insect (*R. dominica*) in grains compared to control. Best results were obtained with the application of bakain's bark powder with 98.95 percent insect deterrent/repellency of the insect, followed by powder of Ak's leaves and bark of Ak with 89.25 and 86.50 percent deterrent/repellency of *R. dominica* respectively. Seed of bakain with 73.75 percent insect deterrent/repellency was found significantly least effective, followed by leaves of bakain with 82.50 percent repellency of the tested insect.

Keywords: Ak, Bakain, Repellency, *Rhyzopertha dominica*.

INTRODUCTION

Insect pests cause substantial losses (running into millions of rupees) not only to field crops but also to stored grains, fruits, vegetables, etc in storage [Baloch 1992]. About 39 species of insect pests attack the stored grains and grain produce. Out of these the lesser grain borer (*Rhyzopertha dominica* F.) is more important, as it is destructive in larval as well as in adult stages [Irshad 1990].

The adults are powerful fliers and migrate from one godown to another, causing fresh infestation. When the infestation is severe, the adults produce a considerable amount of frass, spoiling more than what they eat. The flour, so produced, serves as nourishment for the young grubs until they are ready to bore into the grain. It not only reduces the quantity but also deteriorate the quality of grain and its products [Atwal 1994].

Huge quantities of synthetic pesticides are being used for the control of insect pests every year in Pakistan. The indiscriminate use of these pesticides is not only hazardous to human beings, but also responsible for disturbing the eco-system. The toxic residue of these pesticides also remains on crop, fruit and vegetables in soil and air [Feenstra *et al.* 2000]. In view of the above limitation and increased cost of synthetic pesticides, the use of plant derived pesticides which are usually much safer and effective have drawn attention of the scientists in this region of the world too. Pyrethrum, rotenone, hellebore, nicotine, veratrum alkaloids and quassin were used prior to the advent of synthetic insecticides. More than 2400 plants have been identified with pest control properties [Grainge and Ahmad 1988].

Islam [1983] tested extracts of seed and leaves of neem, certain indigenous plants and weeds of Bangladesh with hexane, diethyl ether,

95% ethanol, acetone and distilled water. He found that the aqueous and ethanolic extracts of leaves, seed of *Azadirachta indica* and *Melia azadarach* deterred feeding in adults of pulse beetles and early instar larvae of jute hairy caterpillar.

Jilani and Helen [1983] studied rhizomes of *Curcuma longa* (L.) (Turmeric) leaves of *A. indica* (Neem) and leaves of *Trigonella foenum graecum* (L.) (Fenugreek) for their residual deterrent effect against the stored grain insects. Turmeric powder was found most effective against *Sitophilus granarus*, *Rhyzopertha dominica* and *Tribolium castaneum*.

Aziz [1988] used the leaves and bark powder of neem and bakain for protecting legumes and cereal, during storage. He used various doses of leaves and bark powder (5-30 g) for six months. 20-30 g of neem and bakain leaves powder was found effective for 80-90 days against insect pests, whereas the bark powder of same provided protection for 150-180 days which indicated the presence of insecticidal properties in bark.

Patel *et al.* [1993] assessed the efficacy of powdered neem seed kernel at 1,2,3,4 and 5 % in the control of *Rhyzopertha dominica* in stored wheat in laboratory. The dose at 5% was found most effective. At this dose percent damage reduced to 2.55, 3.15 and 7.13% compared to control percent damage of 6.57, 13.6, 24.71% after 32, 64 and 96 days respectively.

Rahim [1998] evaluated the residual activity of ethanolic neem (*Azadirachta Indica*) kernel extract containing azadirachtin in laboratory against *Rhyzopertha dominica* on wheat, stored up to 48 weeks. All treatments in both fresh and residual studies did not have any effect on the mortality of the parents. On freshly treated grains, the application rate of 5mg of azadirachtin was effective in inhibiting F1 progeny production by 98% against three test strains. The minimum application for 95% reduction of F1 progeny of the multi-resistant strain throughout the 48-week storage period was 25mg with complete prevention estimated to occur with 75 mg. The effectiveness of azadirachtin was not synergized by Piperonyl butoxide. The results indicate the persistency of this emulsifiable neem formulation and the potential for field evaluation as grain protectant.

Keeping in view the above facts, present studies were conducted with the objective to test the effectiveness of Leaves, bark, seeds of Bakain (*Melia azadarach*) and leaves, bark of Ak (*Calatropis procera*) in powder form as deterrent/ repellent to *R. dominica* attacking wheat grains.

MATERIALS AND METHODS

Leaves, bark and seeds of Bakain (*Melia azadarach*) and Leaves, bark of Ak (*Calatropis procera*) were collected from different localities of D. I. Khan. These were studied for their deterrent activity against lesser grain borer (*Rhyzopertha dominica* F.).

The plant parts (leaves, bark, seed) were cleaned and shade dried. The leaves and bark were ground to fine powder with the help of electric grinder while the seeds were ground with the help of pestle and mortar.

The Lesser grain borers (*Rhyzopertha dominica* F.) were reared in the environmental chamber. For this purpose 200g of whole wheat was taken in 500 ml glass jar and 10 adult (5 males and 5 females) insects were placed in each glass jar. The open mouth of glass jar was covered with muslin cloth and tied with rubber band. This culture was maintained in dark place (environmental chamber) having 30°C temperature and 60 - 65 relative humidity. The experiments were conducted during summer moths 2003, in the laboratory of Entomology department, Faculty of Agriculture, Gomal University, D. I. Khan, in Randomized complete design with 4 replications. In each treatment 4% concentration of each plant material was mixed with the grains.

For this purpose 8g powder of each plant part was thoroughly mixed with 200 g of un-infested (healthy) wheat grains, while the check (control) wheat sample was kept free from mixing of these plant products. These wheat samples were put in marked bags made of cloth. Ten (5 males and 5 females) adult beetles of *R. dominica* were released in each treated and untreated wheat samples. Data of the residual repellency of plant products recorded at weekly interval upto tenth week on the basis of reduction in number of beetles in the bags of treated and untreated grains. After every weekly count the number of beetle equal to the missing ones in each sample bag were added to make total of ten beetles per bag. Residual repellent effect of plant product was calculated by using the following Abbot's formula;

$$\text{Percent Residual Deterrent Effect} = 1 - \frac{A - B}{A} \times 100$$

where A = Total number of beetles released in bag, B = Number of beetles after one week of application (Post treatment).

The experiments were conducted in R.C. Design and data were analyzed statistically by using Mstatc computer program. The means of treatments were separated by LSD test.

RESULTS AND DISCUSSION

Data regarding reduction in the lesser grain borer (*Rhyzopertha dominica* F) population due to residual repellent effect of Leaves, bark and seeds of Bakain (*Melia azadarach*) and Leaves, bark of Ak (*Calatropis procera*), after different durations is presented in Table 1.

The data showed that after one week of application of seeds, leaves, bark of bakain and leaves, bark of Ak in powder form significantly repelled the test insect (*Rhyzopertha dominica* F) compared to control. Best results were obtained with application of powder of leaves and bark of Ak. Both of these plants products repelled 100% lesser grain borer attacking stored wheat grains, followed by bark and seed of bakain with 97.50 and 95.00%

repellency respectively of the tested insect. All of these plants products were found non-significantly different from each other. Leaves of bakain were found significantly least effective with 75.00% repellent effect on the test insect.

Table 1: Residual repellent effect of some plant products against the lesser grain borer *Rhyzopertha dominica* F. attacking wheat after different durations (in weeks) of treatment.

Treatments (T)	Percent reduction in number of beetles after different durations (in weeks) of treatment.										
	1 st week	2 nd week	3 rd week	4 th week	5 th week	6 th week	7 th week	8 th week	9 th week	10 th week	Mean
Leaves of bakain (T ₁)	75.0b	85.0a	87.5 ab	92.5 a	77.5 a	87.5 a	67.5 a	87.5 a	70.0 ab	65.0 b	82.50 b
Seeds of bakain (T ₂)	95.0a	60.0 b	75.0 b	80.0 a	92.5 a	65.0 a	85.0 a	50.0 b	55.0 b	80.0 ab	73.75 c
Bark of bakain (T ₃)	97.5a	95.0 a	90.0 a	92.5 a	92.5 a	85.0 a	82.5 a	95.0 a	92.5 a	87.5 a	90.95 a
Leaves of Ak (T ₇)	100.0a	97.5a	97.0 a	92.5 a	85.0 a	75.0 a	90.0 a	87.5 a	80.0 ab	87.5 a	89.25 ab
Bark of Ak (T ₈)	100.0a	87.5 a	92.5 a	90.0 a	85.0 a	85.0 a	85.0 a	80.0 a	75.0 ab	85.0 ab	86.50 ab
Control (T ₁₂)	12.5c	7.5 c	12.5 c	12.5 b	17.5 b	12.5 b	20.0 b	17.5 c	12.5 c	7.5 c	13.25 d

Means followed by same letter(s) do not differ significantly from each other at 5% level of probability.

Data recorded after two weeks of treatments indicated that powder of Ak's leaves ranked first as it repelled 97.50% lesser grain borer, followed by bark of bakain, bark of Ak and leaves of bakain which repelled 95.00, 87.50 and 92.5% of lesser grain beetles respectively, while seeds of bakain with 68.00% *R. dominica* repellency was found significantly least effective. All of these plants products were found significantly effective repellent against the pest compared to the control.

After 3 weeks of treatment, the residual repellent effect of seeds, leaves, bark of bakain and leaves, bark of Ak showed that all of treatments effectively repelled lesser grain borer in wheat compared to control. Ak leaves were found most effective, followed by Ak bark, bakain bark,

bakain leaves with 97.50, 92.50, 90.00, 87.50% repellency of lesser grain borer respectively. Seeds of bakain with 75.00% *R. dominica* repellency was found significantly least effective.

Results recorded after 4 weeks of treatment illustrated that leaves, bark of bakain and leaves of Ak (all of these products were equally effective) repelled 92.50% of the test insect, while bark of Ak and seeds of bakain repelled 98.00 and 86.00% lesser grains borer respectively. All of these products were found significantly most effective in the repellency of this insect compared to control.

Results after five weeks of treatment of plant products in the form of powder against *R. dominica* indicated that both seeds and bark of bakain were found on the top with 92.50% repellency of lesser grain borer, followed by Ak leaves, Ak bark and bakian leaves with 85.00, 85.00, 77.50% repellency of the pest respectively. All of the treatments were found non-significantly different from each other and significantly effective against the pest compared to control.

Data obtained after six weeks of treatments revealed that bakain leaves, Ak bark, bakain bark, Ak leaves, bakain seed repelled 87.50, 85.00, 85.00, 75.00, 65.00% lesser grain borer respectively. All of treatments were found significantly similar in their repellent effect against the pest and were found significantly effective compared to control.

Results recorded after seven weeks of treatment showed that leaves, seeds, bark of bakain and leaves, bark of Ak repelled 67.50, 85.00, 82.50, 90.00, 85.00% *R. dominica* respectively attacking wheat grains. All of the treatments were found significantly equally effective in their residual repellent activity against the tested insect compared to control.

Data recorded after eight weeks showed that bakain bark was found most effective with 95.00% repellency of *R. dominica* infesting wheat grain, followed by bakain leaves, Ak leaves, Ak bark and bakain seed with 87.00, 87.00 80.00 and 50.00% repellency of the tested insect respectively. All of the products were found non-significantly different from each other except bakain seed, which repelled significantly less number of tested insects. All of the tested plant products were found significantly effective against the lesser grain borer compared to control.

Result obtained after 9 weeks showed that treatment of bakain bark repelled 92.50% of tested insect and ranked first. Ak leaves, Ak bark, bakain leaves repelled 88.00, 75.00, 70.00% of the test insect respectively and ranked second. Bakain seeds repelled 55.00% lesser grain borer and ranked third. All these plants products were found significantly effective against lesser grain borer compared to control.

Data obtained after ten weeks indicated that treatment of Ak leaves and bakain bark showed identical effect as both of these products repelled 87.50% of tested insect and ranked first. Ak bark and bakain seeds repelled 85.00 and 80.00% of the test insect respectively and ranked second. Bakain leaves with 65.00% repellency of lesser grain borer

ranked third. All these plants products were found significantly effective against the pest compared to control.

Our results are in agreement with the findings of Islam [1983], Jilani and Helen [1983], Aziz [1988] and Patel *et al.* [1993]. They tested powders or aqueous and ethanolic extracts of different plants or plant material to show their effectiveness as grain protectants against *Rhyzopertha dominica* F and other insect pests of stored grains.

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