Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol 2, No.2, 2012

Evaluation of (*Khaya senegallensis*) for the control of *Tribolium* confusum (Duval) (Coleoptera: Tenebrionidae) on Stored Pearl Millet

Bawa Livinus Yakubu[1*] Ainika Joseph Nda[2*]

Institute for Agricultural Research, Ahmadu Bello University, Zaria, Nigeria.

*E-mail of the corresponding author: ainikajoseph@yahoo.com

Abstract

The efficacy of *Khaya senegalensis* products was evaluated for the control of Tribolium *confusum* infesting pearl millet seeds. The plant products were used at 5 g, 10 g, and 20 g, and 2.0 g Actellic dust was used as standard check which was replicated three times and also with an untreated control. The parameters assessed include mortality, emergence, and seed damage. The results showed that Actellic dust (2 %) caused significantly higher ($p < 0.05$) mortality of adult *T. confusum* at 24 hrs than *Khaya senegalensis* treated grains and the control. The seed powder at 20 g caused significantly ($p < 0.05$) mortality of *T. confusum* than other formulations and the untreated control. The leaf powder at all levels is not significantly different compared to the control. At 48 hrs and 72 hrs Actellic dust caused significantly ($p < 0.05$) mortality (100 %) of adult *T. confusum* compared to others while the seed powder at 5 g had higher mortality compared to the control. No. significant mortality was recorded among plant products and the control at 72 hrs. At 8 weeks post-treatment the progeny emergence was significantly higher ($p < 0.05$) on the control than on leaf powder, seed powder at different concentrations and Actellic dust, but there was no significant difference among the treatments. The percentage grain damage showed significant differences between the treatments, although the control had more grain damage than the treated grains.

Keywords: Khaya senegalensis products, efficacy, *Tribolium*, millet

1. Introduction

Pearl millet (*Pennisetum glaucum*) probably originated in the West African savanna region. It is grown on more than 43 million hectares world-wide and ranks sixth among the important cereal crops in the world.

Nigeria is an important millet producing country with an average annual production of 3.4 million metric tons it ranks second after India in global millet production (Anonymous, 1998). Pearl millet is very hardy crop which thrives in conditions which most other crops would not survive. Africa and Asia together account for 98 percent of world output (Mahendral et. al, 1996). The pearl millet seed beetle, *Tribolium confusum* is a secondary pest of stored produced. Damage by this insect may be up to 5 % in grain weight (Amatobi, 2007).

A large number of plant-derived substances exert various physiological and behavioral activities on stored product insects and notable among these plants are various spices and medicinal plants used traditionally for protecting foodstuffs against insects (Ho et. al, 1996).

Khaya senegalensis is a small tree some 50-60 feet high with a girth of 6-8 feet, but 70-80 feet and ten feet girth are common. The bark is very bitter and has a considerable reputation amongst people as a fever remedy taken as a decoction. The flowers are sometimes used for treating stomach troubles and as an ingredient in anti-syphilitic prescription (Dalziel, 1948).

This study examines the insecticidal activities of *Khaya senegalensis* products which includes the leaf powder, seed powder of the plant using beetle adult mortality, adult emergence, and seed damage as indices.

2. Materials and Methods

2.1 Insect Culture

The target pest *Tribolium confusum* was reared in the Laboratory under room temperature in the Department of Crop protection, Ahmadu Bello University, Zaria.

The *T. confusum* for culturing was obtained from already infested millet seeds from the Storage Laboratory. Two weeks after oviposition, the adult weevils were sieved out in order to eliminate mixing with F_1 generation. The main objective of this procedure is to obtain and use 24 hrs old adults for the experiment.

2.2 Preparation of Materials

Leaves and seeds of *Khaya senegalensis* were collected from mahogany trees around the institute for Agricultural Research Zaria. The fresh leaves were shade-dried for five days and then pounded into powder using a mortar and a pestle, which was sieved to obtain a fine powder. Similarly the seeds of *K. senegalensis* obtained from the fruits were dried, shelled, pounded in a mortar, dried again and finally pounded to fine powder. The leaf powder and the seed powder were used at three different rates of 5 g, 10 g, and 20 g. Actellic dust was used as check.

2.3 Statistical Analysis of Data

The analysis of variance (ANOVA) was carried out to verify the existence of significant differences between treatments. Student's Newnan keul test was (SNK) was used to separate the means

3. Results

The Effect of *Khaya Senegalensis* Leaf Powder and Seed Powder on Mortality of Adult *T. Confusum*

The results (Table 1) showed that Actellic dust caused significantly higher ($p < 0.05$) mortality of adult *T. confusum* at 24 hrs compared to *K. senegalensis* treated grains and the control. Seed powder at 20 g/100 g seeds had significantly ($p < 0.05$) higher mortality of *T. confusum* compared to the other formulations at different treatment levels and the untreated control. But *K. senegalensis* leaf powder at all levels shows significantly different compared to the control.

At 48 hrs Actellic dust caused significantly higher ($p < 0.05$) mortality of adult *T. confusum* than the other treated grains and the control. Leaf powder at 20 g and the seed powder at 5 g/100 g seed had significantly ($p < 0.05$) higher mortality of *T. confusum* than the control but there was no significantly difference among the plant products on one hand and the control on the other. Actellic dust recorded 100 % mortality of *T. confusum* at this point. At 72 hrs all the plant products treatments caused significant mortality compared to the untreated.

Effect of *Khaya Senegallensis* Leaf Powder and Seed Powder on Progeny Emergence of *T. Confusum*

Results showed that at 4 weeks there was no emergence of *T. confusum* at all levels of treatment except at 5 g of *K. senegalensis* seed powder and the control which not significant. At 8 weeks post-treatment the progeny emergence was significantly higher ($p<0.05$) on the control than *K. senegalensis* leaf powder and *K. senegalensis* seed powder at different concentrations and Actellic dust. But there was no significant difference among the treated grains.

Effect of *K. Senegalensis* Leaf Powder and *K. Senegalensis* Seed Powder on Percentage Damage of Millet Seed at Weeks Post-Treatment.

The percentage grain damage showed no significant difference in all the treatments, although the control had more grain damage than the treated grains.

4. Discussion

In the present study, the leaf powder and seed powder were evaluated, along with Actellic dust used as a check. Actellic dust caused significantly higher ($p<0.005$) mortality of adult *T. confusum* during the periods on pearl millet compared with the plant products.

Mortality results obtained from this showed that *Khaya senegalensis* seed powder had a higher mortality rate on adult *T. confusum* on stored grains of millet.

In terms of adult emergence the plant products significantly ($p<0.005$) suppressed emergence of adult *T. confusum* when compared with the control (Table 2). Adult emergence of *T. confusum* was least in millet seeds treated with *K. senegalensis* seed powder while the control significantly ($p<0.005$) had the highest adult emergence. The efficacy of the plant products in significantly suppressing emergence has largely been attributed to ovicidal properties, which prevent eggs from hatching into larvae (Jadhav and Jadhav, 1984) and/or larvicidal activity which caused the larvae from maturing to adult (Oparaeke, 2011 personal communication).

The damage inflicted on millet grains by *T. confusum* after two months of storage as presented in (Table 3) shows that damage was more in the control treatment but not significantly different compared to *K. senegalensis* seed powder and Actellic treatments. The effectiveness of the plant products which reduced damage to millet seed stored for two months may be due to the suppression of progeny development (Ivbijaro, 1983).

5. Conclusion

Results obtained from this study demonstrate the potentials of this plant derived insecticides against millet weevil in Nigeria. These multiple effects of the leaf powder and seed powder, and their availability locally make them attractive candidates in upgrading traditional postharvest protection practice.

Therefore, further investigations are required to determine the efficacy and methods of formulation using their active principles.

References

Amatobi, C. I. (2007). Arthropods pests of Crops in Nigeria: General Biology, Natural Enemies and control. pp 190-192.

Anonymous, (1998). Federal Ministry of Agriculture and National Resource, Abuja, Nigeria.

Dalziel, J. M. (1948). The useful plants of West Tropical Africa. Published by Crown Agents for the colonies West Minister London. Pp. 223-326.

Ho, S. H., Koh, L., MA, Y, & Sim, K. Y. (1996). The oil of garlic *Allium sativum* L. (Liliceae), as a potential grain protectant against *Tribolium castaneum* (Herbst) and *Sitophilus zeamais* Motsh. Postharvest Biology Technology 9: 41-49.

Ivbijaro, M. F. (1983). Toxicity of neem seed *Azadirachta indica* A. Juss to *Sitophilus oryzae* (L.) in stored maize. Protection Ecology 5:353-357.

Jadhav, K. D. & Jadhav L.D. Jadhav, (1984). Use of vegetable oils, plant extracts and synthetic Products as protectants from pulse beetle *Callosobruchus maculatus* in stored grain. *Journal of food Science Technology,* 14:100-113.

Mahendral, P., Jayanta, D., Rai, R. K., (1996). Fundamentals of Cereal Crop production.
pp. 95-108. Tata MCGraw- Hill publishing Company Limited New DEHLI.

Table 1: Effect of *Khaya senegalensis* leaf powder and seed powder on mortality of Adult *T. confusum* at 24, 48, and 72 hours post-treatment.

Treatment	Conc (g/100 g of seed	24 Hours	48 Hours	72 Hours
***K. senegalensis* leaf powder**	5 g	0.00c	0.33bc	1.00b
***K. senegalensis* leaf powder**	10 g	0.00c	1.00bc	1.33b
***K. senegalensis* leaf powder**	20 g	0.67c	1.33bc	1.67b
***K. senegalensis* seed powder**	5 g	0.33c	1.00bc	0.33b
***K. senegalensis* seed powder**	10 g	1.00c	1.67bc	1.00b
***K. senegalensis* seed powder**	20 g	2.67b	3.67b	1.67b
Actellic Dust	2.0 g	9.67a	0.00a	0.00a
Control		0.00c	0.00c	0.00b
SE±		0.34	0.58	0.35

Means with the letters in the same column are not significantly different at 5 % using SNK.

Table 2: Effect of *K. senegalensis* and *K. senegalensis* seed powder on progeny emergence of *T. confusum* after exposure to treatment.

Treatment	Concs g/100 g seed	Progeny emergence at 4, and 8 weeks respectively.	
		F_1	F_2
***K. senegalensis* leaf powder**	5 g	0.00a	1.67b
***K. senegalensis* leaf powder**	10 g	0.00a	1.00b
***K. senegalensis* leaf powder**	20 g	0.00a	0.67b
***K. senegalensis* seed powder**	5 g	0.33a	0.00b
***K. senegalensis* seed powder**	10 g	0.00a	0.00b
***K. senegalensis* seed powder**	20 g	0.00a	0.00b
Actellic dust	2.0 g	0.00a	0.00b
Control	0.00	0.67a	12.00a
SE±		0.18	1.57

Means with the same letter(s) in a column are not significantly different at 5 % using SNK.

Table 3: Effect of *K. senegalensis* leaf powder and *K. senegalensis* seed powder on percentage damage of millet seeds at weeks.

Treatment	Concs g/100 g seed	Mean damage
***K. senegalensis* leaf powder**	5 g	1.67a
***K. senegalensis* leaf powder**	10 g	1.33a
***K. senegalensis* leaf powder**	20 g	1.00a
***K. senegalensi* seed powder**	5 g	0.33a
***K. senegalensis* seed powder**	10 g	0.33a
***K. senegalensis* seed powder**	20 g	0.00a
Actellic dust	2.0 g	0.00a
Control	0.00	4.00a
SE±		4.62

Means with the same letter (s) in a column are not significantly different at 5 % using SNK