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Full length Research Paper

Insecticidal Activities of Extracts of Some Selected Plants against Maize Weevils (*Sitophilus zeamais* (L.)) on Maize

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Abstract
Leaf extracts of Nicotiana tabacum, Melia azendrachta, Chenepodium ambrosoides, croton macrostachys and seed extracts of melia azendrachta and capsicum esculentum were applied at the rate of 10% w/v to evaluate their insecticidal activity against maize weevil in a pot experiment at a laboratory condition. Malathion 50% had been used as a standard check. Twenty weevils of uniform age had been released into a pot containing 300 weevil-free maize seeds. Data on percent mortality had been collected every seven days after treatment application till twenty-first day. The result showed that all tested treatments had shown significant effect on mortality of maize weevil, though inferior to the standard check. From all the botanicals used, Melia azendrachta, Croton macrostachys and Nicotiana tabaccum had shown superior result with 86.66, 83.33 and 73.3 percent mortality, respectively. The result showed that leaf and seed extracts of Melia azendrachta, Croton macrostachys and Nicotiana tabaccum had higher insecticidal activity against maize weevil. Thus, further researches should be undertaken on different formulations, concentrations and timings of these botanicals.

Key words: - *Botanicals, Maize weevil, Sitophilus zeamais (l.)*

Introduction

Maize, which belongs to family Poaceae or gramineae, is cereal grass related to wheat rice and Oat; raking second after wheat and followed by third ranking rice in order of world grain production. This plant is versatile and with many use since it can thrive in diverse climates, hence it is grown in many countries including Ethiopia the any other crop. A side from being on the major source of food for both human and animals, it is also processed various food and industrial proudest including starches, sweeteners, oils, beverages, un doctrinal alcohol and fuel ethanol (Garica,1990; Tamado, 2008). Maize also has industrial uses, commercially corn oil is associated by wet milling or dry mailing crude corn oil is composed of 95% of try glycosides minor compound is found in crude oil is removed by refining (Reddy,2004).

Cereal pests may infest maize grain dunning storage and transport. Among which maize weevil (*Sitophilus zeamais L.*), one-fourth inch long, red dish, brown to black snout weevil in maize may start in mature crop when the content of the grain has fallen to 18-20% subsequent infestation c-store results post flying into storage although losses are commonly 45% (Casey, 1994). Food grain stored for varying periods, to ensure proper and balanced public distribution for public use through the year. When the grain produced is not properly stored, pose highest losses would assume high proportions. Among biotic and abiotic factors, storage weevils play a major role in the deterioration of food grains coursing both quantitative and qualitative losses (Sounder and Manisegaran, 2010). Ethiopian farmers wait till higher price time and keep it for local or export markets, due to these reason maize stored in Ethiopia for about six or month (Emana, 1999).

Maize weevil (*Sitophilus zeamais* L.) is belongs to family Curculionidae of the order of Coleoptera. It is the known maize weevil. It is one of the most destructive stored grain products. These insects frequently caused complete destruction of grain and the in festered grain will usually be found to be heating at the surfaces and it may be damage sometimes reach to such an extent that sprouting occurs normally the kernels of grain are eaten. Adults feed on whole seed but the larvae develop only in seed of in pieces of seed (Awalthi, 2002). Both adults and grubs cause damage. The full grown larva were with 5 mm in length and pump, fleshy legless, creature, having a white body and yellow brown seed. The adult weevils were small reddish brown beetle (Dhaliwal, 2006). The adult female bores a hole in the grain kernel, deposit a single egg and cover it with a gelatinous fluid. After male lays as many as 300 to 500 eggs in 4-5 months, the incubation period of three days were maintained. The grub is white with yellow is brown head, appodus fleshy, would

remain couth in the grain and fully grown in three to four weeks. It pupates inside the grain and emerges as an adult in 3-6 day. The adult longevity is 4 to 5 month (Yasanthars and Krishna, 2004).

Maize weevil is cosmopolitan inset which is known to be serious pests of stored maize especially in the tropics. The adult weevils infest the grain during field and storage (Vasantharaj and Ananthris Human, 2004). The chewing damage caused by insects brings about increased respiration which ultimately gives rise to depreciation and finally total loss (Dahiya, 1999). Clearing and maintain the threshing floor yard free from insect infestation and away from the vicinity of villages, plastering the cracks holes found on walls and floor with mud / cement and white as the store before storing of maize grain (Yadav, 1987). Sieving and removing all Brocken grain to eliminate the conditions which favor storage pests (Soundarej and Manisegra, 2010). Spraying insecticide, exclusively after they were harvested or on food grain is not recommended (Hall, 19970). Sieving and removing all broken grains to eliminate the condition which favor storage pest (Yadav, 1987). Although synthetic chemical are apparently available for use effective past control no longer matter of heavy application of pesticide, partly because of excessive use of pesticide promotes faster evaluation of resistant form of pests destroy natural enemies formerly innocuous species into pests, harm other non-target organism and contaminates food. There is thus, an urgent need for control agents which are less toxic to man and more readily degradable. Among which use of botanicals pesticide with low mammalian toxicity and can effectively prevent and or suppress insect peats, especially in the especially in the entourage (Gololb and Webeley, 1980). Plant derived pesticide can be transferred into practical application in natural crop protection which can help small scale farmers (Binggelli, 1999). Thus, this paper was initiated to evaluate insecticidal activity of various botanical extracts against maize weevil (*Sitophylus zeamais L.)* at post-harvest level

Material and methods

Description of the Study Area

The experiment were conducted at Wolaita Sodo University which is located in Wolaita Sodo town, in southern nation, nationalities and peoples of regional state at about 390km south of Addis Ababa, capital city. Geographically if is located in an altitude o f 1800m above sea level, 6'49' north of longitude and 345' east of latitude with annual rainfall 1212m and an average temperature of 20^{o}C.

Experimental Design and Treatment

The study were focused on the effectively of botanical extranets as protestant of stored grain of maize against attack by *Sitiphilus zeamais*. The affectivity was based on the adult mortality test. There were mine treatments with chemical marathon (standard control). The botanical were seed powder of *Chenopodium ambrosides*, pod powder of chilly seed powder of chili seed powered of tobacco and leaf powder of *Croton macrostachys* with standard chemical malathion in randomized complete design (CRD) with three replication.

Collection and Preparation of Botanicals

Fresh and matured leaf of each botanicals were collected and immediately it were brought to the laboratory and leaves were dried pulverized and were sieved through a siever to obtain uniform size. The resulting powder were kept separately in glass container with screw cap and stored at room temperature prior to use.

Rearing of Sitophilus zeamais

Colony of maize weevil for the experiment was established to supply similar age of weevil for the experiment. About 2kg of grain of maize seed 22cm high x7cm diameter glass jars, filter paper funnel and sieve used to culture corn maize weevil will thoroughly cleaned and exposed of insets, mites, or disease causing microorganism. The sealed glass jars were allowed to commensurate to the ambient temperature before they were opened to avoid excessive loss or grain of moisture. The grain of maize collected were put into pot and kept of rearing room condition for two weeks. Then they were cultured on a clean and disinfested maize grain in glass/pot jars. It contained 100gram of grain and infested with 10 weevil were removed from each pot and they were placed another set of grain kept of the same condition in which such removal of garn weevil and placement of fresh grain medium were carried out until sufficient number of weevil suitable for the experiment had been collected.

Collected Data

Parent adult mortality was recorded at every seven days, i.e., in the 7th, 14th, 21st, and 28th day after inoculation of maize weevil. Then, they were removed and counted. Four weeks after all the remaining adults were removed; the numbers of live and dead insects were retained under the same condition.

Data Analysis

All collected data were analyses using the procedure of ANOVA (Gomez and Gomez, 1884).

Results and Discussion

There were ($p<0.05$) level of significance difference among treatment in the rate of adult mortality of weevil (*Silophilus zeamais*) (Table- 1). The seed powder of *Melia azadarchita,* leaf powder of *Nicotina tabaccum* significantly affected weevil mortality. The estimated highest mortality were recorded in seed powder of *Melia azadarchita*(86.6%) and leaf powered of *Croton macrostachys* (83.37% however, highest weevil mortality were recorded at 14th and 21thdays after treatment application respectively. Similarly,

Chenepodium ambrosiodes, Melia azadarchita leaf powder and *Nicotina tabaccum* leaf powder gave adult weevil mortality of 63.3% and 73.33% respectively. But lowest adult weevil percent mortality were recorded in powder of *Capsicum esculentum* leaf.

Some of botanicals were merely as effective as synthetic chemical malathion with only difference in speed of kill. However, the research finding were supports Koonp and Najoya (2004), those the use of botanical pesticide which are indigenous, effective and organic control measures for stored product pest in maize weevil (*Sitophius zeamas*)

Table 1. The Effect of treatments on adult weevil mortality (%) in the laboratory under storage condition

No	Treatments	Percent Adult Weevil Mortality After Treatment Application				Commutative Adult Mortality
		7	14	21	28	
1	Malathion	90	100	0	0	100[a]
2	Seed powder of *Melia azendarichta*	13.3	33.33	20	20	83.3[abc]
3	Leaf powder of *Croton macro stachys*	13.3	26.6	30	13.3	83.3[abc]
4	Leaf powder of *Nicotina tabaccum*	26.6	20	13.3	13.3	73.33[abc]
5	Leaf powder of *Chenepodium ambrosiodes*	10	13.3	26.66	13.3	63.3 [bcd]
6	Leaf powder of *Melia azendarichta*	16.6	10	0	13.3	4D[cd]
7	Fruit powder of *Capsicum esculentum*	3.3	10	0	13.3	26.66[d]

**Treatments with a common letter were not significantly different (CV = 16.6%)*

When chemicals are compared to botanicals, it was depicted that Malathions are quick in action. Though botanicals act slowly; they gave a reasonable kill as times go by. The above result in the table corroborated with the finding of Abraham and Adane (1995) who found that leaf powder of *Croton macrostachys*, seed powder of *Melia azenderichta* and *Nicotine tabaccum*showed insecticidal activity on storage maize weevil. However, the different were seen in speed of action within the month storage condition. Leaf powder of *Nicotine tabaccum*, *Chenopodium ambroisdes, Croton macrosthachys* resulted in high adult mortality of maize weevil at 7th days after treatment application and seed powder of *Melia azadrichta* resulted in highest mortality of adult weevil at 14th days after treatment application. The result hale shown that the botanical had a remarkable potential in controlling storage maize weevil, they were have shown mortality of weevil comparable to the Malathion. The mortality had reached 86.6 percent in seed powder of *Melia azendrachita* treated pots while 83.3% in pots treated with leaf powder of *Croton macrostachys.* On the other hand, cumulative insect mortality was 73.3 percent in pots treated with leaf powder of *Nicotina tabacum* and 63.33% in pots treated with leaf powder of *Chenepodium ambrosoides.* The overall result can add value to the cheap, eco-friendly, and sustainable means of production and bring a valuable insight towards an attempt to organic farming that can solve small scale, resource-poor farmer by combining some other non-synthetic measures.

Discussion

The result indicated that significant differences among the various botanical control of maize weevil had been despite wide difference among the botanicals on the basis of the type of botanical applied, plant parts used and dates of action. But the difference were seen in the speed of action with in the months of storage condition leaf powder of *Nicotina tabaccum*, *Chenepodium ambrosiodes* and *Croton macrostachys* of adult weevil of maize at days after treatment. Nevertheless, the results have also shown that the four botanicals are effective in causing a cumulative mortality of maize adult weevil. The botanical showed a good potential in controlling storage maize weevil were *Melia azandrachta* seed powder 86.6%, *Croton macrostahys* (83.3%, *Nicotina tabaccum* leaf powder 73.3 % and leaf powder of *Chenepodium ambrosiodes* 63.3% and can solve poor resource farmers' problem by combining some other synthetic measures. The findings of this research strengthens the reports by Abraham and Adane (1995) that articulated the difference were observed among botanical in speed of action within a month of storage period. Botanical have good potential in the controlling maize weevil were *Jatropha curcas* leaf powder, *C. ambrosoides* seed powder and also *C. rotundifloza* stem powder *p. dodendre* seed powder and can solve poor resource farmers, problem, as integrating with other cultural measures (Yadav, 2006; Abrham and Adane, 1995).

Conclusion

It can be concluded that insecticidal activity of botanical extracts against attack by *Sitophilus zeamais* could be of a promising result as high mortality were recorded in extracts of *Melia azandarachta*, *Croton macrostachys*, leaf powder of *Nicotina tabbacum*, respectively. However, significant differences were observed among the treatments in speed of killing action as compared to synthetic chemical, Malathion. Furthermore, the study has shown the potential of botanicals products in controlling adult maize weevil on stored maize. However further research efforts are needed to determine the application dosage, the active ingredient persistence, effect on germination of seed etc.

Recommendations

From the findings of the study, *Melia azandarachta*, *Croton macrostachys*, leaf powder of *Nicotina tabacum* are recommended for further use. The integration of botanical plants, whether applied singly or in combination with other control methods, was not phytotoxic to the maize crop and it significantly lowered maize weevil infestation and damage of at storage conditions. Thus, small-

scale, poor farmers, who suffer from severe post-harvest loss of maize weevil, are recommended to use these cheap, eco-friendly and obtainable botanicals. Over and above, in areas where mass production is practiced in intensified agriculture, the extracts of these botanicals can be considered in a variety of approaches. Thus, the government, the research centers and universities shall provide a massive training to the producers so as to enhance the adequacy of protection of maize seeds through botanicals. Furthermore, intensive research efforts are needed to determine dosage of botanical, anti-ovipositor repellency and effect on germinate on of seed, and effect on health problem in human being, the persistence of active in gradient which occur in each botanical.

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