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INSECTICIDAL EFFECTS OF THREE PLANTS: GINGER (*ZINGIBER OFFICINALE*), ALLIGATOR PEPPER (*AFRAMOMUM MELEGUETA)* AND GARLIC (*ALLIUM SATIVUM*) AS DUST FORMULATION TO CONTROL MAIZE WEEVILS (*SITOPHILUS ZEAMAIS*).

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A B S T R A C T

Effective control of Agricultural Pests can enhances the achievement of notable idea of Milleniem development goal of food security. In this research, the efficacy of three plants of Ginger (*Zingiber officinale*), Alligator pepper (*Aframomum melegueta*) and Garlic (*Allium sativum*) were tested as dust formulation to control maize weevils (*Sitophilus zeamais*). All the plants contain some active phytochemicals compounds that have been earlier reported to contain repellant action against various plant pests. The dust formulations of three plants were effective although the effectiveness was high as insect repellants rather than insect's killers.

Keywords: Pest, Dust formulation, Food security, Maize weevils.

INTRODUCTION

Pests are menace to food security and to control pests, many efforts both biological and chemical need to be intensified. Applications of chemical pesticide have disadvantages ranges from poisonous effect on non-target organism, accumulation of residue in the ecosystem and pest resistance. Development of botanical pesticide for the control of pest if effective will reduce some of the problem associated with synthetic or chemical pesticide. *Sitophilus zeamais*, a maize weevil is a common pest of stored maize grain, reducing the nutrient content of the seed and unfold economic hardship on farms and marketers. It was introduced to East Africa from Central America in the early 1970s (Hodges, 1986).Recently, there has been a major concern for the promotion of botanical as environmental friendly pesticides although there could still be a need to depend on chemical insecticides in case of epidemics outbreak (Abdelouaheb *et al*., 2009). Most of raw materials for botanical pesticide are ready available locally therefore to reduce the cost of procuring mostly foreign produce synthetic pesticide that are not environmental friendly. One of the objectives of millennium development goals is the attainment of food security for all; this can only be realized by joint efforts of all the stakeholders in food production. Therefore, keeping the menace of pest of stored product at bay and increasing/promoting the botanical pesticide will contribute significantly to this noble objective of Millennium Development Goals MDGs.

The research into botanical pesticide is a viable and will contribute significantly in enhancing the economic value of most of these medicinal plants and open a vital area of research in combating the menace of biological pesticides. The aim of the study is to test for the efficiency of the selected plant as a botanical pesticide; and to test for selected plants pesticidal sustainability of stored grain.

MATERIALS AND METHODS

Sample Collection and Preparation: Plant materials (*Z. officinale*, *A. melegueta* and *A. sativum*) were purchased from markets in Ilaro, Nigeria and brought to the laboratory for identification. The plants were Air-dried until complete dehydration. The plants were grounded into fine powder using a clean milling machine and were stored suing a clean milling machine and were stored in polyethylene bags.

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Experimental Procedure: The plants were grounded into fine powder, and were allowed to cool and stored in a dry-black polyethylene bags and placed in a cold dry place for use. Fourteen boxes of 20cm2 were constructed and covered on three sides with fine nets that cannot permit the escape of the weevil. Each of the boxes were partition into two within leaving a narrow passage that can allow the to-fro movement of the insects. Insects (*Sitophilus zeamais*) were obtained from infested maize grain from the local market, all from the same source. After some days, newly emerged F1 generations were used to infest the maize samples used for the experiment. The species of the pest was identified. At the first phase of the experimental set-up, each plant powder was applied at the rate of 5g to the infested maize and at the second Phase, formulations of Ginger with alligator pepper, Ginger with garlic and Alligator pepper with Garlic were mixed in the ratio of 1:1 before applied them to the infested maize. The control experiment was set up without adding plant powder to the infested maize. Each box was labeled and covered and kept in the laboratory. The experiment was repeated two times for each powder formulation and control. Observations were made each day to record the mortality rates in the weevil exposed to the botanical formulations used in this study. Appropriate statistical analysis was done to compare the mortality ratio / in the pest resulted from treatment the three botanical formulations.

Phytochemical Screening of the Three Plants

Qualitative Tests: These included, alkaloid determination using Harbone (1973) method, saponin determination by Obadoni and Ochuko (2001) method and Flavonoid determination by the method of Boham and Kocipai – Abyazan (1974).

RESULT AND DISCUSSION

Table 1. Qualitative Phytochemicals contents of the Plants.

Phytochemical	*Zingiber officinale*	*Aframonum meleguata*	*Alum sativum*
Alkaloids	+	+	+
Flavonoids	+	+	+
Saponons	+	+	+
Steroids	+	+	+
Tannis	+	+	+
Phlabotanins	+	-	+
Terpenoids	+	+	+

+ presence of constituent, - absence of constituents

Table 2. Rate of Insect Migration**.**

Materials	No of initial insect	24hrs	48hrs	72hrs	96hrs	120hrs	% Mortality
Alligator Pepper	50	0	0	1	0	0	2%
Ginger	50	0	1	0	1	1	6%
Garlic	50	1	0	0	0	0	2%
Ginger+ alligator pepper	50	0	0	0	0	0	0%
Ginger+ garlic	50	0	1	0	0	0	2%
Alligator pepper+ Garlic	50	0	0	1	0	0	2%
Control	50	0	0	0	1	0	2%

Table 3. Migration Table.

Materials	Initial No of insects	24hrs	48hrs	2hrs	96hrs	120hrs	% mortality
Alligator pepper	50	4	2	1	-	-	14%
Ginger	50	3	1	-	3	-	14%
Garlic	50	7	1	6	-	-	28%
Ginger+Alligator pepper	50	1	-	2	-	3	12%
Ginger+ Garlic	50	2	-	4	5	-	22%
Alligator pepper+Ggarlic	50	4	3	1	-	3	22%
Control	50	1	0	0	1	0	4%

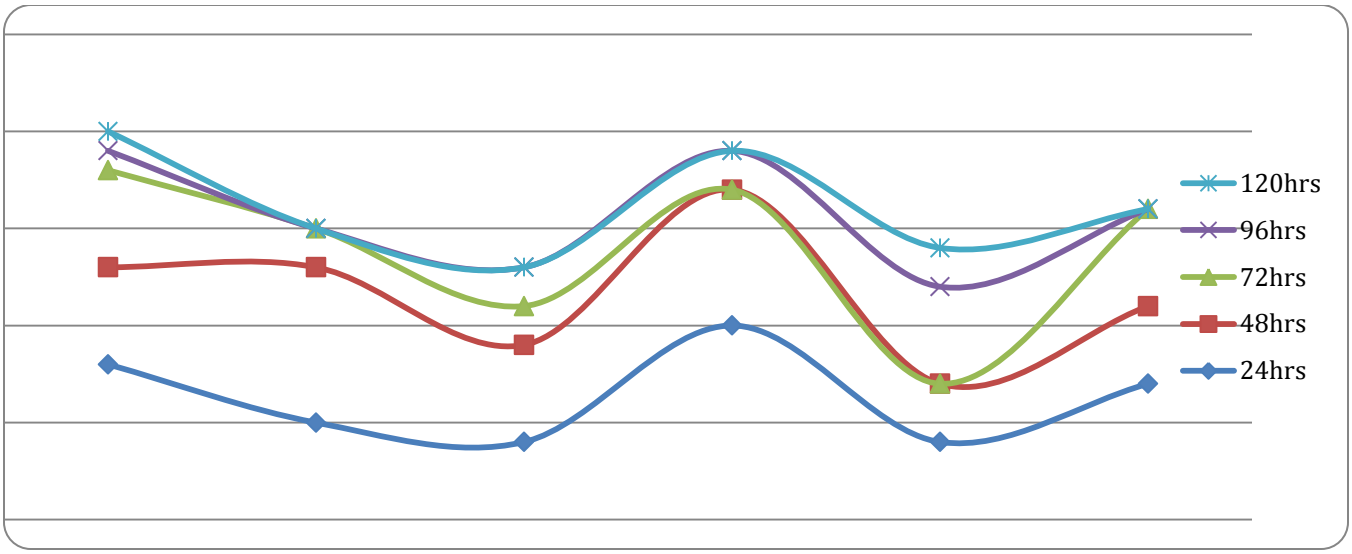

Figure 1. Rate of insect migration in the box.

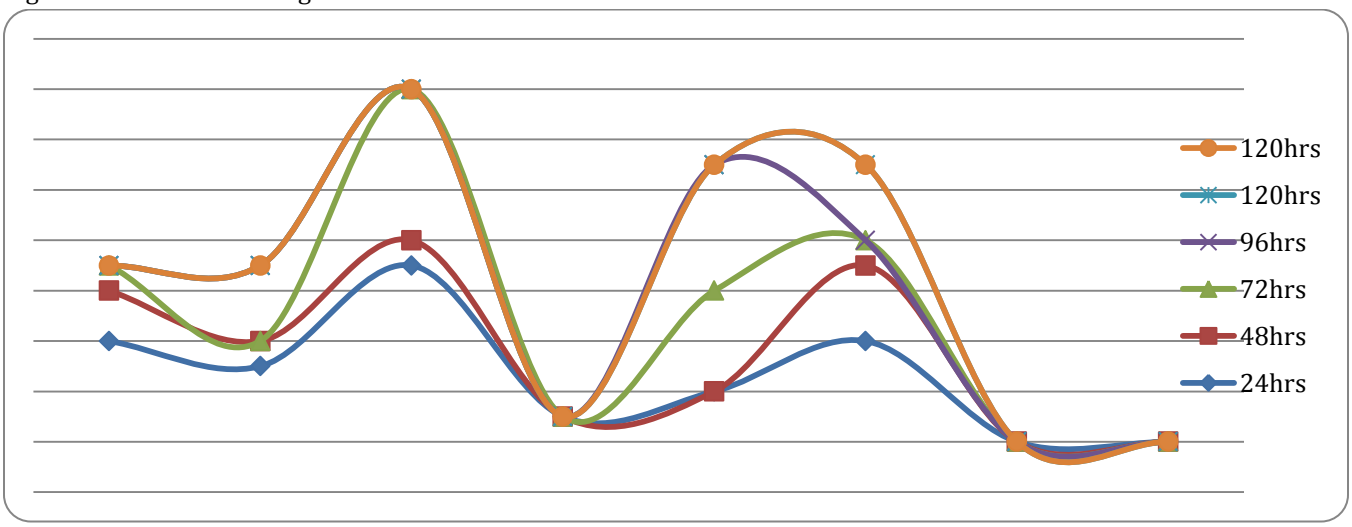

Figure 2. Mortality rate of the insect by each formulation.

The insecticidal activities of plants extracts or its pure compounds against insects have been reported in several manners like mortality, antifeedant, growh inhibiors, fecundity and fertility. The phytochemical screening results indicated that the leaves extracts of these plants were rich in alkaloids, flavonoids and tannins and saponins which may be responsible for the insecticidal properties observed in these plants. These phytochemicals have earlier been reported to have larvacidal abilities by other authors (Sofowora 1993). Alkaloids, Flavonoids, Saponons, Steroids, Tannis, Phlabotanins, Terpenoids are all present in moderate quantities in all the three plants examined and these could be a good reason for their antifeedants effects on plants. (Mostafa et al., 2012, Ukeh 2008). The three plants of Ginger (Zingiber officinale), Alligator pepper (A. melegueta) and Garlic (Allium sativum) showed slight effect/but at different rate on maize weevils (Sitophilus zeamais). While the Alligator paper is shown high repellency potency within a very short period of time of 24hrs after the insect has exposed to it, Ginger and Garlic are less in activities. These various report and conclusion justify the finding in this present study where the repellency action of most of these plants is very high but low in Mortality action. It can also be submitted that the few mortality observed could be due to other reasons rather than toxicity of the plant dust formulation. This conclusion is in line with the submission of other authors (Ukeh et al., 2008). While it can be concluded that the research is a worthwhile venture, effort should also be made on better way of formulating the dust for effectiveness pesticide action.

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