PESTICIDAL EFFECT OF *KHAYA SENEGALENSIS VANONIA AMYGDALINA* AND *OCCIMUM GRATISSIMUM* ON PESTS OF STORED COWPEA SEEDS:-+ *ACANTHOSCHLELIDES OBTECTUS* AND *CALLOSABRUCHUS MACULATUS*

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Abstract
The effect of three natural plants products; Khaya senegalensis *Vanonia amygdalina* and *Occimum gratissimum* as toxicants on pests of stored cowpea seeds, *Acanthosahlelida obtectus* and *Callosobrachus maculatus* was analysed in this study. The natural plant product were obtained locally from fallows in Vom, dried and ground into powdered form. The products were screened phytochemically to structurally identify active ingredients present. All the products contain saponins, alkanoids, tannins, glycosides, resins and flavonoids in varying proportions. The insect pests were obtained from infested cowpea seeds from local markets in Vom. The experiment was laid out in a randomized complete block design with three treatment ABC, comprising of 5kg of clean cowpea seeds, 30 each of adult *C. maculatus* and *A. obtectus*. Treatments ABC were treated with 22g of *K. senegalensis*, *V. amygdalina*, and *O. gratissimum* leaves powder respectively. After 90 days, the treatments were opened to assess number of *bruchides* found alive; number of eggs laid, and damaged seeds. Data collected was subjected to spearmans ranks correlation coefficient and was further subjected to students T test to determine the level of significant difference in the treatments. Results obtained showed that *Vernonia amygdalina* and *Occinum gratissimum* are significantly ($P< 0.05$) more effective than *Khaya senegalasin* as toxicant on pests of stored cowpea seeds. Crude leaves powder of *V. amagdalina* and O. gratissimum significantly reduced the number of adult *bruchids*, reproductive efficiency and percentage seed damaged than *Khaya senegalensis*. It is suggested therefore that *V. amygdalina* and *O. gratissimum* be used by farmers who wish to extend the shelf life of harvested cowpea seeds.
Keywords: Toxicants, Cowpea Seeds, Pests, Insecticides, dose dependent.

Introduction

Cowpea occupies an important place in the diet of an average Nigerian. It constitutes a very important source of vegetable protein not only in Nigeria, but all over Africa. The demand for it is increasing and there is a great need for increased production. (Burkil, 1991). As the demand for cowpea increases, more researches should be embarked upon in order to combat all problems associated with the crop. Thus, need for a research of this nature aimed at enhancing its storage.

The persistent deemphasizing of the use of synthetic chemicals in the developed world for the prevention and control of various field and storage pests is gradually gaining a solid ground in our contemporary African society. Many marginal farmers in Nigeria today are now encouraged in utilizing their traditional medicinal plant potentials for use in prevention; control and preservation during the course of production and storage of our crops in the field or at store. However, one basic way to achieve this is through the use of plants with pesticidal properties

Toxicants are often referred to toxic agents and may be defined as any substance causing death, disease or injury (Aliu., 1996). They are naturally occurring and/or manmade chemicals which following their passage in small quantities into the body, produce biochemical disbalance, abnormalities or physical lessions. They arise from various sources such as bacteria, industrial pollution,

burning of fossils fuel and radio nuclides. Drugs also fit into the definition of poisons.

Presently, more than 2400 plant species around the world are known to possess pesticidal properties. Many of these plant species inspite of the growth of the modern agro-chemical industries are still used for the control of pest in the developing world, and are claimed to be effective.

An estimated one third of global agricultural production valued at several billion dollars is destroyed annually by over 20,000 species of storage pests. Most dangerous and difficult to identify at early stage of infestation are the bean bruchids. The synthetic pesticides widely used for control are valued for their effectiveness (although in many cases, it diminishes over time). Their relatively long shelve life (when properly stored) and the ease with which they can be transported, stored and applied is noteworthy. However, they responsible for estimated three million or more cases of fatality. (Tindal, 1993).

Most of the research works so far conducted on traditional plant based Bio-pesticides (BPC) agents have been quantitative rather than qualitative. This study is undertaken to evaluate and authenticate the effectiveness of some natural plant products used by local farmers for control of pests of stored products.

MATERIALS AND METHODS

Section of plant Materials

Clean cowpea seeds were purchased from a local market in Vom-Plateau State-Nigeria. The natural plant products were also obtained from fallows in Vom, Plateau State, Nigeria.

Phytochemical Screening

Phytochemical analysis of the three plants, *khaya senegalensis*., *Vernonia amygdalina* and *Occimum gratissimum* was carried out at the Biochemistry Laboratory of University of Jos and later verified at the Biochemistry Laboratory of the NVRI, Vom. Qualitative reagents were used to test for Tannins, Alkanoids, Resins, Cyanides, Saponins, Glycosides and Flavonoids as described by Sofowora in 1993.

Preparation of Plant Materials

The plant leaves were initially oven dried at 50^{o}C and pulverised with pestle and mortar, then sieved using 2mm sieve size. The crude leaves powder obtained were stored in air tight container until used for insect Bioassay.

Insect Rearing

Adult *A. obstetus* and C. *marculatus* used in this study were obtained from ingested cowpea purchased from local markets in Vom. The *bruchids* were maintained in jars in the Laboratory, FCAH&PT VOM, under day/night temperature of 28^{o}C and relative humidity of 80-96%. Clean cowpea seeds in "bagco bags" were infested with imaginable males and females of both insect species

Bio-assay on Bruchid Infested Seeds

22 grams of each of the natural plant products were applied to 5kg of cowpea in two replications. The seeds were shaken gently to enable the preparation to mix evenly with the seeds infested with mated female insects. Each of the 5kg seeds of cowpea was divided into two seed lots infested with 10 pairs of male and female *A. obstectus* and *C. maculatus*, respectively.

Effect of Ovipositioning Adult Emergence

The number of eggs deposited on cowpea seeds in each treatment was recorded after the death of the female. The number of F1 progeny which emerged during the entire duration of the experiment was recorded. This continued on the seed in F_2 and F_3 progenies, two and four months respectively. The reproductive

efficiency of the female was determined for the F_1 progeny by the proportion of the offspring that emerged over the total number of eggs laid.

Damage Assessment on Seeds

The treatments were examined for exit holes of adult emergent total number of *bruchids* alive and number of eggs laid in each treatment for every progeny. Seeds carrying exit holes were regarded as damaged and number observed was recorded. Based on initial low seed damage as a result o0f the efficiency of all the treatments, observations were continued on the seeds until the F2 and F3 progenies emerged two and four months later respectively. This is to ascertain the period which the efficacy of the crude powder extract will last on the treated seeds.

Data Analysis

Data collected were ranked, to identify the most effective plant product using Spearman's Rank Correlation Analysis. T-Test was also used to test for significant differences.

RESULTS AND DISCUSSION

Table1: Phytochemical constituents of *Khaya senegalesin leaves extract*

SAMPLES	PARAMETERS TESTED	OBSERVATIONS	REMARKS
Khaya senegalensis	Resins Alkanoids	Resinous precipitate	++
	Dragendorff's reagent	Precipitate formed	++
	Wagner,s reagent	No precipitate formed	--
	Glycosides	Redish brown precipitate	++
	Tannins: 5% ferric chloride iodine solution flavonoids	No blush coloration	-
	Flavonoids	Colourless solution	++

Source: Biochemistry Lab. NVRI, Vom

The phytochemical test for *Khaya senegalensis* is presented in table 1 above. The result shows that the plant product does not contain Tannins, it contains Alkanoids and flavonoids.

Table 2 phytochemical constituents of *Vernonia amygdalina leaves extract*

SAMPLES	PARAMETERS TESTED	OBSERVATIONS	REMARKS
Vernonia amygdalina	Resin	Resinous precipitate	++
	Dragendorff's reagent	Precipitate formed	++
	Wagners reagent		
		Precipitate formed	++
	Saponins:	Persistent fronting	++
	5% ferrichloride Tannins	Bluish coloration	++
	iodine	No bluish coloration	--
	Glycosides	No coloration	--
	Flavonoids	Colourless	++

SOURCE: Biochemistry Lab. NVRI, Vom

The phytochemical constituents of *Vernonia amaygdalina* is presented in Table 2. The result shows that the plant product contained Saponins, Alkaloids and Flavonoids in significant quantity.

Table 3 Result of Phytochemical Screening for *Occimum gratissimum leaves extract*

SAMPLES	PARAMETERS TESTED	OBSERVATIONS	REMARKS
Occimum Gratissimum	Resin	Resinous precipitate	++
	Alkaloids:	Precipitate formed	++
	Dragendorff's reagent	Precipitate formed	++
	Saponins	Precipitate formed	++
	Glycosides	No coloration	--
	Flavonoids	Maintains colour	--
	Cyanide	Filter paper maintains colour ciohetesh	--
	Tannins	Bluish coloration	++

Source: Biochemistry Lab. NVRI, Vom

The effects of various test reagents on the phytochemical composition of *Occimum gratissimum* is presented in table 3. Results indicate positive for Saponins and Alkaloids were present while Glycoside, Flavonoids and Cyanide were completely absent in this plant product.

Table 4 Mean Number of Emerged F_1 F_2 and F_3 Progeny of A. *Obtectus and C.* Malulatus on Cowpea Treated with Plant Products

	F_1		F_2		F_3	
	A. Obtatus C. Maculation		**A. Obtectus C. Maculation**		**A. Obtectus C. Maculation**	
K. senega	12	14	11a	13	21	24
O. gratissum	7a	8a	9a	8a	9a	10a
V. amygdelina	5a	5a	7a	6a	8a	7a

Means with the same letters along rows are not significantly different at (P<0.05) (Spearmans Rank Correlation Coefficient)

The results showed that number emerged F_1 F_2 and F_3 progenia were fewer ($P < 0.05$) on cowpea seeds treated with *Vernonia amygdalina* and *Occimum gratissimum* than on cowpea seeds treated with *Khaya Senegalesis* for both *acanthoschlelida Obtetus* and *Callosobruchus.*

Table 5 Mean Number of Eggs Laid by F_1 F_2 and F_3Progenia of *A. Obtectus* and *C. Maculatus* on cowpea seeds Treated with Plant Products

	F_1		F_2		F_3	
	A. Obtatus C. Maculation		**A. Obtectus C. Maculation**		**A. Obtectus C. Maculation**	
K. senega	54a	63a	78a	87a	106a	198a
O. gratissum	50a	50a	68a	62b	67b	78b
V. amygdelina	48a	49a	47b	48b	54b	53c

Means with same letters along rows are not significantly different ($P \leq 0.05$). (Spearman's Rank Correlation Coefficient)

The result of this study demonstrated that the crude powdered leaves of *Vernonia amygdalina*, *Occimum gratissimum* and *Khaya senegalensis* significantly caused the mortality of the pests of stored cowpea as well as caused significant reduction in the number of viable eggs laid by the pests in a plant related manner, with the highest pesticidal effect recoded in *Venonia amygdalina*

followed by *Occimum gratissimum* and *Khaya senegalensis* respectively. The observed pesticidal and ovicidal effects could be ascribed to the high tannins, saponnins and flavonoids contents of these plants (Aliu, 1996., Muraina and Mamman, 2004). Tannins, saponnins and flavonoids that abound in the tissues of these plants have been demonstrated to possess varied biological activities including antibacterial and pesticidal properties (Aliu,1996., Okpara, 2015).

The selective toxicity of tannins is due to their more rapid absorption through the chitinous exoskeleton (cuticle) of pests like cowpea weevils than the skin of mammals. Furthermore, many pesticides like cyclodienes act on nervous tissues located near the cuticle acting as contact poison. It is conceivable that the powdered leaves of these plants produced the observed pesticidal effects by stimulating the nervous system through cytosolic calcium ion concentration thereby disrupting action potential causing paralysis and death (Aliu, 1996). The ability of tannins and saponnins to accumulate in the tissue of the pests may have also resulted in the significant decrease in the number of the viable eggs laid by the pests. Flavonoids have been demonstrated to affect the activities of many enzymes system *in vivo* and *in vitro*. It is also conceivable that these plants products like the *trizepentadienes* exhibited the observed pesticidal effect by inhibiting the activity of *monamine oxidase* essential in the metabolic processes of the pests (Aliu. 1996., Okpara,2015).

Herbal medicinal products are assuming greater roles in the lives of the people of Africa in the face of global upsurge of resistance, toxicity, adverse effects and escalating cost of synthetic medicinal products (Okpara *etal*., 2007). The results obtained from this study support the traditional use of these plants in the control of pests of stored grains in many part of Nigeria. The result warrant evaluation of safety and the isolation and characterization of the active principle(s) of these plant leaves.

Since crude leaves powder of *V. amygdalina* and *O. gratissimum* significantly reduce the number of adult bruchids, reproductive efficiency and percentage seed damage, it is therefore concluded that *Vernonia amygdalina* and *gratissimum* leaves powder be incorporated into the insecticides used in the strategic grain reserves of the country and farmers should be educated and encouraged to use these plants products at the recommended rates of 229grams of crude leave powder for every 50kg of cowpea seeds in order to control *Acanthoschlelides obtectus* and *Callosobruchus maculatus coleopteran, brunchidae.*

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