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PROTECTIVE BIOACTIVITY OF BIONIMBECIDINE BOTANICAL AND JATROPHA LEAF POWDER (JATROPHA CURCUS L.) IN THE MANAGEMENT OF CALLOSOBRUCHUS MACULATUS (F.) INFESTATION IN STORED COWPEA (VIGNA UNGUICULATA L. WALP.)

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ABSTRACT

Synthetic insecticides have been the main tool used for the control of cowpea bruchid in storage, but the indiscriminate use of the insecticides with their negative effect on man and the environment has been a serious problem to their use. Hence, the practice shifts to the use of alternative eco-friendly relatively cost effective control measures. Laboratory experiments were conducted under ambient conditions of temperature 32-35o c and 55-65% relative humidity to determine the bioactivity of Jatropha (Jatropha curcus L.) leaf powder on C. maculatus (F) infestation on stored cowpea grains (Janwake, Danmalaysia and Iron beans). Ten grams of cowpea grains was weighed into a 200 ml bottle in three replicates for untreated and 3 levels of treatment with Jatropha leaf powder (1.0 g, 2.0 g, and 3.0 g respectively). Grain treatments with these dosages were afterward carried out before infestation with three pairs males and females of adult C. maculatus. Number of eggs laid and adults emerged were counted and recorded throughout the first filial generation. Experiments were arranged in completely randomized designed (CRD). Data obtained were computed and subjected to analysis of variance (ANOVA). Significantly different means were determined using least significant difference (LSD) at 5% level of probability. Results showed no significant differences in all the parameters tested for treated and untreated grains. This indicated that Jatropha leaf powder treatment was ineffective in suppressing infestation, and damage caused by the cowpea bruchid. This may partly be due to difference in the dose used for Jatropha leaf powder and aging of bionimbecidine botanical powder. Similarly, varietal differences did not appear to have had effect on the level of infestation by C. maculatus.

Keywords: Callosobruchus maculatus, Vigna unguilata L. walp/Cowpea, Bionimbecidine botanical, leaf powder.

1. INTRODUCTION

Cowpea, Vigna unguiculata (L.) Walp. Is a pulse crop that can be grown successfully in extreme environments with high temperatures, low rainfall, and poor soils with a few inputs (Fery,2003), Subsistence farmers in the semi-arid and sub-humid regions of Africa are the major producers and consumers of Cowpea (Phillips *et al.,* 2003). Cowpea grain is important to the income of resource poor farmers as well as to the nutritional status. The seed is high in protein contents and

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can be consumed directly, make flour, sprout, weaning food for young children and thus ameliorating malnourishment, wasting and stunting (De Boer, 2003). Cowpea (Vigna unguiculata) belongs to the family Leguminosea, sub-family Faboideae, and tribe phaseoleae, genus Vigna. Members of the phaseoleae includes many of the economically important warm season grain and seed legumes such as soya beans, common beans and mung beans. It has a number of common names but generally called beans in Nigeria.

Cowpea is grown in the tropical and subtropical regions of the world. In Nigeria, it is grown mainly in the drier region of Northern Nigeria, though; recently the cultivation has gained ground in Southern Nigeria, in the West and East. Cowpeas provide a rich source of protein and calories as well as minerals and vitamins. A cowpea seed can consist of 25% protein and it is low in anti-nutritional factor. According to Singh et al, cowpeas were estimated to be cultivated on 12.5 million. Cowpea also plays a key role in subsistence farming and livestock fodder. The cowpea is also seen as a major cash crop by central and West African farmers with estimated 2 million people consuming cowpea on daily basis.

Worldwide, an estimated 7.6 million tons of cowpea is produce annually on 12-13 hectares of land. Sub-saharan Africa accounts for 70% of total world production, 21% in the America and the rest in Europe and Asia; Nigeria is the largest cowpea producer accounting for about 22% of the total, followed by Brazil which produces 10% on 1.44 million hectares annually (Izge *et al.*, 2009). The major and primary storage pest of cowpea is Callosobruchus maculatus (f.). It is field to store cosmopolitan insect pest of Cowpea. Infestation of cowpea often begins in the field as the mature pods dry (Sathyaseelan *et al.,* 2008). When such grains are harvested and stored, the pest population increases rapidly and results in total destruction within a short duration of 3-4 months (Rahman and Talukder, 2006).

There is a tremendous wealth of traditional local knowledge on the use of plant materials in storage protection (Govindan *et al.,* 2010). Some of this knowledge has been neglected over the past decades. However, there is an increasing interest and necessity to reactivate the knowledge (Stoll, 2000). Therefore, it has become necessary to search for an option that can produce satisfactory result in a way that such option is not only acceptable to the farmers, but must also be feasible from a socio-economic stand point. In the present circumstance, an approach that would rely on the use of plant products without involving synthetic pesticides appears to hold the greatest hoppe for increased cowpea production in the traditional cropping system throughout the tropics and sub-tropics (Stoll, 2000). It has been reported that various plant products were effective in not reducing oviposition and adult emergence of C. maculatus only, the seed quality and germination were not affected (Sathyaseelan *et al.,* 2008). The use of botanical plant powders to mitigate infestation and damage by C. maculatus in cowpea grains has been reported by several authors (Adedire & Lajide, 2001; Lale, 1994; Maina *et al.,* 2011, Ofuya & Salami, 2002; Yahaya, 2002). This study aimed at determining the efficacy of Bionimbecidine Botanical powder and Jatropha leaf powder in the management of C. maculatus in grains of three cowpea varieties.

2. MATERIALS AND METHODS

Source of cowpea grains and botanical powders Jatropha (Jatropha curcus L.) leaf powder and bionimbecidine botanical powder

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Varieties of cowpea grain (Jan wake, Iron beans, and Dan-malaysia) was purchased from a local market in Mutum-biyu of Gassol Local Government Area, Taraba State, Nigeria. Pristine cowpea grains were sorted out and cleaned from dirty and kept in the laboratory in a refrigerator until required for use. Jatropha leaf powder, was plucked from the plant in Maiduguri dried under the shade 3-4 days and pound in a motor and pistil. The powdered leaf was afterward sieved and packed in a polyethene bag until required for use. Bonimecidine botanical was obtained from crop protection department, faculty of Agriculture, University of Maiduguri.

Insect Culture:
Callosobruchus maculatus culture was raised on Borno red cowpea grains. C. maculatus stock was obtained from house-hold infested cowpea. Adult progeny that emerged from this culture was used to set up the experiments. The culture was raised under ambient conditions of temperature range (32-350C) and relative humidity (55-65%)

Data Collection and Experimental procedure:
Ten grams of cowpea grains was weighed and counted into a 200ml bottle in three replicates for untreated check (control) and three levels of bionimbecidine botanical powder (1g, 2g, 3g) for each variety of cowpea (Dan-malaysia, Janwake, and Iron beans). Similar weighing was also carried out for Jatropha curcus leaf powder. Cowpea grains in each replicate were treated with the appropriate level of botanical powder before infestation with 3 pairs (opposite sex) of adult C. maculatus (0-72 hours old). The adult insects were removed 7 days after infestation and the numbers of eggs laid on grains in each replicate was counted. Experiments were conducted under similar conditions that the C. maculatus culture was raised as indicated above. Number of adult C. maculatus that emerged was recorded daily throughout the first filial generation (F1). Percentage grain damage and severity of damage were determined for each replicate.

Data Analysis: All Data obtained were computed and subjected to analysis of variance (ANOVA). Significantly different means were determined using least significant difference (LSD) at 5% level of probability. P>0.00 was considered insignificant.

3.RESULTS
Table 1 shows the mean number of eggs laid on cowpea grains treated with various doses were each not of statistical significance (P>0.05) relative to the untreated grains in each of the cowpea varieties.

Table 1: Effect of Bionimbecidine botanical and jatropha leaf powder on oviposition by C. maculatus

Treatment	Cowpea varieties		
Jatropha leaf powder (g)	Janwake	Danmalaysia	Ironbeans
0.0	23.67	26.33	34.67

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1.0	40.33	21.67	9.67
2.0	22.67	35.67	9.00
3.0	22.33	32.33	21.67
SE+	11.79	3.51	8.35
LSD	27.18	8.10	19.25

Values are means of three replicates and were not significantly (P=0.05) different.

Table 2 shows that, there was no significance (P>0.05) difference between the mean number of adult C. maculatus that emerged from each of the treated cowpea varieties compared to each of their untreated grains.

Table2: Effect of Bionimbecidine botanical and jatropha (Jatropha curcus L.) leaf powder on adult emergence that emerged from 10g cowpea grains

Treatment	Cowpea Varieties		
Jatropha leaf powder (g)	Janwake	Danmalaysia	Ironbeans
0.0	23.67	7.67	25.67
1.0	32.00	3.67	9.67
2.0	21.33	5.00	7.00
3.0	17.67	8.33	20.00
SE+	10.98	3.51	8.65
LSD	25.31	8.10	19.94

Values are means of three replicates and were not significantly (P=0.05) different.

Similarly, table 3 shows that, there was no significant (P>0.05) difference between the mean percentage of damage by C. maculatus on each untreated cowpea grains relative to each of the treated grains of the cowpea varieties.

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Table 3: Effect of Bionimbecidine and Jatropha leaf powder in mitigating damage potential of C. maculatus on 10g cowpea grains.

Treatment	Cowpea Varieties		
Jatropha leaf powder (g)	Janwake	Danmalaysia	Ironbeans
0.0	35.02	9.54	45.78
1.0	42.18	5.91	24.14
2.0	22.75	8.06	15.71
3.0	22.85	12.58	33.13
SE+	12.02	5.85	15.01
LSD	27.71	13.48	34.61

Values are means of three replicates and were not significantly (P=0.05) different.

Table 4 shows the mean severity of damage by C. maculatus on each treated and untreated grains of each variety showed no significant (P>0.05) difference.

Table 4: shows the mean severity of damage by C. maculatus on 10g cowpea grains.

Treatment	Cowpea Varieties		
Jatropha leaf powder (g)	Janwake	Danmalaysia	Ironbeans
0.0	46.22	15.64	83.41
1.0	61.74	7.22	33.33
2.0	39.44	10.05	23.67
3.0	40.04	16.53	71.10
SE+	22.56	7.14	29.30
LSD	52.02	16.47	67.57

Values are means of three replicates and were not significantly (P=0.05) different.

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4. DISCUSSION

The findings of this study indicated that varietal difference as well as the treatments did not have any effect on C. maculatus infestation and consequently damage to the cowpea grains. The inability of jatropha leaf powder to reduce egg laying capacity of C. maculatus on the treated cowpea grains may be lack of sufficient dosage. Yahaya (2002) reported that piper guanines were found to reduce egg laying capacity of adult C. maculatus. The ovicidal effect of P. guinines were attributed to the irritating smell of the powder which causes suffocation to adults thereby hindering oviposition success.

This study further revealed that the treatment does not have any effect on the adult emergence of C. maculatus on treated cowpea grains compared to the control. The reason for this is not clear but since Jatropha leaf powder was not able to suppress grains, it may not be able to reduce the hatching of the larvae and the subsequent emergence of F1 adults. This is contrast with the report of Seck *et al.,* (1991) where they showed that powder of leaves and Kernals of Azadirachta indica increased mortality of adult C. maculatus on cowpea grains.

The findings also implied that the treatment as well as the varietal difference did not appear to have had effect on the mean percentage of damage by C. maculatus on cowpea grains in relation to each of the controls. The inability of the treatment to reduce oviposition of bruchids and the number of F1 adult emerged from the treated cowpea grains means that is also cannot reduce the mean percentage of damage of C. maculatus on the grains but this is in contrast with the wor of Oparaeke and Davia (2005) who reported that cowpea treated with mahogany wood ash may have been blocked or interfered with the curticle of the insects resulting in increased mortality, reduced oviposition and infertility of the eggs.

Similarly, the result indicates that there was no significant difference in the mean severity of damage by C. maculatus on each treated and untreated grains of each variety, means that the treatment at different doses has no effect on the severity of damage between each of the treated cowpea grains and their controls. Generally, higher bruchid oviposition as well as the number of F1 adult emergence on grains treated with Jatropha leaf powder resulted in the mean severity of damage since the treatment at various doses were not effective in reducing the mean severity of damage. This opposed the report by Maina *et al.,* (2012) where they reported that bionimbecidine botanical powder especially at higher doses lowered the mean severity of damage to the treated grains.

5. CONCLUSION

In conclusion, the result of this study will serve as a baseline information on the important of cowpea legume as a major source of dietary protein to people in many regions of the world. It is attached by pest both in the field and during storage. The major storage pest cowpea is Callosobruchus maculatus (F) the larvae of the insect bone into the grain which make it unsuitable for human consumption and the environment. The high cost of synthetic insecticides, the danger of insecticides misused and of toxic residues in food has resulted in rapid development and assessment of botanicals as alternative for chemical control of stored product pest.

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Many botanicals in nature have a great potential for development of plant-based biopesticide for the control of cowpea bruchid. The result of present study revealed that Jatropha leaf powder was ineffective in reducing the oviposition, adult emergence, percentage damage and the mean severity of damage by C. maculatus on the treated cowpea grains. This also means that Jatropha leaf powder cannot be use under the condition the experiments carried out the treatment dose on the management of C. maculatus on stored cowpea grains. Therefore, for effective control of cowpea bruchid, alternative methods which are less harmful to the environment, easily affordable and available for use by resource poor farmers should be studied and used.

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