

EXPLOITATION OF CERATOTHECA SESAMOIDES ENDL. IN THE PROTECTION OF STORED COWPEA SEEDS AGAINST (*Callosobruchus maculatus* F.) (COLEOPTERA: BRUCHIDAE)

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ABSTRACT

Laboratory experiments were conducted to determine the insecticidal potentials of two (2) cultivars (cv. Pete and cv. Gogoro) of *Ceratothercasamoides* seed powder in the protection of two (2) varieties of cowpea against *Callosobruchus maculatus* (F.). The experiment was carried out using a completely randomised design. There were three treatments, each applied at 0.5g, 1.0g and 1.5g/50g of cowpea seeds. Each treatment was replicated three times. There was no significant difference between the cultivars in their insecticidal properties but there was a significant difference between the rates of application. *Callosobruchus maculatus* mortality increased significantly in the treated seeds when compared with the control. The highest mortality of *C. maculatus* was observed at the highest rate of application (1.5g/50g seed), while the lowest was observed on the control. There was a significant reduction in the F₁ progeny emergence of *C. maculatus* which led to a 7.2 and 7.5 fold reduction in the F₁ progeny emergence on the 31st day for Ife brown and TVX 76 respectively. The result also showed that the seed weight loss decreased significantly in the treated seeds when compared with the control with seeds treated at 1.5g/50g seed resulting in a 32.3 fold increase in the mean weight of cowpea seeds for Ife brown and 33.2 fold for TVX 76.

Keywords: Bean weevil, Control, Cultivars, Damage, Storage

1. INTRODUCTION

Cowpea (*Vigna unguiculata* (L.) Walp) belongs to the family Leguminosae, subfamily Papilionaceae and Tribe Phaseolae (Gbaye and Holloway, 2011). It is one of the most important food legumes in the semi-arid tropics covering Asia, Africa, Southern Europe, Central and South America (Singh, 2002). It is high in protein and is an important source of food and cash for man, animal feed and soil nitrogen fixation by root nodules of cowpea (Adeboye et al., 2011). It is also a staple food and essential source of plant protein in Africa where animal protein is rarely available (Fatunla and Badaru, 1983). Anyawuet al. (1982) stated that cowpea is the cheapest and most widely consumed legume in West Africa. They also reported that it is the most common source of plant protein in West Africa. Cowpea has relatively high protein and lysine content which constitutes the natural protein supplement to staple diets in Africa and an alternative to meat, fish and milk protein (Shaw, 2007). Nigeria is the largest producer and consumer of cowpea with about 5 million hectares and up to 2.4 million tonnes produced annually (Smart and Hymowitz, 1985). IITA (2008) reported that at least one major insect pest affects cowpea in every stage of production, with *Callosobruchus maculatus* (F.) being the most destructive pest during cowpea storage. The infestation starts from the field, in transit and while in storage causing up to 60% damage to cowpea in storage (Hill, 1983; Kumar, 1984). Unfortunately, most of the farmers in Nigeria use conventional pesticides which are imported and expensive. There have been cases of pest resistance, high persistence in the environment and carcinogenicity of these pesticides (Hill, 1983). The use of natural plant materials will offer a good substitute to the synthetics. This makes it imperative for research in the use of natural methods of control that are cheap, readily available, affordable and environmentally friendly.

This study is to determine the insecticidal potentials of two cultivars of *Ceratothercasamoides* Endl. (cv. Pete and cv. Gogoro) seed powder in the protection of stored cowpea against the bean weevil *Callosobruchus maculatus* and the most effective application rates.

2.0 MATERIALS AND METHODS

Two different types of cowpea variety were used for the study, one improved variety (TVX 76) sourced from the Kwara State Agricultural Development Programme and Ife brown variety sourced from an agro allied store in Ilorin metropolis. Two cultivars of *Ceratothercasamoides* namely cv. Pete and cv. Gogoro were used for the study. They were both sourced from a local market (Kodi at Oja Oba) in Ilorin, Kwara State. A stock culture of *C. maculatus* was sourced from Nigeria Stored Product Research Institute (NSPRI) and this was used to establish a culture in the laboratory of the Department of Crop Protection. The culture was maintained at ambient temperature (28°C ± 2°C) in the laboratory. The seeds of cv. Pete and cv. Gogoro were sundried for 7 days and then pulverized into powder using a high speed blender. The resultant powder was then sieved to obtain a fine powder which were then stored in an air tight container until used.

50g of each variety of cowpea was weighed and placed in a transparent plastic container 8cm x 8cm x 4cm. The treatments were applied at the rates of 0.5g, 1.0g and 1.5g to the 50g of seeds in the containers. They were then shaken to ensure that the powders' coats the surface of the seeds evenly. 5 unsexed newly emerged adults of *C. maculatus* taken from the culture in the laboratory were introduced into each container and a muslin cloth held in place with the aid of a rubber band was used to cover the plastic containers.

The efficacy of the treatments were assessed using the following parameters, adult mortality of *C. maculatus* at 24 hours and thereafter every other day for 10 days, number of emerged F_1 progeny and the weight loss of cowpea seeds. The data collected were analysed using Analysis of Variance and the means separated using the Least Significant Difference (LSD). SPSS version 21 statistical package was used for the analysis.

3.0 RESULTS AND DISCUSSION

There was no significant difference ($P>0.05$) between the insecticidal properties of the two cultivars (cv. Pete and cv. Gogoro) on adult mortality of *C. maculatus* for the two cowpea variety's (Table 1) throughout the experimental period.

Table 1: Effect of cv. Pete and cv. Gogoro powder on adult mortality of *C. maculatus* on Ife brown and TVX 76

Treatment	Ife Brown					TVX 76				
	Days					Days				
	2	4	6	8	10	2	4	6	8	10
cv. Pete	1.0	1.0	0.9	0.8	0.7	0.9	0.9	0.9	0.9	0.7
cv. Gogoro	1.1	0.9	1.0	0.8	0.7	0.9	0.9	1.0	0.8	0.7
LSD	0.2	0.1	0.4	0.3	0.1	0.4	0.3	0.3	0.1	0.3
	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns

NS= not significant

The trend was similar for the F_1 progeny emergence (Table 2) and the seed weight loss (Table 3). Akinneye and Ashamo (2009) observed that mortality of insects varied with plant parts, rate of application and exposure period. Although there was no significant difference ($P>0.05$) in the effect of the different cultivars, there was a significant difference ($P<0.05$) in the different rates of application when compared with the control for all parameters observed.

Table 2: Effect of cv. Pete and cv. Gogoro powder on F_1 progeny emergence of *C. maculatus* on Ife brown and TVX 76

Treatment	Ife Brown			TVX 76		
	Days			Days		
	27	29	31	27	29	31
cv. Pete	32.1	33.9	36.0	7.0b	14.0	14.0
cv. Gogoro	35.0	36.5	35.5	14.0a	15.9	15.2
LSD	27.6	16.7	20.2	4.4	2.5	3.1
	NS	NS	NS	NS	NS	NS

Means followed by the same letter in a column were not significantly different ($P>0.05$), NS = Not significant

Table 3: Effect of cv. Pete and cv. Gogoro powder on seed weight loss caused by *C. maculatus* on Ife brown and TVX 76

Treatment	Ife Brown		TVX 76	
	Days		Days	
	37		37	
cv. Pete	18.4		8.2a	
cv. Gogoro	17.5		7.7b	
LSD	3.3		0.3	
	NS			

Means followed by the same letter in a column were not significantly different ($P>0.05$) NS = Not significant

All the rates applied were able to increase adult mortality of *C. maculatus* with 1.5g/50g rates being the most effective on both varieties of cowpea seeds studied (Table 4). This observed effect might be due to the powder acting as an abrasive on the cuticle of the insect leading to their death or as observed by Kemabonta and Faloye (2013), who reported that most insects breathe through the trachea which usually leads to the opening of the spiracle. These spiracles might have been blocked by the powders thereby leading to suffocation. The increase in mortality associated with 1.5g/50g seeds probably led to a reduction in available adults to mate and oviposit.

Table 4: Effect of different rates of application on adult mortality of *C. maculatus* on Ife brown and TVX 76 of cowpea

4.0 CONCLUSION

The result obtained from this study shows the potential of either cv. Pete or cv. Gogoro in the control of *C. maculatus* in stored cowpea. 1.5g/50g seed was able to increase mortality of adult *C. maculatus*, reduce F_1 progeny emergence and reduce the mean seed weight loss of treated cowpea seeds. These treatments can be utilized by resource poor farmers in the storage of their produce.

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