Scientia Africana, Vol. 22 (No. 1), April, 2023. Pp 13-16 https://dx.doi.org/10.4314/sa.v22i1.2
© Faculty of Science, University of Port Harcourt, Printed in Nigeria *ISSN 1118 – 1931*

EFFICACY OF MIXED POWDER OF CHILLI PEPPER (*CAPSICUM ANNUM*) AND BITTER LEAF POWDER IN CONTROL OF *CALLOSOBRUSCHUS MACULATUS* IN STORED COWPEA (*VIGINA UNGUICULATA* (L) WALP)

Wintola, H.U, Okpanachi, M., Umar, S.O. and Ogbe, K.U.
Department of Animal and Environmental Biology, Prince Abubakar Audu University
PMB 1008, Ayingba, Kogi State, Nigeria
Corresponding Author Email: ogbekingsley90@gmail.com

Received: 30-11-2022
Accepted: 21-03-2023

ABSTRACT

A mixture of two edible plant product powders chilli pepper (Capsicum annum) and bitter leaf (Vernonia amygdalina) (MEPPP) were studied for the effectiveness in suppressing ovipositor, and progeny emergence against Callosobruschus maculatus (f). Pulverized MEPP at the rate of 0.5, 1.0, 1.5, 2.0, 2.5, 3.0g/20g of cowpea seeds were applied as to pre-treated product powder significantly (P≤0.05) reduced oviposition by C. maculatus when tested as pre-treated application, compared with oviposition in control treatments. Consequently, F1 progeny emergence was significantly (P≤05) suppressed compared with emergence in control. In the treatment after infestation, egg mortalities were highest in treatment with at 2g, 2.5g and 3.0g.

Keyword: Mixture of edible plant product powder, *Callosobruchus maculatus*.

INTRODUCTION

Cowpea, *Vigna unguiculata* (L.) Walp is a very important grain legume in West Africa (Kuzh Kuzha et al, 2019). It is widely cultivated and eaten in Nigeria (Kuzhkuzha *et al*., 2019), the most important producing areas in Nigeria being located in the Savanna regions (Phillip, 2012). It is however, cultivated in a large range of ecologies in all the continents of the world (FAO, 2017). It is an extremely valuable crop both as a source of cheap dietary protein for the third world where meat is expensive (Odogwu et al 2021). The high protein and lysine contents of the seeds make them a natural supplement to single diets of cereals, roots, tubers and fruits (Odogwu *et al*., 2021).

The cowpea seed bruchid, *Callosobruchus maculatus* (F.) (Coleoptera: Bruchidae) is a cosmopolitan harvest pest of cowpea in the tropics (Biam and Okorie, 2012). It causes substantial quantitative and qualitative losses manifested by seed perforation and reduction in weight, market value and germinability of seeds (IITA 2019). At least 4% of the total annual production of about 30,000 tons valued at over 30 million us dollars is bruchid (Biam and Okorie, 2012). Under traditional storage conditions, 100% infestation of cowpea occurring within 6 months or more often 3 to 5 months of storage is common (Kuzhkuzha *et al*., 2019).

The use of synthetic insecticides has been the major means through which cowpea seeds are protected during storage. The use of synthetic pesticides over the years has revealed the nuisance they constitute to the ecosystem such as their undesirable side effects on non-target organisms including man and the fact that they are environmentally disruptive (Parfitt *et al*., 2010).

Due to the problems associated with the use of synthetic insecticides, some insecticides of plant origin with a long history of traditional

use have been identified (Natarajan and Santha, 2006). Some of these plants have been reported not to have the problems associated with the use of synthetic insecticides (Rajashekar *et al.*, 2016). To this end, there has been a renewed interest in tropical countries towards the search for safer and cheaper ways of controlling the pest infestation in storedpulse and cereal grains (Adejumo, 2013).

The use of bitter leaf powder has been reported by some researchers in the control of *Callosobruchus maculatus* but the mixed powder of bitter leaf and chilli peper have not been tested. (Uddin II *et al*., 2021) the mixture of bitter leaf powder and chilli pepper powder has not been tested.

MATERIALS AND METHODS

Preparation of plant materials; one kilogram of bitter leaf was obtained from the botanical garden of Prince Abubakar University and air dried with high powder electric mill. One kilo of chilli pepper purchased from Ayigba market was destalked and pulverized into powder. The powder from the two plant species were mixed equally, put in a polypropylene bag and stored in a refrigerator at 4^0cuntill ready for use.

Preparation of cowpea seeds: Two kilograms of clean and sorted uninfected cowpea seeds were purchased from the open market of Ayingba. The seeds were further fumigated with aluminum phosphide (from phostoxin pellets) in an air-tight container for 24 hours to kill any insect present. The seeds were later aired for three days to allow for dissipation of fumigant effect. Therefore, the cowpea seeds were stored in a black polypropylene bag until ready for use.

Maintenance of *Callosobruchus maculatus* culture: one kilogram of already fumigated cowpea (*Var. Dan – illa*) seeds were divided into two parts and were placed in each of two kilner jars and infested with adult bruchids from an insect culture raised in the laboratory over five generations. Bruchids that emerged from this culture were used for the bioassay test. From the new culture, 1-2 day old of 1st or 2nd bioassay were used for the study. The colony of cowpea bruchid was maintained under laboratory conditions of 25 – 32 ^{O}C and 56 – 71% humidity. The bioassay experiment was carried out under these conditions.

Bioactivity testing: Each of the powders of MPPP was applied at six different levels (0.5, 1.0, 1.5, 2.0, 2.5 and 3.0) and mixed with 20g of cowpea (var. Dan-illa) seeds in a 100ml glass jar. The treatment was shaken vigorously for proper mixing and evenly distribution of the powder and allowed to stand for an hour before introducing 5 pairs of 1 – 2 days old adult *Callosobruchus maculatus* into each jar. Control batches were set along for each dosage rates without any admixture of powder. Adult female *C. maculatus* were allowed to oviposit for 7 days before removal and discarding the number of eggs laid in each replicate of treatments were counted and recorded. F_1 progeny emerged in the treated was removed and recorded for the consecutive days after date of the first emergence. Each of these dosage rates and treatment were separately carried out as pre-treatment and treatment after infection. Treatments were carried out as described above in both bioassays.

Experimental design and statistical analysis: Each experiment and treatment was carried out in a randomized complete block design with each treatment replicated four times. The adults that emerged in each replicate for the F1 progeny were expressed as a percentage of the number of egg mortality. Percentage data were arc sine transformed and the entire data collected were subject to two-way ANOVA and means were separated using the Least Significant Difference (LSD) ($p \leq 0.05$) statistic.

Scientia Africana, Vol. 22 (No. 1), April, 2023. Pp 13-16 https://dx.doi.org/10.4314/sa.v22i1.2
© Faculty of Science, University of Port Harcourt, Printed in Nigeria *ISSN 1118 – 1931*

RESULT AND DISCUSSION

Both pre-treated and treatment after infestation with the MPPP proved effective control of *C. maculatus* infesting stored cowpea seed through reduced ovipositor and reduced adult emergence. Table 1 shows the result of the oviposition of *C. maculatus* in pre-treatment infestation.

Table 1: Mean ovipositor of adult *C. maculatus* on cowpea (Var. Dan - illa) seed pre-treated with mixture of chilli pepper and bitter leaf powder.

Dosage (g) 20g seeds	R.1	R.2	R.3	R.4	R	Mean
0.5	2	1	0	2	0	1.25
1.0	0	0	1	1	0	0.5
1.5	0	0	0	0	0	0
2.0	0	0	0	0	0	0
2.5	0	0	0	0	0	0
3.0	0	0	0	0	0	0
Control	8	20	28	61	64	129.8

Mixture of MEPPP powder: SED = 1.22 LSD ($p \leq 0.05$) = 1.12

Table 2: Mean percentage adult *Callosobruchus maculatus* emergence in cowpea (Var. Dan - illa) seeds, pre-treated with mixture of chilli pepper and bitter leaf powder.

Dosage (g) 20g seeds	R1	R.2	R.3	R.4	Means
0.5	0.0	0.0	0.0	0.0	0.0
1.0	0.0	0.0	0.0	0.0	0.0
1.5	0.0	0.0	0.0	0.0	0.0
2.0	0.0	0.0	0.0	0.0	0.0
2.5	0.0	0.0	0.0	0.0	0.0
3.0	0.0	0.0	0.0	0.0	0.0
Control	36	48	61	66	129.8

SED = 1.1 LSD ($p \leq 0.05$) = 0.1

The MPPP was effective in suppressing or completely inhibiting ovipositor from 0.1 – 3.0g. There was significant difference ($p \leq 0.05$) between all the treatment levels and control. The ability of the mixture of plant product powder to suppressed progeny emergence is shown in Table 2. It completely inhibited adult emergence at dosages of 0.5 – 3.0g/ 20g respectively. There was significant difference ($p \leq 0.05$) in all emergences in cowpea. The effectiveness of this product exhibited in suppressing and inhibiting ovipositor and adult emergence could be due to active ingredients contained in the MPPP.

Earlier report has shown that products from these plant materials either as oil extracts or their powders have been used in the control of stored products pest (*Adejumo et al*., 2013).

In this study, the use of mixture of chilli pepper and bitter leaf powder was able to effectively control the ability of *Callosobruchus maculatus* to preserve cowpea seeds during storage. This is very important in reducing damage caused by the pest in storage. This is because *C. maculatus* is a field to store pest and hence any cowpea seeds carrying eggs after harvest or those that can be contaminated by on already infested cowpea seeds can be controlled with the use of this MPPP that have been reported to be very effective. Also considering their ease of availability, safety, low cost and low technology requirement in processing as against the synthetic insecticides, there is need for their adoption for the preservation of stored crop products. These MPPP products are edible and non-toxic for human consumption.

REFERENCE

Adejumo, B.A (2013) Development of a 350kg double walled insulated metallic silo for tropical climate. *Greener J.SCI Eng Techol, Res*, 3 (2013), PP. 195 – 204

Biam, C.K., Okorie, A. (2012) Accelerating grain legumes production in Nigeria. Prospects and challenges *J. Agric –Sci. Technol B*., 2 (2012) pp. 627 – 641

FAO. Food and Agriculture Organization (2017) Statistics. http:apps.fao.org/ dataset?entryid=299920434-c74e-4eazbeed-016832e60609.

IITA. (2018) Scholarly articles for journal on cowpea IITA 2018. www.iita.org/news. crop/cowpea 2019

Kuzkhuzha, M.D., Girei, A., Umar, H. (2019) economic efficiency and its determinants; A study case of cowpea production in the western Agricultural zone of Nasarawa State. *Asian Journal of Agricultural Extension economics & Soc.* DOI: 10.9734/ajees/2019/V301430119

Morandin, L.A., Winston, M.L (2003). Effects of Novel pesticides on bumble bee (*Hymenoptera apida* colony health and foraging ability environmental entomology, volume 32 issue 3, 1 june 2003, pages 555, 563)

Natarajan, G., Santha, R. (2006). Indigenous Agricultural practices among tribal women. *Indian J. Tradit. Knowl.*, 5 (2006), pp 114-117.

Odogwu, B., Uzogara, M.O., Worlu, H., Agbagwa, I. (2021). Crop improvement of indigenous legumes. *African Journal of Food, Agriculture, Nutrition and Development* 21 (3): 17669-17681.

Parfiff, B., Barthel, M., Macnaughton, S. (2010). Food waste within food supply chains qualification and potential for change to 2050 philo. Tran. R. Soc. B, 365 (2010), PP. 3065 – 3080.

Philips, R.D (2012). Cowpea processing and products, in dry beans and pulses production processing and nutrition Blackwell publishing Ltd; pp 235 – 259, http://onlinelibrary.wiley.com/doi.io.1002/9781118448298.chic

Rayashekar, Y., Tonsing, N., Shantibala, T., Manjurath, J.R (2016). 2,3 – Dimethyl maleic anhydride (3 -4 dimethyl-2-5-furandione) a plant. Derived insecticida molecule from colocasia esculenta var. esculenta (L) schott Sci. Rep, 6 (2016) p 205 46 10 v038

Uddin, R., Solihu, A., Gambari, L., Babatunde, S.F (2021). Efficacy of neem leaf (*Azadirachta indica*), bitter leaf (*V. amygdalina*) and pawpaw leaf (*Carica papaya*) powder in control of *Callosobruchus maculatus* in stored cowpea.