THE EFFICACY OF SCENT LEAF *(Ocimum grattissimum)* IN CONTROLLING COWPEA POD BORER *(Maruca vitrata)* IN OWERRI, NIGERIA

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ABSTRACT

This experiment was conducted at the Teaching and Research Farm of Faculty of Agriculture and Veterinary Medicine, Imo State University, Owerri, Nigeria, between May-August, 2018. It investigated the efficacy of Ocimum gratissimum against cowpea pod borer, Maruca vitrata. Four rates of liquid extracts were used, 0, 50, 100, and 150 mls as treatments using randomized complete block design. Proximate analysis on Ocimum gratissimum revealed percentage nutritional contents of ash 14.58%, moisture 82.22%, fibre 9.37% and protein 3.16%. Phytochemical analysis revealed phytate, 12.45g, tannin, 15.43g, sapogenin 11.64g, anthocyanidines 0.27g, and quinine 11.09g. Mineral compositions were Sodium 0.321mg/100g, potassium 0.355mg/100g, calcium 0.0144mg/100g, Magnesium 1.85mg/100g and cadmium 0.187/100g. Heavy metals include zinc, 0.250mg/100g, cadmium 0.00mg/100g, chromium 0.00mg/100g, Fe 0.381mg/100g, Nickel 0.291mg/100g and manganese 0.492mg/100g. Infrared compounds were alcohol 3344.5, aldehyde 2719, carboxylic acid 2995.5, alkenes 2804.4, isocyanate 2804.4. Data were collected on number of insects observed after application, number of plants infested, number of leaves damaged, and number of pods per plot and yield weight. Further results showed that treatments reduced number of insects, number of plants infested, number of leaves damaged, 2, 3, 4 WAP and these were significantlydifferent P≤0.05. Number of pods and yield weight were significantly P≤0.05 different over the control. In this study, Ocimum gratissimum reduced the number of insect pest attack (Maruca vitrata) on cowpea and these actions were due to the anti-nutritional constituents contained in the extract.

Keywords: *Ocimum gratissimum*, *Maruca vitrata*, Phytochemicals, Infrared

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INTRODUCTION

The need to provide quality food crops in the right quantity and at a price that is affordable and accessible has remained a priority to agriculturists; even though those needs have not been met. This is due to a number of factors, which include the menace of insect pests. Insect pests feed on crops and compete for food and transmit diseases to humans and livestock. They include wireworms, cut worms, aphids, several species of beetles, moths, thrips and weevils. These insect pests cause havocs in crop production. The need to reduce losses caused by damage of crops by insect pests has been a great concern to agriculturists. This is because insect pests have continued to limit the food crop harvest meant to feed the ever-growing population of the world. Farmers have used different pest management strategies to curtail the nuisance of insect pests. These include cultural practices (such as crop rotation, bush fallowing and soil sterilization), chemical control through the use of agrochemicals, botanical products, in addition with physical and biological method. The use of pesticides has contributed immensely to the increase in agricultural productivity and to the improvement of human health, particularly the eradication of vector-borne diseases, undoubtedly (Rahman*et al.,* 2016).

In the field, about 35% of cowpea crops are lost annually to insect pests, which adversely affect the world food production during crop growth (Jitendra *et al.,* 2009). Insect pests have continued to limit the food crop harvest meant to feed the ever-growing population of the world. Although pesticides have been used widely to control pests, it is expensive, criticized currently with respect to environmental hazards, human health and development of resistance (Njoroge, 2014). The over-use of pesticides has caused environmental problems and health concerns which is a threat to agriculturists, scientists and the public. These significant drawbacks have necessitated the need for alternatives in pest management for cowpea production. Based on these backdrops therefore, plant products have become promising alternatives in place of synthetic agrochemicals as a replacement based on their cost effectiveness, availability and environmentally friendly to mention but a few (Ohazurike *et al*., 2003). Their efficacy is controlled by environment, time of application and multiplication rate (Sterling, 1991; Njoroge, 2014). Botanicals are naturally occurring chemicals extracted or derived from plants as they offer many environmental components compared to the use of synthetic pesticides in pest control management (Rahaman *et al.,* 2016). Different plant products have been used as botanicals in pest management. Sharma, (2000) revealed *Azardirachta indica* products that are effective against nematodes. Kurman and Khama, (2006) tested effect of neem plant and found good. Uses of neem, custard, sesame, castor oil, *Piper nigrum, Jatropha curcas* cakes are good alternative pesticides (Jourand *et al.,* 2004; Oparaeke *et al.,* 2006). Ohazurike *et al.,* (2003), Dev and Koul, (1997) tested aqueous and powdered leaf extracts of plants as rich sources of novel insecticides. Plant materials with insecticidal properties have been traditionally used for pests and diseases throughout the world (Belman *et al.,* 2001). Bioactive compounds found in plants, can be synthetically produced. They include flavonoids, caffeine, carotenoid, aldehyde, co-enzyme Q, creatine, dilhiolthiones, phytosterols, polysaccharides, phytoestrogens, glucosinolates, polyphenols, anthocyanins, prebiotics, tannins, phytate and alkenes (Srirastara *et al.,* 1989).

Ocimum gratissum commonly known as African basil, scent leaf, herbaceous plant reputed for many medicinal and agronomic practices amongst peasant farmers has been domesticated and readily available (Mann, 2012). Culinary herb, home grown shrub used mainly as spice for delicacies due to unique aromatic taste (Okpala, 2015). The plant species has clusters of flowers with tarrant leaves, serrated margin with nutritional and medicinal values that depend on certain active chemical substances, with physiological impact on the human body (Mann, 2012). Based on the fore-going, this study evaluated the efficacy of *Ocimum gratissimum* against *Maruca vitrata* planted in the field.

MATERIALS AND METHODS

The experiment was conducted during the cropping season of 2018 at the Teaching and Research Farm of the Faculty of Agriculture and Veterinary Medicine, Imo State University, Owerri, Imo State, Nigeria. It is situated between latitudes 5^{0}30'N and 6^{0}10'N, longitude 6^{0}35'E and 7^{0}2'E at an altitude of 72.20 m within the south eastern rainforest agro-ecological zone of Nigeria. Soil sample was collected and tested before preparation of the site. Local variety of cowpea was planted by May, 2018 in a plot measuring 20 x 10 m. The plot was laid in a randomized complete block design (RCBD) which consisted of four treatments randomized 4 times = 16 treatment units. The seed beds of 1m x 1m size were made with borders of 50cm between beds. A total of 16 beds were prepared, bordered by 25cm externally. Two seeds of cowpea were sown per hole at a plant spacing of 50 cm x 50 cm. Each plot has 8 plants giving a total plant population of 128 plants. *O. gratissimum* leaves were dried, grounded. 1000g of the powder was soaked in 1L of distilled water in a clean beaker, covered with aluminum foil, allowed to stand for 48 hours, filtered to produce the liquid extract. Four weeks after planting, 4 treatment levels 0, 50, 100, 150 mls were applied to the crops except the control. Data were collected on proximate, mineral, heavy metal, phytochemical and infrared of *O. gratissimum*. Data were collected on number of insects, number of plants infested, number of leaves damaged, number of fruits per plot and yield weight after harvest.

RESULTS

Result of proximate analyses of *Ocimum gratissimum* revealed 82.2% moisture content, ash 14.5%, fibre 9.3%, protein 3.1%, lipid 8.5%. Mineral composition revealed magnesium 1.8mg, potassium 0.3mg, sodium 0.32mg, Cadmium 0.2mg, Calcium 0.14 mg (Table 1). Heavy metals revealed manganese 0.49mg, iron 0.381mg, Nickel 0.291mg, Zinc 0.250mg, Cadmium 0.0mg Cromium 0.mg (Table 2 and 3). Phytochemical analyses revealed the presence of phytate 12.4ug/g, sapogenin, 11.6ug/g, Quinine 11.0ug/g, Anthocyanidines 0.3ug/g and tannin 5.4ug/g (Table 4). On parameters tested, there were no significant difference at 5% level of probability in the number of insects observed at 2WAAP and 3WAAP except the control (Table 5). On number of plants infested, all the treatments were significant at 0.05 except control plot at 5WAP and 6 WAP (Table 6). On number of leaves damaged significant differences at ($P \leq 0.05$ existed in all treatments except in the control (Table 7). The numbers of pods per plot were significant $P \leq 0.05$ in all treatments except the control. Values of yield were significant0.05 in all treatments, 150> 100> 50> 0.0 (700, 350, 210) g/ha. (Table 8).

DISCUSSION

The result of the proximate analyses of *Ocimum. gratissimum* showed it's nutritional composition such as moisture content, ash, fibre, protein, and lipid, which are beneficial in the preparation of many dishes (Okpala, 2015). On heavy metals contents, an absence of cadmium and chromium and low zinc, iron, nickel, manganese showed that there is very low deposition of metals in scent leaf (Njoroge, 2014). The Phytochemical and infrared analyses of scent leaf contained many major bioactive compounds namely phytate, tannin, sapogenin, anthocyanidines, quinine, alkene, aldehyde and carboxylic acid. These tallied with Ohazurike *et al*., (2003) and Oparaeke *et al., (*2006) in their work with *Jatropha curcas a*nd neem used to treat maize weevils. The efficacy of bioactive compounds in *African basil* in the control of *Maruca vitrata*, caused reduction in the number of insects at 2 and 3 (WAAP) respectively. This tallied with the findings of Njoroje *et al*., (2014) and Ohazurike *et al., (*2003) which stated that botanical products which are easily and cheaply collected in rural farms have been found promising and useful for common bean pest control. The numbers of pods per plot and values of yield which showed positive significance were in line with Njoroge, (2014) and Ohazurike *et al.,* (2005) that natural plant products reduced pest attack and increased yield of crops.

CONCLUSION

Ocimum gratissimum leaf extracts were lethal to *Maruca vitrate* in cowpea with concentrations, (150>100>50) mls respectively in all the parameters tested. Therefore, its use in the fight against *Maruca vitrata* will be of immense benefits for farmers within our sub humid region.

RECOMMENDATION

The study recommends that *Ocimum gratissium* was potent at various levels in this experiment to control *Maruca vitrata* in all the parameters tested. Moreso, further bioassay, should be carried out through HPLC (High Pressure Liquid Chromatography) and GCMS (Gas Chromatography Mass Spectrometer) to determine the active principles causing the insecticidal and repellent activities and their structure.

REFERENCES

Jourand P., Rapior S., Fargette M., & Mateille T., (2004). Nematostatic effects of a leaf extract from *Crotalaria vigulata* sub sp. Grantiana on *Meloidogyne incognita* and its use to protect tomato roots. *Journal of Nematology 6*(1): 79 - 84.

Kumar, S and Khama, A. (2006). Effect of neem-based products on the root-knot nematode, *Meloidogyne incognita* on the growth of tomato. *Nematology 34:141-146*

Mann, A. (2012). Phytochemical constituents and antimicrobial and grain protectant activities of Clove Basi (Ocimum gratissimum L) grown in Nigeria. *International Journal of Plant Research, 2*(1): 51-58

Njoroge and Hannah Wanja, (2004). *Management of Root-Knot nematodes and Fusarium wilt of tomato by pretreatment of seedling with chemical and biological agents*. Department of Plant Science and Crop Protection, Faculty of Agriculture, University of Nairobi, Kenya.

Ohazurike N.C., Onuh M. O., & Emeribe E. O., (2003). E use of seed Extracts of the Physic nut (*Jatrolpha curcas L.)* in the control of Maize weevil (*Sitophilis Zeamais M*) in stored Maize grains (*Zea mays L*). Global *Journal of Agricultural Sciences, 2(2):86-88*

Okpala B. (2015). Benefits of *Ocimum gratissiumum. (Scent leaf),Nchanwu. Global foodbook. http://globalfoodbook.com*

Okparaeke, A.M. (2006). The sensitivity of flower bud thrips, *Megalurothrips Sjostedti* Trybom (Thysanoptera *Thripidae)* on Cowpea to three concentrations and spraying schedules of *Piper guineense* Schum and Thonn. *Plant Protection Science 42,106-111.*

Sharma, G. (2000). Efficacy of neem-based formulations against the root-knot nematode Meloidogyne incognita. *Pesticide Research Journal 12:183-187.*

Srivastava, R and Kulshreshtha, D. (1989). Bioactive polysaccharides from plants. *Phytochemistry 28* (11): 2877-2883.

Stirling, G. (1991). Biological control of plant parasitic nematodes. CABI, Wallingford, UK.

APPENDICES

Table 1: Proximate analysis of scent leaf (*Ocimum gratissimum)*

Parameters	Percentage (%)
Moisture content	82.22
Ash	14.58
Fibre	9.37
Protein content	3.16
Lipid (Fat)	8.52

Table 2: Mineral composition of (*Ocimum gratissimum)*

Mineral	Mg/100g of Scent leaf
Na	0.321
K	0.355
Ca	0.144
Mg	1.85
Cd	0.187

Table 3: Heavy metal content in scent leaf (*Ocimum gratissimum)*

Metal	Mg/100g of Scent leaf
Zn	0.250
Cd	0.000
Cr	0.000
Fe	0.381
Ni	0.291
Mn	0.492

Table 4: Phytochemicals of *Ocimum gratissimum*

Phytochemicals	Ug/g of Scent leaf sample
Phytate	12.45
Tannin	15.43
Sapogenin	11.64
Anthocyanidines	0.27
Quinine	11.09

Table 5: Mean number of insects at different intervals after application.

Treatments	2WAAP	3WAAP
Lo (0.0ml)	6.67^{a}	6.67^{a}
L1 (50ml)	2.33^{ab}	2.00^{b}
L2 (100ml)	$3.00a^{b}$	1.00^{b}
L3 (150ml)	1.33^{b}	0.67^{b}
C.V	71.24	67.36

Means having the same superscript letter (s) are not significantly different at ($P \leq 0.05$)

Table 6: Number of Infested Plants

Treatments	2WAAP	4WAAP
LO (0.0ml)	8.00^{a}	2.67^{a}
L1 (50ml)	2.67^{b}	1.33^{b}
L2 (100ml)	3.33^{b}	0.33^{b}
L3 (150ml)	2.33^{b}	0.33^{b}
C.V	52.75	55.33

Means followed by the same superscript letter (s) are not significantly different at ($P \leq 0.05$).

Table 7: Number of Leaves damaged

Treatments	2WAAP	3WAAP
L0 (0.0ml)	2.33^{a}	2.33^{a}
L1 (50ml)	1.00^{a}	1.33^{ab}
L2 (100ml)	1.00^{a}	1.00^{b}
L3 (150ml)	1.00^{a}	1.00^{b}
C.V	57.28	42.42

Means followed by the same superscript letter(s) are not significantly different at (P≤0.05)

Table 8: Number of Pods per plot

Treatments	Pods per plot
L0 (0.0ml)	54.00^{a}
L1 (50ml)	31.33^{b}
L2 (100ml)	51.00^{a}
L3 (150ml)	46.67^{ab}
C.V	20.09

Means followed by the same superscript letter(s) are not significantly different at (P≤0.05).