# INSECTICIDAL EFFICACY OF THREE EDIBLE PLANT PRODUCT OILS GAINST THE COWPEA BRUCHID, *Callosobruchus maculates* (FAB.)

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Abstract

*Three edible plant product oils, West African Black Pepper (WABP) Piper guineense Schum and Thonn; Claot, '<Syzgium aromaticum (L) Merril and Percy; Ethiopian pepper oil, Xylopia aethiopica (Dum) A. Rich, were studied far their effectiveness in suppressing or deterring oviposition, egg mortality and progeny emergence against* the j *cowpea bruchid, Callosobruchus maculatus (F) in the laboratory under ambient temperature and relative humidity. The experiment was carriedoutas treatment before infestation (TBI) and treatment after infestation (TAI) on cowpea seeds infested with cowpea bruchids. The edible plant product oil (EPPO) was used at the rate of 0.25,0.5,0.75 and 1.00 mg/lOg of cowpea seeds against cowpea bruchid C. maculatus. The TBIexperiment showed that the entire plant product oil significantly (P<0.05) reduced oviposition by* C. *maculatus when compared with oviposition in the control treai nents. Clave and WABP oil at the highest dosage rate of 1.00 mg completely deterred oviposition by the adult* C *meculatus and hence no adults emerged in the treatments.* WABP *oil completely deterred* F, *adult emergence a' the dosage rates of 0,5 and 0.75; and dove oil deterred adult emergence of the* $F_2$*generation at the dosage rate of 0,75 -<ig. Ethiopian pepper oil was generally found to be less effective than clove and WABP when applied as treatment before infestation. In the TAI the three essential oils significantly (P<0.05) reduced the percentage* o/C *maculatus a'tults that emerged. Egg mortalities were highest in all the treatments when compared with the control and were statistically significant.* No *adult emerged in cowpea seeds treated with WABP andEthiopianpepperoilsat the rate of 1.00 mg/lQg seeds. The potential effectiveness of all the three edible plant product oil implied that stored cowpea seed- could be adequately protected against Callosobruchus maculatus; thus reducing their infestation and damage on &wpea seeds.*

*Keywords: Callosobruchus maculatus, Cowpea, edible plant product oils, treatment.*

## INTRODUCTION

Cowpea, *Vigna unguiculata* (L.) Walp. is one of the moat important legumes in the tropics and a very popular and important indigenous African crop in many communities living in less developed countries (: Jshamalini *et al,* 1998). They are grown as a pulse vegetable, fodder and as a cover crop where it serves as a source of nitrogen to the soil. It is a very important but cheap source of dietary protein for many countries of the tropics (Ofuya, 2001). It is widely cultivated and eaten in Nigeria (Ohiagu, 1986) as an important grain legume which contains 22 35% protein and constitute the major .protein source in the third world countries (Singh &Jackai, 1985). The high protein content of cowpea and its use as a staple in the diets of Sahelian and coaster populations make it also a crop with high potential for food security in these regions (TarawaliefaZ.,2006).

The annual world cowpea crop is about 12.5 million ha and the total grain production is about 3 million tonnes. West and Central Africa is the leading cowpea producing regions in the world. The principal cowpea producing countries are Nigeria, Niger Republic, Senegal, Ghana, Mali, Burkina Faso and Cameroon. Nigeria accounts for over 70% of the world production (FAOStat, 2000). The largest producer and consumer of cowpea in West African (and in the World) is Nigeria (FAOStat, 2000) where dense population creates an enormous demand for the crop. Nig6r Republic is the largest cowpea exporter in West Africa with an estimated 215,000 million tonnes export annually mainly to Nigeria (FAOStat, 2000). Nigeria produces 64% of the estimated 3 million tonnes of cowpea seeds produced in the region. Sigh *et al* (1997) estimated that out of the 12.5 million ha, 8 million ha are in West and Central Africa and these are distributed predominantly between Nigeria and Niger Republic, with grain yield estimated at 240 kg/ha for northern Nigeria. This compares to the current estimate of average grain production of 358 kg/ ha for West Africa (FAOStat, 2006).

i principal storage pest of cowpea grain is the i bruchid, *Callosobruchus maculatus* (F.), also Own erroneously as the cowpea weevil (Hill, 7; Ofuya, 1990). The insect is a field-to-store pest ir pulses in tropical Africa and Asia and the level of eld infestation is a major factor that influences the |ionomics of these bruchid (Ajayi & Lale, 2001). ! enormity of weight loss, reduced viability and Seduced commercial value of the seeds, due to tattack by C. *maculatus* is well documented. The Imagnitude of losses negates efforts at selK |sufficiency in food production and poverty |alleviation. C *maculatus* has been reported to cause fsubstantial quantitative and qualitative losses, manifested by seed perforation and reduction in Iweight, market value and germinability of seed I^Adeduntan and Ofuya, 1998). At least 4% of the iftOtal annual production of about 30,000 tonnes J valued at over 30 million US Dollar is lost annually i in Nigeria alone to this bruchid (Caswell, 1980;

SingM«J.,1983).

The control measure of C. *maculatus* with synthetic insecticides is effective 0ackai and Daoust, 1986), I but its use have antecedent side effects, such as high mammalian toxicity, environmental pollution, insect resistance and resurgence, high cost and unavailability at critical periods which tends to discourage fanners thus causing high losses during post harvest (Ivbijaro, 1983; Lale, 1995, Ofuya, 2003). Additionally, most peasant farmers have little or no technical skills, education or competence to safely handle pesticides (Lale, 1995). This is corroborated in a study carried out by the Ministry of Health in the northern Borgou Province of Republic of Benin in 2005 that revealed that 57 people died due to endosulf an pesticide applied to cowpea and another 36 people experienced serious ill health (Pesticides News, 2007).

Due to the problems associated with the use of synthetic insecticides, there has been a growing interest in the use of plant products to control insect population. Some of these plants have been reported not to have the problems associated with the use of synthetic insecticide (Arnason *et al.,* 1989). To this end, there has been a re-newed interest in tropical countries towards the search for safer and cheaper ways of controlling the major storage insect pests of pulses and cereal grain (Malik & Naquvi, 1984). Peasant farmers in the tropics have been reported to use various plants (whole, parts, powders of ash) or mixtures of plant products and oils to protect cowpea seed against pest damage during storage (Lajide *et al.,* 1998; Golob *et al,* 1999). The candidate plant products used for this study have been previously used in the management and control of some stored product Coleopteran (Grainge & Ahmed, 1988; Lale, 1992; Ajayi & Wintola, 2006). There are also reports of their use as condiments and for culinary purposes in homes (Cobley & Steele, 1976; Rehm & Espig, 1991).

The present study evaluated the insecticidal efficacy of three oils obtained from clove, *Syzgium aromaticum;* West African Black Pepper (WABP), *Piper guineense* and Ethiopian pepper, *Xylopia aethiopica* for their effectiveness in suppressing progeny emergence, oviposition deterrence and egg mortality of the cowpea bruchid, *Callosobruchus maculatus* (F.) (Coleoptera: Bruchidae).

## MATERIALS AND METHODS

**Preparation of plant materials and oil extraction**

One hundred and fifty grammes of each dried seeds of WABP *(Piper guineense* Schum and Thonn.), dried fruits of clove *(Syzgiun aromaticun* L. Merril and Percy) and dried fruits of Ethiopian pepper *(Xylopia aethiopica* Dun. A. Rich.) were purchased from the open market in Lafia (08° 33N

and 08° 32'E) north central, Nigeria. The seeds and fruits were separately ground into coarse powder and steam distilled in a clavenger glass'apparatus. Distillation was carried out for five hours in the Chemistry laboratory of Nasarawa State University, Keffi, Nigeria. The process yielded on the

average 0.83% of P. *guineense,* 7.4% *S. aromaticum* and 1.2% X. *aethiopica* ml of oil. Distilled oil was collected into a 50 ml glass jar and stored at laboratory temperature until ready for use.

**Insect rearing and maintenance**

The initial stock of cowpea bruchid (C. *maculatus* (F.) used for the study was obtained from an already infested cowpea seeds purchased from Lafia market, Nasarawa State, Nigeria in January, 2008. From this stock, new generation was reared in the laboratory on cowpea variety IT90k-277-l at room temperature. Freshly emerged adults of C. *maculatus* were then subsequently sub-cultured on the same variety of rowpea over four generations before they were used for the experiment.

Preparation of cowpea seeds

Ten kilogrammes of clean and sorted uninfested cowpea seeds, IT90k-277-l variety was obtained from the harvested cowpea seed from the stock of Faculty of Agriculture, Nasarawa State University, Shabu-Lafia Campus, Lafia. Screened seeds were

fumigated with aluminum phosphide (phostoxin tablet") in an air-tight container for about one week. The seeds were later air dried for three days to allow dissipation of the fumigant effect. Thereafter, the- cowpea seeds were stored in a black polypropylene bag inside a deep freezer below 0°C for about a week. The seeds were later air dried for three consecutive days to allow seed to dissipate imbibed moisture contents.

**Bioassay test for treatment before infestation with three edible plant product oils on G maculates**

The bioassay test was carried out as treatment before infestation (TBI). 10 g of cowpea seed (IT90K-277-1) was weighed into sixty 50 ml glass jar bottles using an electronic laboratory scale (Balance Top Leading Ohms Digital Model) and treated with 0.25, 0.50, 0.75 and 1.00 mg of WABP, clove and Ethiopian pepper. The different dosage rates were carried in 0.2 ml of analytical grade acetone and applied onto the cowpea seeds in the jars. After application, each of the contents in each jar was stirred in order have even spread of the oil over the cowpea seeds. Seeds in control jars (0.0 mg) were treated with 0.2 ml of pure acetone alone and stirred. Upon evaporation of acetone, five pairs of mated 3-4 day old adult of C maculates were introduced into each jar carrying treated cowpea seeds. Female bruchids were allowed to lay eggs for seven (7) days. On the seventh day, the insects were removed and the eggs laid on each cowpea seed and treatments were counted and recorded. The F, progeny that emerged later in each treatment was recorded and removed for fourteen (14) consecutive days after the date of first emergence. Also the $F_2$ progenies that emerged were also recorded and removed. The experiment was laid out in a completely randomized design and replicated four times.

**Bioassay test of three edible plant product oil on *C. maculatus* after infestation**

The'same number of insects and age were used for this study in identical jars (50 ml each) containing 10 g of cowpea'seeds (TT90K-277*!). Adult C. maculates was allowed to lay eggs for 7 days on the cowpea seeds. On day 7, all insects were removed and the number of eggs laid on each seed in the bottles was counted. Each replicate of cowpea seed and treatment (now carrying bruchid eggs) was treated with the same amount of edible plant product oil (EPPO) carried in 02 ml of analytical grade acetone as shown above. The control treatment was treated with 0.2ml of pure analytical grade acetone. The admixture of the seeds with oil in acetone or pure acetone alone in the case of control was stirred to ensure adequate coating of seeds with oil or acetone with seeds. The admixtures were left open until the acetone was completely evaporated and lids of the glass jars replaced. F, progeny that emerged in each treatment and replicate was removed and receded for 14 consecutive days after date of first emergence. Data were taken for first and second generations. The
experiment was set up in completely randomized design (CRD) and treatments were replicated four times.

Data collection and analysis Data collected include the number of eggs laid in each bottle jar and treatment, number of progeny emergence in each treatment for F, and F, generations. The number of emergence was expressed as a percentage of the number of eggs laid. Number of egg mortality was expressed as the percentage of the number of adults that emerged. -All-percentage data were arc sine transformed before being subjected to one way ANOVA and means were compared using the least significant difference (LSD) test at P-0.005.

RESULTS AND DISCUSSION

Table 1 shows the effect of three edible plant i product oils on cowpea bruchid, *C. maculatus* \ infesting cowpea seeds treated before infestation. } The Table showed that the plant product oil ! significantly deterred egg laying by the cowpea ! bruchid. There were no significant differences j (P>0.05) between the different, dosage rates in oil extracted from Ethiopian pepper, but there were significant differences (P<0.05) between the treatments at 0.5,0.75 and 1.00 mg when compared with the control; there were significant differences between the lowest dosage rate (0.25 mg) and higher dosage rates (0.75 and 1.0 mg). Also there were no significant differences (P>0.05) in cowpea seeds treated with clove and WABP at the dosage rates of 0.25,0.5,0.75 and 1.0 mg,.respectively, but there was a significant difference (P<0.05) between the control and the lowest dosage rate (0.25 mg) for clove and WABP. Also there were significant differences (P<0.05) between the other dosage rates and the control in cowpea seeds treated with clove and WABP, respectively.

Table 2 represents the percentage egg mortality observed as percentage number of eggs that were unable to hatch. The Table showed that there were no significant differences (P=0.05) in cowpea seeds treated with Ethiopian pepper oil and the control and all other dosage rates except the highest dosage rate (1.00 mg). There were however no significant differences (P>0.05) between the other dosage rates when compared with each other in cowpea seeds treated with Ethiopian pepper, and the control. There were no significant differences (P>0.05) between the dosage rates (0.5, 0.75, 1.0 mg) in cowpea seeds treated with WABP, but there was however, significant differences among the lowest dosage rate (0.25 mg). Also there were significant statistical differences (P<0.05) between the cowpea seeds treated with 0.25 and 0.50 mg using clove oil. The control treatment was significantly different (P<0.05) from all the dosage rates in cowpea seeds treated with WABP and clove oils with the exception of the lowest dosage- (0.25 mg) rate in clove. From the Table it can also be deduced that cowpea seeds treated with clove and WABP oils resulted in 100% egg mortality at the dosage rate of 1.00 mg, respectively.

Table 3 represents the mean number of *C. maculatus* that emerged as a result of eggs laid by the Fl adults. In cowpea seeds treated with Ethiopian pepper oil although there were no significant differences (P>0.05) between the lowest dosage rate (0.25 mg) and the control but there were significant differences (P<0.05) between the control and all other dosage rates. There were also no significant differences (P<0.05) between the lowest dosage rate (0.25 mg) and the higher dosage rates (0.50,0.75 and 1.00 mg) in cowpea seeds treated with clove and WABP oils. Even though the dosage rates did not differ statistically (P>0.05) from each other, they differ statistically (P=0.05) from the control. It was also observed that at the rates of 0.75 and 1.00 mg/10 g seed in cowpea seeds treated with clove oil, emergence of C. *maculatus* was completely prevented. While in the case of cowpea seeds treated with WABP oil, emergence of adult bruchid was completely prevented at 0.5, 0.75 and 1.0 mg, respectively.

The results of mean number of eggs laid in treatment after infestation showed that, there was no significant difference (P>0.05) among the number of eggs laid on cowpea seeds. The lowest mean number of eggs laid was 116.8 while the highest mean number was 174.3 (Table 4). Table 5 showed the comparison of percentage of Fj progeny emergence on cowpea seeds treated with edible essential oil of three plant species. The Table showed that there were significant differences (P<0.05) between the highest dosage rates and the control (0.70 and 0.60) in cowpea seeds treated with Ethiopian pepper oil and clove oils (0.00 and 0.01), respectively. There was however, no significant difference (P>0.05) in all the dosage rates when compared with each other. In cowpea seeds treated with WABP oil there was significant difference (P<0.05) between the highest dosage rate (1.00 mg = 0.00) and the control (0.85).

Table 6 showed the mean progeny emergence of control of second filial (FJ generation of C. *maculatus* in cowpea seeds treated after infestation. There were significant differences (P<0.05) between the control and all the dosage rates for all the three plant oil used. The Table also showed that there was significant difference (P<0.05) between the lowest dosage rate and the highest dosage rate for all the three plant oil, butihere was no significant difference (P>0.05) between the dosage rates of 0.5,0.75 and 1.0 mg, respectively. The results of this study have shown that cowpea protected with Ethiopian pepper, clove and WABP oils before infestation of cowpea bruchid significantly prevented egg laying by ovipositing females as seen in Table 1. At the dosage rates of 0.5, 0.75 and 1.0 mg of Ethiopian pepper oil there was significant deterrence of oviposition by C. *maculatus* while in case of clove and WABP oils, all the dosage rates significantly prevented

Table 1: Mean Number of Eggs Laid by *C. maculatus* on Cowpea Seeds Treated Before InfestaUon with Edible Essential Oils of the Three Plant Species

| Dosage of oil (mg/lOgseed) | Ethiopian pepper | Source of Oil | |
|---|---|---|---|
| | | Clove | West African Black Pepper |
| 0.00 (Control) | 86.50 | 88.50 | 87.25 |
| 0,25 | 61.00 | 11.00 | 10.00 |
| 0.50 | 32.50 | 7.25 | 7.00 |
| 0.75 | 22.50 | 2.25 | 4.50 |
| 1.00 | 16.25 | 0.75 | 2.00 |
| SED | 13.87 | 5.83 | 5.11 |
| LSD | 29.57 | 12.43 | 10.89 |

**Table 2: Comparison of FI Percentage Progeny Emergence from Cowpea Seeds treated before Infestation with Essential Oils of the Three Plant Species**

| Dosage of oil (mg/lOgseed) | Ethiopian pepper | source of oil Clove | West African Black Pepper |
|---|---|---|---|
| 0.00 (Control) | *(41.80)44.40 | (46.69)52.90 | (63.68)80.30 |
| 0.25 | (38.02) 37.90 | (40.11)41.50 | (24.40)1740 |
| 0.50 | (34.76)32.50 | (17.24) 8,80- | (12.20) 4,40 |
| 0.75 | (34.42)32.00 | (8.81) 2.30 | (6.64) 130 |
| 1.00 | (31.16)26.80 . | (0.00) 0.00 | (0.00) 0.00 |
| SED | 7.89 | :8.64 . | 6.95 |
| LSD | 16.82 | 18.42 | 14.82 |

* Values in parenthesis are arc sine values of the means to which SED and LSD values are applicable

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**Table 3: Comparative $F_2$ Generation Adult Emergence from Cowpea Seeds Treated Before Infestation with Edible Essential Oils of the Three Plant Species**

| Dosage of oil (mg/lOgseed) | Ethiopian pepper | Source of Oil | |
|---|---|---|---|
| | | Clove | West African Black Pepper |
| 0.00 (Control) | 28.75 | 38.00 | 42.25 |
| 0,25 | 17.25 | 10.25 | 0.50 |
| 0.50 | 6.25 | 1.25 | 0.00 |
| 0.75 | 5.00 | 0.00 | 0.00 |
| 1.00 | 1.00 | 0.00 | 0.00 |
| SED | 7.66 | 10.11 | 6.33 |
| LSD | 16.31 | 21.54 | 13.49 |

**Table 4: Mean Numbers of Eggs Laid by Callosobruchus maculates on Cowpea seed Treated After infestation with Edible Essential Oils of the Three Plants Species**

| Dosage of oil (mg/lOgseed) | Ethiopian pepper | Source of Oil | |
|---|---|---|---|
| | | Clove | West African Black Pepper |
| 0.00 (Control) | 174.3 | 167.8 | 141.5 |
| 0,25 | 170.3 | 143.3 | 138.8 |
| 0.50 | 116.8 | 118.3 | 129.8 |
| 0.75 | 147.5 | 124.8 | 127.0 |
| 1.00 | 171.5 | 170.5 | 135.3 |
| SED | 28.1 | 21.8 | 23.3 |
| LSD | NS | NS | NS |

NS= None Significant

**Table 5: Comparison of Percentage FI Progeny Emergence from Cowpea Seeds Treated After Infestation with Edible Essential Oil of the Three Plant Species**

| Dosage rates (mg/10 g seeds) | Ethiopian pepper | Source of oil Clove | West African black Pepper |
|---|---|---|---|
| 0.00 (control) | * (2.34) 0.70 | (4.43) 0.60 | (5.30)0.85 |
| 0.25 | (1.82)0.10 | (2.40)0.18 | (1.25)0.05 |
| 0.50 | (1.30)0.50 | (1.50)0.07 | (0.55) 0.01 |
| 0.75 „ | (1.40)0.60 | (1.18) 0.04 | (0.43) 0.01 |
| LOO | (0.00)0.00 | (0,63) 0.01 | (0,20)0.00 |
| SED | 0.95 | 0.97 | 1.4 |
| LSD | 21 | 2.1 | 3.1 |

*Values in parenthesis are arc sine values of the mean to which SED and LSD value are applicable.

**Table 6: The Mean Progeny Emergence of $F_2$ Generation of *Callosobruchus macuJatut* in Cowpea Seeds Treated After Infestation with Three Essential Plant Oils**

| **Dosage, rates (mg/10 g seeds)** | **Ethiopian pepper** | **Clove** | **West African black Pepper** |
|---|---|---|---|
| 0.00 (control) | 14,00 | 15.75 | 17.25 |
| 0.25 | 8.75 | 7.50 | 4.25 |
| 0.50 | 3.25 | 2.00 | 1.75 |
| 0.75 | 3.25 | 1.25 | 0,10 |
| 1.00 | 0.00 | 0.75 | 0.00 |
| SED | 2.1 | 1.98 | 0.905 |
| LSD | 4,5 | 4.25 | 1.90 |

oviposition when compared with the control that was untreated. Protection -of coWpea with these edible plant oils also increased the percentage egg mortality and reduced significantly the emergence of both Fi and $F_2$ generations as seen in Tables 2 and 3, respectively.

S. *aromaticum* significantly deterred oviposition by C *maculatus* an effect that has also been observed by Oparaeke (1997) and Ofuya (1990). The efficacy of clove could be attributed to the presence of eugenol an active ingredient in clove (Purseglove, 1979) which has an insecticidal activity against pests. It can also be deduced from Tables 2 and 3 that clove at the rate of 1.00 mg completely prevented adult emergence in the F,, and $F_2$ at 0.75 and 1.00 mg, respectively. The results of this study are also consistent with previous reports (Ivbijaro &Agbaje, 1986; Olaifa & Erhun, 1988; Lale, 1994; Mbata *et al.,* 1995) that P. *guinemse* is effective in protecting stored seeds of cowpea from infestation and damage by C. *maculatus*. Extraction of P. *guineense* seed powder with hexane or acetone yielded oil which is more potent in protecting stored seeds of cowpea against infection by C. *maculatus* (Olaifa & Erhun, 1989; Ivbijaro, 1990; Mbata *et al,* 1995). Adults of the beetle are rapidly killed and oviposition and subsequent adult emergence completely prevented.

Olaifa & Erhun (1988) reported that P. *guineense* have proved significantly more effective in reducing oviposition than in the control. The seed powder adversely affects the biology of maize weevil, *Sitophilus zeamais* and also caused high mortality in the weevil (Lale, 1992). P. *guinemse* as seen in Table 1 significantly reduced egg laid even at very low doses when compared with the control. It also gives high egg mortality up to 100% at 1.00 mg/10 g of cowpea seeds and completely prevented emergence of the F, generation at 1.00 mg/10 g as shown in Table 2 and at 0.5 mg, 0.75 mg and 1.00 mg/10 g of cowpea seeds in the $F_2$ generation as shown in Table 3. Cowpea seeds treated with Ethiopian pepper oil did not. completely deterred oviposition but significantly reduce oviposition, increased egg mortality, reduced F,, and $F_?$ adult emergence to a considerable level that will ensure the safety of cewpea instorage. The efficacy of X, *aethiopica .seems* to ije cons»tent ^ifh previous findings of CS^i (1994) in wMch cowpea and maize grain inqculated; withtile weevif and treated with the groundedf?$eeds erf X. *dethiopica* were free from infjestatioh; after,; 3 months. According to CDjimelukvve &i.-iftsfu (2003) two plant products *(Capsicum #jwuunt:$hd* 3|. *ttethiopico) were* able to protect co%pea$^{j}$ fibur from infestation by *C. maculatus for* 60 days. Ojimelukwe (2000) found that the seeds damage for cowpea seed stored with X. *aethiopica* against C. *maculatus* for six months were significantly less than seed damage in the control. When cowpea grains were treated with seed dust of X. *aethiopica,* less number of eggs of C. *maculatus* was observed (Ojimelukwe & Kalu, 2003).

Some of the edible plant products, particularly P. *guineense, S. aromaticum and Xylopia aethiopica* were effective in suppressing or completely inhibiting oviposition (Ajayi & Wintola, 2006). Suppression of C. *maculatus* adult progeny development as observed in this study is brought about by reduced egg laying and increased mortality of eggs and first instars, larvae on the surface of the seeds before they are able to penetrate the cowpea cotyledons (Lale & Abdulrahman, 1999; Lale & Mustapha, 2000).

The result of this study have shown that cowpea seeds can be protected with Ethiopian pepper, Clove and WABP oils even after infestation had been initiated by cowpea bruchids, *Callosobruchus maculatus* in stored cowpea seeds during storage. Significantly the reduction in progeny emergence was as a result of significant reduction in viable eggs that can give rise to new adult. The use of Ethiopian pepper oil at high dosage rate can significantly deterred adult emergence while dove and WABP oils at even a small dosage rates have been shown to significantly reduce adult cowpea bruchid emergence when compared with control. The study also showed that treating cowpea seeds with Ethiopian pepper, Clove and WABP oils as shown in the Table 5 and 6 can completely eliminate progeny emergence. The use of essential oil has been reported to show some protection against stored product pest.

It has been suggested that some plant product releases volatile oils when crushed (Lale, 1992). The volatile oils contained in the edible plant products might be the sources of larvicidal action in the edible plant oils used. The efficacy of Clove even at lower dosage rate could be attributed to the presence of eugenol an active ingredient in Clove (Purseglove, 1979), which has an insecticidal activity against pest. Some of the edible plant products, particularly P. *guineense, S. aromaticum* and *X.'aethiopica* were effective in suppressing or completely inhibiting oviposition and adult emergence. The result of this study also corroborated with Boughdad *et al.* (1987), Lale, (1995), Lale & Mustapha, (2000), Who showed that plant extracts are widely known to cause significant mortality of first instar larvae when used to protect stored grains against infestation by *Callosobruchus maculatus*

**CONCLUSION**

In this study, the use of edible plant product oil was able to effectively control the ability of C. *maculatus* to perpetuate on cowpea seeds during storage. This is very important in reducing damage caused by the pest in storage. The results showed that treatment of cowpea seeds before infestation significantly deterred opposition and adult emergence thus reducing infestation. The use of edible plant product oil as a bio-pesticide is very good considering the antecedent of hazards that is related to the use of synthetic insecticides. The edible plant products are readily available, safe to use, obtainable with low cost and required low technology during processing as against synthetic insecticides. Hence, there is need for their adoption for the preservation of stored crop products and is therefore recommended for use.

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