# EFFECT OF NEEM OIL DOSAGES ON COWPEA SEED BRUCHIDS (*CALLOSOBRUCHUS MACULATUS*) INFESTATON AND GERMINATION POTENTIAL OF COWPEA (*VIGNA UNGUICULATA* [L.] WALP.) SEEDS

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**Abstract:** The purpose of this study was to assess the impact of neem oil doses on cowpea seed bruchid infestation and neem seed germination potential. Three replicates were used in a completely randomized design for the experiment. In various kilnar jars, cowpea seeds were combined with neem oil and actellic ec at rates of 0.5 ml/100 g, 1.0 ml/100 g, and 1.5 l/100 g. Each jar was filled with five pairs of male and female, and each jar was covered with a fine muslin cloth. Two Whatman filter papers were placed in each of the petri dishes, and 5 ml of distilled water was added to wet them. In each petri plate, ten seeds from each jar were chosen and placed on wet filter paper. During 24 hours of treatment, 96.67% and 100% of the patients died as a result of the systemic toxicity and contact toxicity of the Neem oil and Actellicec, respectively. Neem oil and Actellicec dramatically (p 0.001) reduced *C. maculatus's* ability to lay eggs, emerge as adults, lose weight, produce Bpi, and damage seeds. At rates of 1.0 ml/100 g and 1.5 ml/100 g of the treated cowpea seeds, neem oil considerably ($p<0.001$) decreased the germination potential of cowpea seeds. This study demonstrates the insecticidal ability of neem oil as a potential safeguard for cowpea seeds that have been stored. It causes high bruchid mortality within 24 hours and totally prevents oviposition, progeny emergence, and seed damage. On the ability of cowpea seeds to germinate, neem oil has a mild impact. Because seeds are only lightly coated, a low concentration of neem oil has little impact on the uptake of water and respiration during germination. Neem oil is suggested for use in the storage of cowpea grains as a safer alternative to dangerous synthetic insecticides.

**Keywords:** Cowpea; Dosages; Germination; Infestation; Neem Oil; Oviposition.

## Introduction

A lack of proteins, vitamins, and minerals in diets causes about 870 million people to be undernourished worldwide (FAO, 2012). After cereals, legumes are the most significant family of agricultural crop species globally (Kebede and Bekeko, 2020). Grain legumes are a good source of proteins and a remedy for malnourishment. In actuality, they are the second most significant class of crops in the world, right behind cereals. The cowpea (*Vigna unguiculata* [L.] Walp.), a legume, provides dietary protein for human consumption, primarily in underdeveloped nations where a balanced diet can be a challenge (Toyinbo *et al*., 2021). Because seeds are only lightly coated, a low concentration of neem oil has little impact on the uptake of water and respiration during germination. The dry seed has 67% carbohydrates and 25% protein. Moreover, cowpeas include carotene, iron, calcium, and vitamins (Ileke, 2015). A significant food legume that grows in tropical and subtropical areas of the world is the cowpea. In many African nations where tender leaves, fresh pods, and grains are consumed, it serves as a staple and versatile food legume (Kebede and Bekeko, 2020). A total of 6.2 million metric tons of cowpea are produced annually on an estimated 14.5 million hectares of planted land.

Cowpea production increased at an average yearly rate of 5% over several decades, with annual area growth of 3.5% and yield growth of 1.5%, with area expansion accounting for 70% of the overall growth during this time (Boukar *et al*., 2016). Notwithstanding the many benefits of crop storage, the main obstacle to the effective storage of agricultural products is damage from storage pests, particularly insects (Segun *et al*., 2014). In certain cases, losses of up to 30 to 70 percent on food that was stored were seen in the absence of effective pest management and control procedures (Beza *et al*., 2022). The losses and damage to grains that have been stored, especially cowpea, are very severe. Cowpea bruchid losses in Nigeria alone amount to approximately 30 million US dollars per year, or around 4% of the world's total yearly production of cowpea, or 30,000 tons (Fakayode *et al*., 2014).

The weevil (*Callosobruchus maculatus* Fab.), which is the most significant pest in cowpea storage, can cause unique holes produced by the larvae, the adult emerged from the seed (Szentesi, 2021). Weevil infestations in cowpeas impair the grain's physiology, its nutritional value, and contaminate the product with excrement (Okori *et al*., 2022). Such issues result in qualitative and quantitative losses, which lower the commercial value of beans. The availability of dietary protein, the level of the market, and the stock for planting during the following cropping season are all negatively impacted by qualitative and quantitative loss, which presents challenges to maintaining food security in many developing nations (Abu Hatab *et al*., 2019).

Synthetic insecticides have been used to manage *C. maculatus*, which unfortunately has led to some issues such pest recurrence, pest development of resistance, food poisoning, deadly effects on non target organisms, and environmental contamination (Singh *et al*., 2021).

The search for another alternative approach for controlling bruchids, especially plants having insecticidal potentials, is justified by the negative effects associated with the use of synthetic insecticides. Biologically active chemicals with insecticidal effects are abundant in plants (Ramesh *et al*., 2018). They have a reputation for being affordable, simple to prepare, non-poisonous to humans, easily available, and having multiple active ingredients that work together to prevent pest from developing resistance (Englezos *et al*., 2022).

Many tropical and sub - tropical nations, like Nigeria, have a variety of medicinal plants that could be crucial in controlling pests (Ileke *et al*., 2020). Many plants utilized for therapeutic purposes have shown promise for controlling insects (Hiruy and Getu, 2020). Nowadays, neem (*Azadirachta indica* A. Juss) is a very effective biopesticide (Chaudhary *et al*., 2017; Salau *et al*., 2022). The Neem tree's seeds contain 40% oil and azadirachtin as a primary component, which is primarily responsible for the plant's insecticidal properties (Kumar et al., 2022). Azadirachtin is the most well known phytochemical anti - bruchid, and it has been employed alone, in botanical pesticides, or as a component of Neem tree leaves or extracts (liquid or powder). Azadirachtin has both an insecticide and an anti - ovipositant (larvicide and adulticide) activities. Neem oil can directly apply on other extracts, or neem derivatives to seeds, where the volatile components also have a fumigant effect (Reddy, 2020).

There are several publications on the insecticidal properties of Neem products (extract and powder), however there is little research on the effect of Neem oil on bruchids in cowpea seeds.

The aim of this study was to assess the impact of neem oil doses on cowpea seed bruchid infestation and the ability of treated cowpea seeds to germinate. The objectives of this study are to ascertain the impact of neem oil and actellic EC on bruchids that produce eggs and their progeny, as well as to ascertain the germination potential of cowpea seeds that have been treated with neem oil and actellic EC.

## Materials and Methods

The experiment was conducted in the storage and entomology lab. Department of crop protection Institute for Agricultural research, Samaru, Zaria which is located at latitude 11° 12" North and longitude 7° 33" East Ahmadu Bello University (ABU), Zaria Nigeria.

### *Collection and Preparation of Neem Oil*

The Neem seeds and leaves were collected from area H ABU, Zaria. Samples were taken to the Herbarium unit Department of botany for authentication.

The Neem oil was extracted from the seeds kernels using cold pressing method reported by Ekoja and Ogah (2020). The seeds were decorticated to separate the kernels and mesocarp was removed from the kernels. They were pan-grilled on fire and pound to form a paste. The pastes was pressed using an expeller to give off the oil.

### Collection and Fumigation of Cowpea

Local, susceptible cowpea variety (Kanannado) was obtained from Samaru market, Zaria Kaduna state Nigeria. The seeds were properly sieved, handpicked and fumigated with phostoxin for 3 days to kill all hidden infestation (if any). The fumigated cowpea seeds were stored in plastic containers with tight lids for one week.

### *Insect Culture*

The initial bruchids used for the experiment was obtained from the bruchids stock culture in the storage and entomology laboratory, Department of Crop Protection. IAR, Samaru, Zaria. The insect culture was done by the method reported by Odeyemi and Daramola (2000) and Ileke *et al*. (2013) with modifications.

Twenty pairs of adult *C. maculates* were introduced into two kilner jars containing 500 g of cowpea seeds each. The jars were covered with the fine muslin cloth to allow air into the jars for bruchids respiration and at the same time to prevent bruchids escaping. The culture was maintained in the laboratory at room temperature (RH) (23 ± 3 °c and 74 ± 4 % RH) to allow the bruchids to oviposit. The parents stocks were removed after 7 days. The seeds containing the eggs were left in the jars for 30 days. The emerging F1 progenies from the culture were used for the experiment.

### *Toxicity of the Neem Oil and Actellic EC on Bruchids*

The experiment was laid out in a completely randomized design with three replicates. The Neem oil and Actellic EC was admixed with the cowpea seeds at the rate of 0.5 ml/100 g, 1.0 ml/100 g and 1.5 ml/100 g, same weigh for untreated cowpea seeds. Five pairs (Male and Female) of *C. maculates* were introduced into the kilner jars. The jars were covered with a muslin cloth. The mortality of adult *C. maculates* was evaluated daily for 3 days. Sharp pin was used to proved weather the insect was alive or dead. At 72 hours, all bruchids were removed in the treated and untreated jars. Percentage of adult mortality was corrected using Abbott formula (Abdullahi *et al*., 2016).

$$\text{Adult mortality} = \frac{\text{Total number of dead adult}}{\text{Number of adult introduced}} \times 100$$

Oviposition by adult bruchids on cowpea sees were recorded before retaining the seeds in their respective containers for the emergence of first filial generation. Emerged adult insects were expressed in percentage using standard method as follows:

$$\text{Adult emergence} = \frac{\text{Total number of adult emerged}}{\text{Total number of eggs laid}} \times 100$$

Progeny inhibition rate was calculated using the method reported by Tapondjoun *et al*. (2002).

$$\%\ IR = \frac{Cn - Tn}{Cn} \times 100$$

Where:

Cn = Number of emerged insect in the control; and Tn = Number of emerged insect in the treated

Reduction in weight of the cowpea seeds was assessed as follows:

$$\text{Weight loss} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

Damaged seeds were evaluated by expressing wholesome seeds and bored by the adult insect in percentage as follows:

$$\text{Seeds damage} = \frac{\text{Total Number of seeds damaged}}{\text{Total number of seeds}} \times 100$$

Beetles perforation index (BPI) was also evaluated for the analysis of damage as follows:

$$BPI = \frac{\%\ \text{Treated paddy perforated}}{\%\ \text{Control paddy perforated}} \times 100$$

BPI value that exceeded 50 will be regarded as enhancement of damaged by cowpea bruchid or negative protectant (Ileke *et al.*, 2020).

***Germination Test***

The seeds germination test was conducted in the laboratory using petri dishes, in a completely randomize design with three replicates. Ten seeds were selected from each kilnerjar, the selected seeds was treated with fungicides (mancozeb powder) to enhances germination. Two whtaman filter papers were placed on each Petridish. 5 ml of distilled water was poured on the filter papers to moisten them. Ten seeds were placed on the moistened filter papers for treated cowpea seeds, while for untreated, ten damaged and undamaged cowpea seeds were placed on different Petridishes. Petridishes were covered and incubated and monitored daily under laboratory conditions. The number of seeds germinated was recorded daily for 6 days, and seeds germination percent was evaluated as follows:

$$\text{Germination} = \frac{\text{Total number of seeds germinated}}{\text{Total number of seeds placed}} \times 100$$

***Data Analysis***

The data obtained were subjected to analysis of variance (ANOVA) at 5% level of significance, and significant treatment mean were separated using Duncan multiple range test. The analysis was performed using SAS V. 9.4 (2014).

**Results**

***Bruchid Mortality in Cowpea Treated with the Neem Oil and Actellic EC***

The effectiveness of the Neem oil and Actellicec on mortality of *C. maculates* at different hours after treatment is presented in a table 1. Therewas no significant difference ($p<0.05$) in bruchids adult mortality among the treatment. Highest mortality rate of 100 % was recorded for Actellicec at all concentration at 24 hrs, 48 hrs and 72 hrs of treatment. While for Neem oil highest mortality tare of 100 % was recorded at concentration of 1.0 ml and 1.5 ml respectively at 24 hrs, 48 hrs and 72 hrs of treatment. Neem oil and Actellic ec have significantly increases the mortality rate of the bruchids ($p<0.01$) compare with untreated cowpea seeds.

***Effect of Neem Oil and Actellic EC on Oviposition and Progeny Emergence of Cowpea Seeds Bruchids***

The Neem oil and Actellic ec had significantly inhibited the oviposition and adult emergence of *C. maculates* compared with untreated cowpea seeds. There was no eggs laids in jars treated with the Neem oil and Actellic EC (Table 2). Bruchid adult emergence was completely inhibited in jars treated with the Neem oil and Actellic ec with inhibition rate (IR) of 100 % compare to untreated cowpea that recorded 138.00 % oviposition and 64.73 % adult emergence. There was no significant difference ($p<0.05$) in number of eggs laid, adult emergence and inhibition rate among the treatments.

***Seeds Damaged caused by Bruchids in Cowpea Seeds Treated with Neem Oil and Actellic EC***

The Neem oil and Actellic EC completely prevent infestation inhibit damage of the treated seeds at all the concentrations (Table 3).There was neither seeds damage nor weight loss in the cowpea seeds treated with Neem oil and Actellic EC. Same trend was equally observed for beetles perforation index compared with untreated cowpea seeds that suppers a greater infestation and damage. In untreated cowpea seeds 22.56 % damages occurred and 10.98 % weight loss; the weight of untreated cowpea was significantly ($p<0.05$) reduce compared with treated seeds.

***Germination Potential of the Cowpea Seeds Treated with Neem Oil and Actellic EC***

The effect of Neem oil and Actellic EC on germination potential of cowpea seeds is presented in a Table 4. There was significant different in germination potential among the treatments. Germination potential increase with decrease in concentration of the treatments. The highest germination percent of 100 % was recorded for 0.5 ml of the Actellic EC at 48 hr after planting. While for Neem oil highest germination of 96.67 % was recorded at 0.5 ml of the oil. At 24 hrs after planting the germination was observed and recorded in untreated seeds and treated seeds except for seeds treated with 1.5 ml of the oil. High concentration of the oil significantly delays the germination of the cowpea seeds. Both the treatment significantly ($p<0.05$) reduces the germination potential at high concentrations compared with untreated cowpea seeds.

**Table 1: Effect of Neem Oil and Actellic EC Doses on Bruchids Mortality**

| | | Mean Mortality (%) ± SE | | |
|---|---|---|---|---|
| **Treatments** | **Concentrations (ml)** | **24 hrs** | **48 hrs** | **72 hrs** |
| N1 | 0.5 | 96.70±1.78$^a$ | 100.00±0.00$^a$ | 100.00±0.00$^a$ |
| A1 | 0.5 | 100.00±1.78$^a$ | 100.00±0.00$^a$ | 100.00±0.00$^a$ |
| N2 | 1.0 | 100.00±1.78$^a$ | 100.00±0.00$^a$ | 100.00±0.00$^a$ |
| A2 | 1.0 | 100.00±1.78$^a$ | 100.00±0.00$^a$ | 100.00±0.00$^a$ |
| N3 | 1.5 | 100.00±1.78$^a$ | 100.00±0.00$^a$ | 100.00±0.00$^a$ |
| A3 | 1.5 | 100.00±1.78$^a$ | 100.00±0.00$^a$ | 100.00±0.00$^a$ |
| Untreated | 0.0 | 13.33±1.78$^b$ | 30.00±0.00$^b$ | 60.00±0.01$^b$ |

**Note:** Means within the same column followed by the same letter are not significantly different at P< 0.01 using Duncan's Multiple Range Test. N= Neem oil, A= Actellic EC., hrs = Hours

**Table 2: Effect of Neem oil and Actellic EC on Oviposition, Progeny Emergence and Inhibition Rate of Cowpea Seeds Bruchids**

| Treatments | Concentrations (ml) | No. of Eggs Laid | Adult Emerged (%) | Inhibition Rate (%) |
|---|---|---|---|---|
| N1 | 0.5 | 0.00±6.24[b] | 0.00±1.53[b] | 100.00±0.00[a] |
| A1 | 0.5 | 0.00±6.24[b] | 0.00±1.53[b] | 100.00±0.00[a] |
| N2 | 1.0 | 0.00±6.24[b] | 0.00±1.53[b] | 100.00±0.00[a] |
| A2 | 1.0 | 0.00±6.24[b] | 0.00±1.53[b] | 100.00±0.00[a] |
| N3 | 1.5 | 0.00±6.24[b] | 0.00±1.53[b] | 100.00±0.00[a] |
| A3 | 1.5 | 0.00±6.24[b] | 0.00±1.53[b] | 100.00±0.00[a] |
| Untreated | 0.0 | 138.00±6.24[a] | 64.73±1.53[a] | 00.00±0.00[b] |

**Note**: Each value is a mean ± standard error of three replicates. Means within the same column followed by the same letter (s) are not significantly different at P < 0.01 using Duncan Multiple Range Test. N= Neem oil, A= Actellic EC.

**Table 3: Inhibitory Effect of Neem Oil and Actellic EC on Seed Damage, Weight Loss and Beetle Perforation Index**

| Treatments | Concentrations (ml) | Total No. of Seeds | No. of Damaged Seeds | Seeds Damage (%) | Weight Loss (%) | Beetle Perforation Index |
|---|---|---|---|---|---|---|
| N1 | 0.5 | 248.00±3.26[a] | 0.00±0.50[b] | 0.00±0.20[b] | 0.00±0.51[b] | 0.00±1.05[b] |
| A1 | 0.5 | 243.33±3.26[ab] | 0.00±0.50[b] | 0.00±0.20[b] | 0.00±0.51[b] | 0.00±1.05[b] |
| N2 | 1.0 | 238.00±3.26[b] | 0.00±0.50[b] | 0.00±0.20[b] | 0.00±0.51[b] | 0.00±1.05[b] |
| A2 | 1.0 | 242.67±3.26[ab] | 0.00±0.50[b] | 0.00±0.20[b] | 0.00±0.51[b] | 0.00±1.05[b] |
| N3 | 1.5 | 246.00±3.26[ab] | 0.00±0.50[b] | 0.00±0.20[b] | 0.00±0.51[b] | 0.00±1.05[b] |
| A3 | 1.5 | 240.00±3.26[ab] | 0.00±0.50[b] | 0.00±0.20[b] | 0.00±0.51[b] | 0.00±1.05[b] |
| Untreated | 0.0 | 249.67±3.26[a] | 56.33±0.53[a] | 22.56±0.20[a] | 10.98±0.51[a] | 94.66±1.50[a] |

**Note**: Each value is a mean ± standard error of three replicates. Means within the same column followed by the same letter are not significantly different at P < 0.01 using Duncan Multiple Range Test. N= Neem oil, A= Actellic EC.

**Table 4: Effect of Neem Oil and Actellic EC on Germination Potential of Cowpea Seeds**

| | | Cowpea Seeds Germination (%) ± SE | | | |
|---|---|---|---|---|---|
| **Treatments** | **Concentration (ml)** | **24 hrs** | **48 hrs** | **72 hrs** | **96 hrs** |
| N1 | 0.5 | 56.67±5.65[a] | 93.33±8.00[a] | 96.67±8.16[a] | 96.67±8.00[a] |
| A1 | 0.5 | 66.67±5.65[a] | 100.00±8.00[a] | 100.00±8.16[a] | 100.00±8.00[a] |
| N2 | 1.0 | 13.33±5.65[c] | 30.00±8.00[cd] | 40.00±8.16[cd] | 43.33±8.00[cd] |
| A2 | 10 | 30.00±5.65[b] | 60.00±8.00 [b] | 80.00±8.16[ab] | 80.00±8.00[ab] |
| N3 | 1.5 | 0.00±5.65[d] | 16.67±8.00[d] | 20.00±8.16[d] | 20.00±8.00[d] |
| A3 | 1.5 | 6.67±5.65[d] | 30.00±8.00[cd] | 36.67±8.16[d] | 40.00±8.00[d] |
| Untreated damaged | 0.0 | 16.67±5.65[bc] | 43.33±8.00[bc] | 70.00±8.16 [b] | 76.67±8.00[ab] |
| Untreated undamaged | 0.0 | 20.00±5.65[bc] | 53.33±8.00[bc] | 56.67±8.16[bc] | 66.67±8.00[bc] |

**Note**: Means within the same column followed by the same letter (s) are not significantly different at P < 0.01 using Duncan Multiple Range Test. N= Neem Oil, A= Actellic EC., hrs = Hours

**Discussion**

The potential of Neem oil and Actellic EC in causing mortality, prevent oviposition, adult emergence, seeds damaged and perforation index to cowpea seeds by *C. maculates* has been demonstrated in this study and the result obtained coincide with the conclusions of Ekoja and Ogah (2020) and Ileke *et al*. (2020) who reported the insecticidal activity of different plant materials against *C. maculatus.*

The effectiveness of the Neem oil and Actellic EC on mortality of bruchids in this work could be due to contact and systemic toxicity effect as a result of volatile constituents which may lead to respiratory impairment, which affect their metabolism and consequently other systems of the insect body. Ekoja and Ogah, (2020) reported that Neem oil contains azadirachtin which is toxic to bruchids and other insect pests. The significant insect mortality caused by the application of plant materials may be due to presence of high spicy alkaloidic secondary metabolites (Amazu *et al*., 2021). This prevented locomotion, physical contact of adult beetles with seeds and triggered asphyxia, starvation of adult insect or unknown physiological changes activation (Ileke *et al*. 2020).

The complete inhibition in oviposition observed in this study could be attributed to the high adult mortality caused by the Neem oil and Actellic EC. Ekoja and Ogah (2020) reported that egg mortality could occur when oil blocks the exchange of air between the egg surface and the environment. Generally, oxygen is needed for insect egg survival especially in the first 7 days after oviposition (Arthur*et al*., 2020). Similarly Ekoja and Ogah (2020) reported that the use of the plant oil may have caused deficits in the oxygen level of the eggs leading to asphyxiation. The suppression in oviposition by bruchids in treated jars compared to untreated may be due to locomotion impediment; hence, the bruchids was unable to move freely there by affecting mating activities and sexual communications (Ileke *et al*., 2020).

The effectiveness of the Neem oil and Actellic EC on bruchid adult emergence in this experiment could be due to ovicidal effect of the Neem oil. Chaudhary*et al*. (2017) reported that Neem oil significantly delays reproduction in pest, it causes lethal toxicity during the pupal stage leading to various morphological deformations such as malformed adult, partial ecdysis and molt blocking, that defers and inhibits adult formations. Similar finding was observed by Ileke *et al*. (2020) who reported that partial blastokinesis and abnormal breakage of extra embryonic membranes in the embryo can result into reduction in progeny development or emergence of teneral adult. However, Rosulu *et al*. (2022) suggested that the ability of the evaluated plant materials to significantly suppress or inhibit adult emergence confirms the insecticidal activity of the plant species in reducing oviposition and adult emergence.

The total preventions of the Neem oil and Actellic EC on seeds damaged by bruchids could be due to high adult mortality and antifeedant effect of the Neem oil. Perera *et al*. (2018) reported that Neem plant offers immense antifeedant properties due to its efficacy in suppressing feeding sensation in insect, at concentration even less than 1 ppm. Similarly Ekoja and Ogah (2020) reported that feeding activities by bruchids occur during progeny development (larval stage) and it usually results in exit holes on seeds leading to their weight loss. It may be that the plant oils modified the storage micro-environment, thereby discouraging bruchid larvae from perforating the seeds to feed, causing starvation and death of the insects as described Ekoja and Ogah (2020). The BPI value in treated jars was negligible if compare with untreated jars, and it could be due to high bruchids mortality. David (2019) reported that BPI value that exceeded 50 % will be regarded as an enhancement of damage by cowpea bruchids or negative protectant. The inhibition of seeds damaged observed in this study was the consequences of higher adult mortality, antifeedant, oviposition deterrence, ovicidal, larvicidal, and reproduction inhibitory of *A. indica* (Mahmoud *et al*., 2020).

The significant differences observed on germination potential of cowpea seeds treated with the Neem oil in this research, it could be due to change in structural nature of the seeds coat which affects its permeability to water. Cowpea treated with 0.5 ml/100 g of Neem oil didn't affect the germination, probably because of low concentration of the oil which might have little interference with water uptake and respiration of seeds during germination because of light coverage of seeds. Hamid *et al*., (2014) reported that strictly, germination is refers to phase 1 and 2 of the imbibition process, the duration of each phase depends on seeds properties such as size, content of hydratable substances, seed coat permeability to water and oxygen uptake. However, Kathpalia and Bhatla (2018) suggested that seed coat may restrict entrance of water and respiratory gases during imbibition and that this may be a major cause of poor germination. The reduction in germination potential in untreated cowpea seeds could be due to bruchid infestations. Similar finding was observed by Oyeyinka *et al*. (2014) who reported that *C. maculates* reduces the food value of the beans as well as reducing the germination potential of the beans seeds. Significant difference was observed between untreated cowpea seeds group, high germination potential was recorded in untreated damaged cowpea seeds than untreated undamaged. High germination observed could be due to bruchid perforation which increases the surface area for water and respiratory gases uptake during germination. While reduction in germination recorded could be due to bruchids oviposition which probably blocks the seed coat microphile which could inhibit water uptake during germination.

## Conclusions

This study shows that Neem oil and Actellic EC has anti - insecticidal value as a potential stored cowpea seeds protectant, it evoke high bruchids mortality within 24 Hr and its completely inhibit oviposition, progeny emergence and seeds damaged. Neem oil and Actellic EC has a moderate effect on germination potential of cowpea seeds. Low concentration of Neem oil and Actellic EC has little interference with water uptake and respiration of seeds during germination because of light coverage of seeds.

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