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# Preliminary Evaluation of the Insecticidal Potential of Organic Compost Extracts Against Insect Pests of Okra (Abemoschus esculentus (L.) Moench)

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## ABSTRACT

*Experiment was conducted in 2009 planting season using extracts of Tithonia composts, Maize stover composts and Cassava peel. The extracts were applied to the foliage to control Podagrica species, Zonocerus variegatus and Bemisia tabaci on okra seedlings planted in a Randomized Complete Block Design with three replicates. Results showed that the organic compost liquid formulations acted as antifeedant to the test insects but Maize stover compost had a very good control of the insects with its efficacy ranging from 60% to 80% control. Okra plants treated with maize stover compost had significantly higher physiological and yield performance of okra plant than cassava peel, Tithonia compost and untreated plants. This study suggests that organic composts especially maize stover compost can be used as insecticide in organic farming system to raise okra plant.*

**Key words:** organic composts, *Podagrica* species, *Zonocerus variegatus*, *Bemisia tabaci*, insect infestations, lambdacyalothrin.

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## INTROUDUCTION

Okra (*Abelmoschus esculentus*) known as lady's finger is a major vegetable crop in many countries [7]. Okra fruit is principally consumed fresh or cooked and is a major source of vitamins A, B, C, minerals, Iron and Iodine but it is reportedly low in sodium, saturated fat and cholesterol [20]. Mucilage derived from okra is used industrially to clear sugar cane juice during jugglery in India and for seizing paper in China [17]. Cultivation of okra in western states of Nigerian is usually done by the peasant farmers and mixed cropping is their usual practice. Okra can be grown on wide range of soils, but well drained fertile soils with adequate organic matter result to high yield [4]. The crop is widely cultivated throughout the year in the tropics.

Insect pests infestation is one of the major factors militating against cultivation of okra in Nigeria. Different phenologies of okra have been reportedly attacked by the insects. The crop was observed to have shared the same broad pest spectrum with cotton and hibiscus [14]. Among the insect pests, *Podagrica* species have been reported to have caused economic damage. According to Fasunwon and Banjo (2010), *Podagrica* species attack the lamina of the foilage and matured leaves of the okra plant which result to reduction of the photosynthetic ability of the crop leaves. The insect is also responsible for transmission of mosaic virus, this infection could result to 20 - 50% yield reduction [11]. With piercing and sucking mouthparts, whitefly is able to feed effectively on plant sap causing okra leaf curl disease, geminivirus and yellow mosaic virus [5]. Furthermore, *Zonocerus variegatus* have been reportedly feed on wide range of crops in which okra is one of them [21].

In view of the aforementioned destructive activities of these insects, the control of those insects becomes imperative in order to have a high yield. Generally, synthetic insecticides are the most effective means of controlling insect pests due to their quick action and long lasing effect.

However, most of these synthetic insecticides have been placed on ban in developed countries. This might have been in connection with development of insect resistance, environmental pollution, carcinogenic effect and destruction of beneficiary insects [16]. In addition, most of these synthetic chemicals in Nigeria are not available and the available few are unaffordable to the farmers due to the harsh economic situation. These problems emanated from synthetic chemicals, necessitated the idea of developing effective, cheap and easily biodegradable alternative products. In recent years, kaolin, botanical insecticides and organic composts have received a greater attention as promising alternative to synthetic insecticides.

Apart from the fact that composts can be used to combat the problems of soil fertility, it has made an impact in the pest management thereby decrease herbivorous insect populations [3]. Therefore, this study was conducted to evaluate the effect of the three different compost extracts on insect pests of okra.

## MATERIALS AND METHODS

The field experiment was conducted at Ladoke Akintola University of Technology, Teaching and Research Farm, Ogbomoso, Nigeria. The region which climate could be described as hot humid tropical falls in Southern Guinea Savanna of Nigeria with a mean temperature of $27^0$C and annual rainfall of 1400 mm. Eighteen plots were demarcated and arranged in a randomized complete block design with three replications per treatment. Each of the experimental plots measured 2.5 x 2.5 $m^2$ and separated by gap of 1m.

A variety of okra (NH47-4) collected from National Institute for Horticultural Research, Ibadan, Nigeria was used for the experiment. Each plots had 36 plant stands, the crop was spaced out at1 m x 1 m. Weeding was done manually as at when due. At 14 days after planting, thinning was done to one plant per stand. Maize stover, aeria part of *Tithonia* plant and cassava peel were prepared following Akanbi (2002). 500 g of each the three peletized composite types was soaked separately in 3000 ml of water for seven days for the fermentation. Filtration of the materials was done with muslin cloth. The filtrate collected was stored in a 5 litre keg.

A spray volume of organic composts of 250 ml per plot was applied to each designated plots. However, unsprayed plots and Lambdacyalothrin (Karate) which was applied at 8 L/ha were included for comparison. Application of the treatments commenced 2WAP to each assigned plots. The foliar application of the treatment was done early in the morning and weekly treatment was done three times. Estimation of the insect populations was randomly done from the four plant stands in the two middle rows. This was done a day after each treatments for three consecutive days.

Physiological parameters which were plant height, number of flowers and percentage number of defoliated leaves were carried out from four selected plant stands in the two middle rows. Also, yield was calculated in Kg/ha.

Data collected were subjected to analysis of variance (ANOVA) using Randomised Complete Block Design (R C B D) as explained by Gomez and Gomex (1987). Significant means were compared using Duncan Multiple Range test (DMRT) at 5% probability level.

## RESULTS

During the first week of spraying, all the composts did not differ significantly in the control of *Z. variegatus*. From 2$^{nd}$ to 3$^{rd}$ week of treatment application, organic composts effectively controlled *Z. variegatus* compared with untreated plots (Table 1). The result after first week of spraying indicated that cassava compost was not effective against *B. tabaci* but after 3rd spraying period, all the organic composts significantly reduced the population of *B. tabaci* as did by Lambdacyalothrin (Table 2). Untreated plots had highest mean population of *P. uniformis* compared with organic composts and Lambdacyalothrin treated plots. However, maize stover compost caused a significant reduction of *P. unifomis* compared to the *Tithonia*, and cassava peel composts (Table 3). Throughout the spraying periods, maize stover compost was significantly effective as Lambdacyalothrin in the control of *P. sjostedti*. Although, *Tithonia* and Cassava peel compost were not effective as Lambdacyalothrin but were more superior than untreated plots (Table 4).

**Table 1: Population of *Z. variegatus* as affected by different organic compost and lambdacyalothrin Insect Population**

| Treatments | 1 WAT | 2 WAT | 3 WAT |
|---|---|---|---|
| Control | $0.40^{b}$ | $0.60^{a}$ | $0.60^{a}$ |
| Lambadacyalothrin | $0.00^{c}$ | $0.00^{d}$ | $0.00^{b}$ |
| Tithonia compost | $0.60^{a}$ | $0.20^{c}$ | $0.00^{b}$ |
| Maize stover compost | $0.60^{b}$ | $0.00^{d}$ | $0.00^{b}$ |
| Cassava compost | $0.60^{a}$ | $0.40^{b}$ | $0.00^{b}$ |

*Mean followed by same alphabet(s) in a column are not significantly different (p<0.05 test)*
*WAT = week after treatment*

**Table 2: Population of *B. tabaci* as affected by different organic compost and Lambadacyalothrin Insect population**

| Treatments | 1 WAT | 2 WAT | 3 WAT |
|---|---|---|---|
| Control | $0.80^{b}$ | $1.20^{a}$ | $2.00^{a}$ |
| Lambadacyalothrin | $0.40^{c}$ | $0.00^{e}$ | $0.00^{b}$ |
| Tithonia compost | $0.60^{bc}$ | $0.60^{b}$ | $0.20^{b}$ |
| Maize stover compost | $0.60^{bc}$ | $0.20^{d}$ | $0.00^{b}$ |
| Cassava compost | $1.20^{a}$ | $0.40^{c}$ | $0.40^{b}$ |

*Mean followed by same alphabet(s) in a column are not significantly different (p<0.05 test)*

**Table 3: Population of *P. uniformis* as affected by different organic compost and Lambadacyalothrin Insect population**

| Treatment | 1WAT | 2 WAT | 3 WAT |
|---|---|---|---|
| Control | 6.20[a] | 4.40[a] | 4.40[a] |
| Lambadacyalothrin | 0.00[d] | 0.00[d] | 0.00[d] |
| Tithonia compost | 3.60[b] | 3.40[b] | 2.40[b] |
| Maize stover compost | 2.20[c] | 2.80[c] | 1.00[c] |
| Cassava compost | 3.00[bc] | 3.20[bc] | 2.80[b] |

*Mean followed by same alphabet(s) in a column are not significantly different (p<0.05 test)*

**Table 4: Population of *P. sjostedti* as affected by the compost and lambadacyalothrin Insect population**

| Treatment | 1 WAT | 2 WAT | 3 WAT |
|---|---|---|---|
| Control | 1.20[a] | 2.00[a] | 1.20[a] |
| Lambadacyalothrin | 0.00[b] | 0.00[b] | 0.00[c] |
| Tithonia compost | 1.20[a] | 0.40[b] | 0.00[c] |
| Maize stover compost | 0.20[b] | 0.20[b] | 0.00[c] |
| Cassava compost | 0.80[a] | 0.80[b] | 0.20[b] |

*Mean followed by same alphabet(s) in a column are not significantly different (p<0.05 test)*

The damage caused by *Podagrica* species and *Z. variegatus* on okra leaves was significantly reduced on maize stover treated plots than cassava peel, *Tithonia* composts and untreated plots (Fig. 1). The highest plant height was observed from the plots treated with Lambdacyalothrin (108.3 cm) and maize stover compost (101cm) (Fig. 2). However, all the imposed composts induce flowering compared to the untreated plants (Fig. 3). Plants treated with Maize stover compost produced better yield (266.7 kg/ha) compared with other composts with the least yield recorded from untreated plants (107.5 kg/ha).

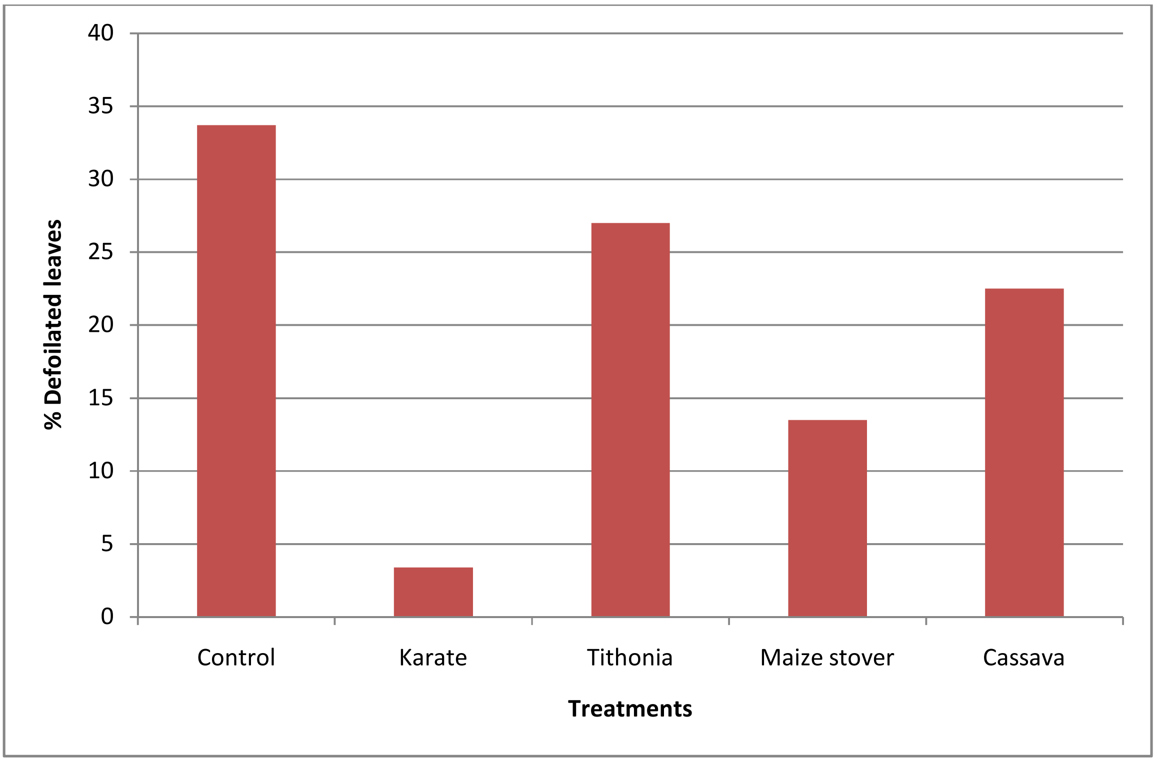


**Figure 1: Effect of treatments on percentage leaves defoliated at flowering stage**

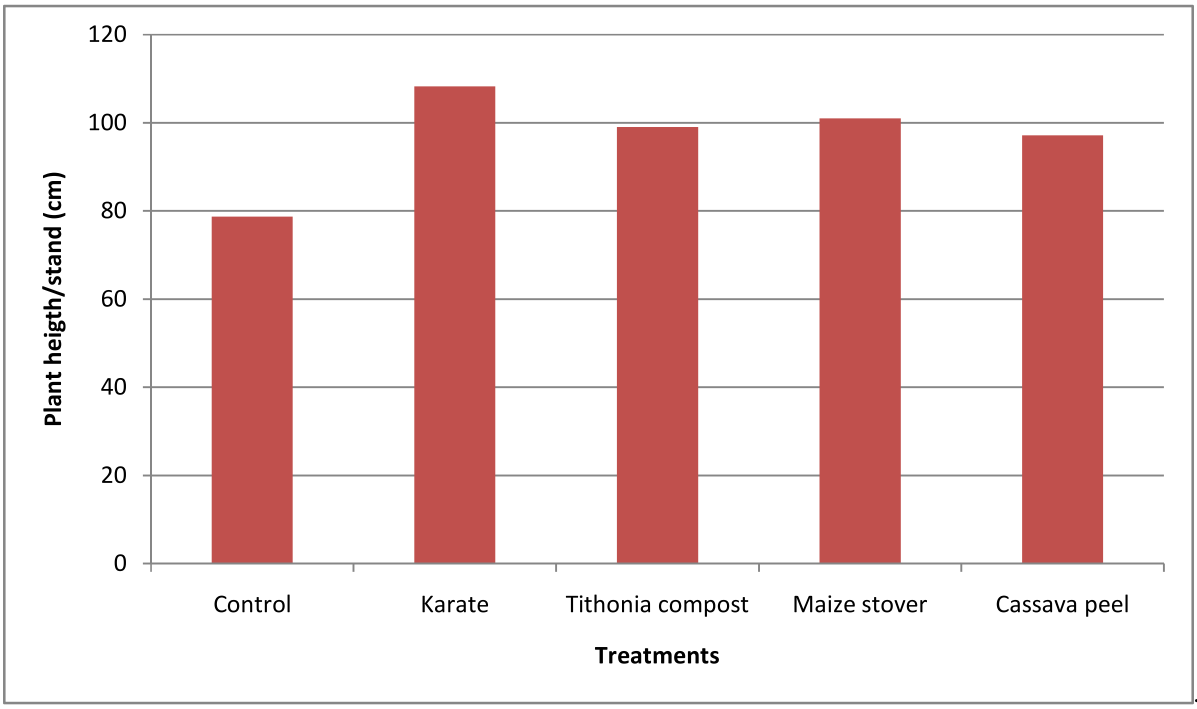


**Figure 2: Effect of treatments on plant height of okra**

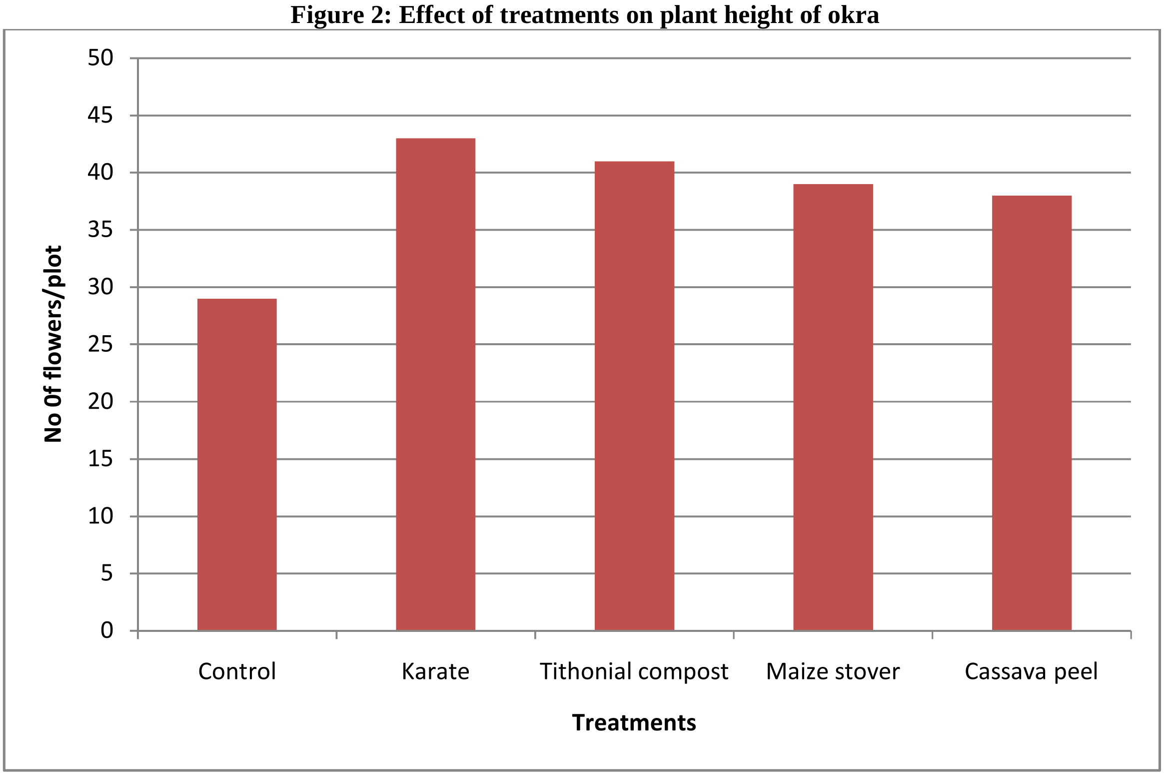


**Figure 3: Effect of treatments on number of flowers per plot**

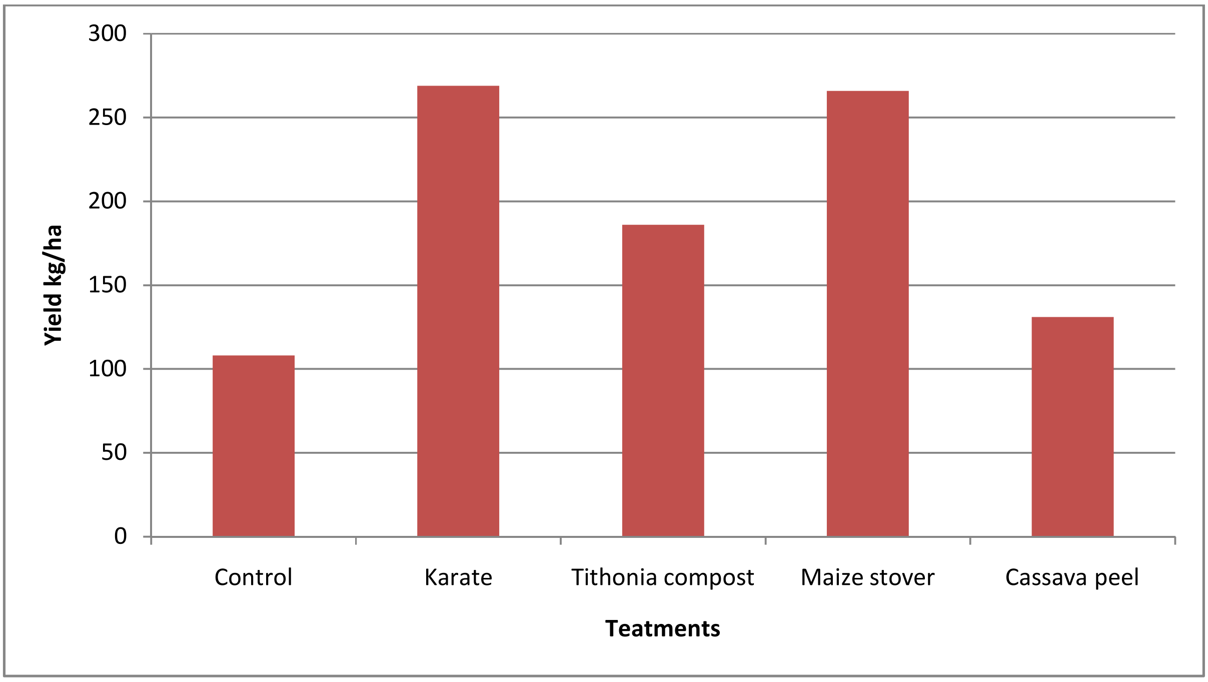


**Figure 4: Effect of treatments on yield (kg/ha)**

## DISCUSSION

The study showed that organic composts can be used as insecticide to control insect pests of okra. The three organic products were more effective against the four major pre-flowering insect pests of okra. Also, it was observed that the three organic composts varied greatly in their efficacy, Maize stover composts exhibited high efficacy, ranging from 60-80% followed by *Tithonia* composts. After fermentation of the tested organic composts, offensive odour was observed which may suggest the presence of microorganisms, therefore the effectiveness of maize stover composts suggest higher number of microbial activity than the other products. Meanwhile, further studies are needed to validate this hypothesis. This work is in line with Akanbi *et al* (2007) who reported that foliar application of organic composts effectively controlled the level of insect infestation of *Telfairia occidentalis* compared to untreated plots.

High effectiveness of Lambdacyalothrin compared to organic composts could be attributed to undegradability of the active ingredient formulation that possesses immediate knock down effects on the target insects [14]. The low efficacy of organic compost could be due to inability of microorganisms to survive under high temperature.

Data at first week after treatment revealed that organic treated-plots had mean population densities of the insects compared to lambdacyalothrin. In addition, feeding activities of those insect was extremely higher than the subsequent treatments, this contributed to high percentage defoliated leaves in the organic treated plots. The field observation showed that the organic compost extracts did not kill the observed insects but have a repellent and/or barrier effect. The organic products might have created a hostile environment for insects and a physical barrier to infestation, hindered feeding activities of the insects. These effects may be attributed to characteristic offensive odour resulted from fermentation of organic composts.

The ultimate aim of the farmers is to obtain a reasonably high yield which is directly related to environmental and physiological factors and the level of insect infestation [14]. This could have been the major reason why low yield of okra was obtained from the untreated plots (107.5 kg/ha) which had highest mean infestation followed by the cassava compost treated plots (131.3 kg/ha) (fig. 4)

However, this experiment revealed that foliar application of liquid formulation of organic composts to control insects shared most of the common attributes of the botanical insecticide. This strongly suggests that organic materials could be incorporated with botanical insecticides in organic farming system. Organic composts have been said to have dual purposes [3]. The use of organic composts in the management of insect pests and improvement of soil fertility could serve as an important component of integrated pest management especially in developing countries like Nigeria. Developing organic composts as insecticide will boost the economy of our organic farmers who may not have access to imported synthetic insecticides or some of the recently discovered insecticidal plants. Identification of different microorganisms in the organic composts, dosage, frequency of application and improvement on the effectiveness are presently under investigation.

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