Effects of bio pesticides in suppression of field insect pests (*megalurothrips sjostedti* [tryborn]) of cowpea (*vigna unguiculata* [l. Walp]) in Bali, Taraba state-Nigeria

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Abstract

A retrial field experiment was carried out in August 2022, at the Teaching and Research Farm of the Department of Crop Production Technology, The Polytechnic, Bali to determine the Effects of Biopesticides in suppression of Field Insect Pest (Megalurothrips sjostedti Tryborn) of Cowpea (Vigna unguiculata [L. Walp]) and to compare the insect supressing ability of the different neem products (vis-Aqueous neem leaf, bark and seed oil extracts). A Randomized Complete Block Design (RCBD) was adopted for the field experiment. A plot measuring 45 m x 15 m was cleared, tilth and the soil pulverized. Sixteen beds, each measuring 2 m x 2 m were constructed. Nine stands of cowpea plants (Kanannado spreading cultivar) were raised on each bed at spacing of 90 cm x 90 cm. The setup was replicated four times, giving a total of 64 beds. Three treatments of aqueous neem leaf suspension, neem bark suspension and neem seed oil were applied to 12 beds and the remaining four beds received no treatment (as control). Parameters assessed were initial insect counts (fortnightly) per bed before the application of the treatments and the final insect counts during the periods of application. Data generated were subjected to linear regression analysis (using "R" statistics) to estimate the relationship between insect catch and the treatment applied. Mean catch was also used to compare the suppressing ability of the three treatments applied. The results showed 15% overall reduction in the insect catch, which could be attributed to the treatments effect. However, comparison between the mean insect catch showed that neem seed oil has the best insect suppressing ability over the aqueous leaf and bark suspensions.

Key words: Bio-pesticides, suppression, neem products, insect pests, cowpea

I. Introduction

Cowpea is affected by various groups of insect right from the point of emergence to reproductive stage and careful spraying of insecticides is the most reliable means of pest control (Agbato, 2011). Cowpea attracts many insect pests which reduce the grain yield and quality, and most disastrous among them is the flower bud thrips (*Megalurothrips sjostedti* Tryborn) which causes serious damage at the flowering stage (Nandang, *et al.*, 2011). Maina *et al*. (2012) reported that before harvest and during storage, cowpea seeds are prone to a large number of species of insect pests, which constitute a major setback in its production. Therefore, preserving agricultural products for future use is the most important pre and post-harvest operation; however, this is impeded by the actions of field and storage insect pests.

The environmental pollutions and health hazard pose by synthetic pesticides alongside its high cost, make it imperative for farmers to adopt the use of alternative and safer means of combating problems of insect

pests and many entomologists the world over have now concluded that neem has remarkable qualities for controlling insect pests and is likely to usher in a new era of natural pesticides (Ghosh, 2014). Several control measures were postulated by different workers, which include use of wood ash, solarisation, conventional insecticides and botanical insecticides (Zettler *et al*., 1997). For instance, neem products are botanical insecticides which affect insect vigour, longevity and fecundity; and about 450-500 species of insects were tested with neem products globally, out of which 413 were reportedly susceptible at various concentrations (Dhaliwal *et al*., 2013). Furthermore, entomologists all over the world now proposed that neem has greater qualities for controlling insect pests and is likely to offer itself in a new era of natural pesticides (Ghosh, 2014). Dhaliwal *et al.*, (2013) further reported that neem seed extract was recommended for sweet potato white fly control in India and its successful use was reported.

Gap – Even though entomologists had proposed neem products to have great quality in control of insect pests, however, the question remains as to what extent is the suppressing ability of the neem products on insect pests of cowpea and whether they will serve as substitutes to conventional (synthetic) pesticides?

Statement of the Problem

Losses of agricultural produce due to pest infestation by storage and field insect pests are substantial and pose a real threat to food security in Nigeria and other countries in the tropics. It is therefore, clear that sustainable agricultural production in most countries is under threat due to activities of both field and storage insect pests.

Justification of the Study

If enough food must be produced to feed the ever growing human population, the activities of insect pests must be checked via economically viable means and maintained to produce food on sustainable basis. Therefore, bio-pesticide may offer itself as cheaper alternative and may also serve as good source of job creation.

Significance of the study

1. Local farmers have been faced with ever increasing cost of synthetic pesticides. Therefore, neem products which affect insect vigour, longevity and fecundity may serve as alternative to synthetic pesticides.
2. If the above mentioned alternative (item 1) becomes realistic more farmers could be encouraged to go into cultivation of beans; thereby ensuring increased supply of plant protein and a good means of job creation.
3. Adoption of natural pesticides can save our community from environmental pollution pose by synthetic pesticides and the consequent health hazards.

Objective of the Study –

The objective of this study are:

(i) To determine the extent to which neem products can suppress field insect pests of cowpea.
(ii) To find out which product of neem is most effective in suppressing insect pests of cowpea.

Null Hypotheses:

H_{o1} = Neem products have no effects in the control of field insect pests of cowpea.
Ho2 = No differences in the suppressing ability of the various neem products.

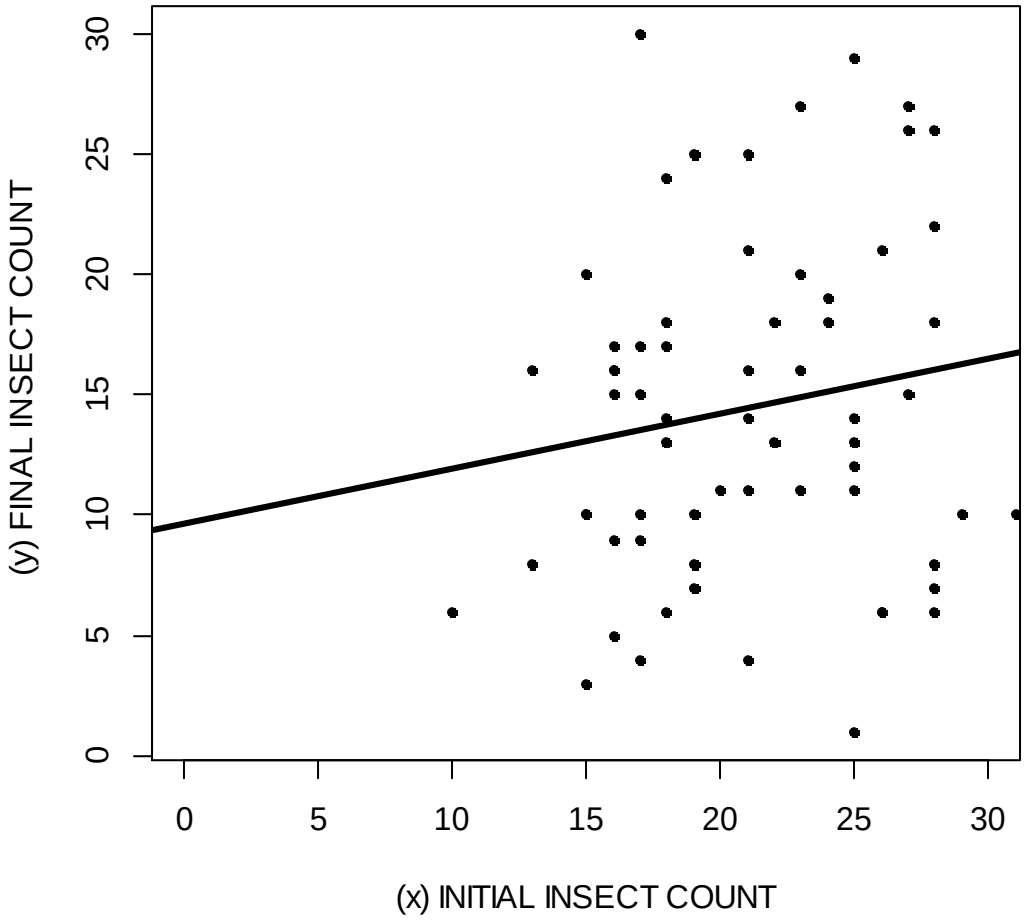
Materials and Methods

Study Area - The research was carried out in August, 2019 at the Teaching and Research Farm of the Department of Crop Production Technology, Federal Polytechnic, Bali. Bali is located in the central part of Taraba State between latitudes 7º 12/ N to 9º 00/ N of the equator and longitudes 10º 00/ E to 12º 00/ E of the Meridian. It has a land mass of 100,000 km^2 and lies within the Guinea Savanna ecological zone of Nigeria. The annual rainfall ranges from 750 mm to 1100 mm and the temperature ranges between 22º C-35º C (Rajab, 2020). The soil is dominantly of ferruginous tropical type that lies on sandy parent materials (Dada *et al*., 2006). Bali has a demographic population of 211,024 (NPC Census, 2006). The most cultivated cash crops in the area include soybean, groundnut and maize, while food crops include rice, corn, beans, sorghum, yam and cassava (Rajab, 2020).

Method – 60 m x 30 m field was clear-felled and stumped in mid-July. The field was ploughed and harrowed to form fine tilth. Sixteen (16) beds of 2 m x 2 m size were constructed with 0.5 m pathways between them, which gave a total of 12 m^2. The layout was replicated four (4) times (allowing 2 m gaps between them) which in turn gave a total of 45 m x 15 m. Randomized Complete Block Design (RCBD) was adopted and each bed contained nine (9) stands of cowpea, spaced 90 cm x 90 cm apart. There was a total of 64 beds.
Planting was done on 7th August, 2022 which was immediately followed by application of pre-emergence herbicide. Three seeds were drilled per hole and later thinned to one plant per stand. At the onset of the flower buds, neem leaf and bark were macerated and soaked in 20 litres of water each. The suspensions were left overnight to release their chemical contents. Another suspension of 500ml of neem seed oil was also prepared early in the morning and each of the three suspensions was applied separately onto the seed beds, giving a total of 12 treated beds in each replication. The remaining four untreated beds served as control. Insect counts were recorded for two consecutive weeks before the start of treatments application (where the average served as initial insect count). Application of the treatments continued weekly until harvest; however, each application was preceded by insect count (the average therefrom served as final insect count). Regression analysis was used to estimate the relationship between the insect counts before the flower buds set-in and the counts after the application of the treatments (i.e. initial and final counts) with the help of the "R" statistical pack-age.

Result –

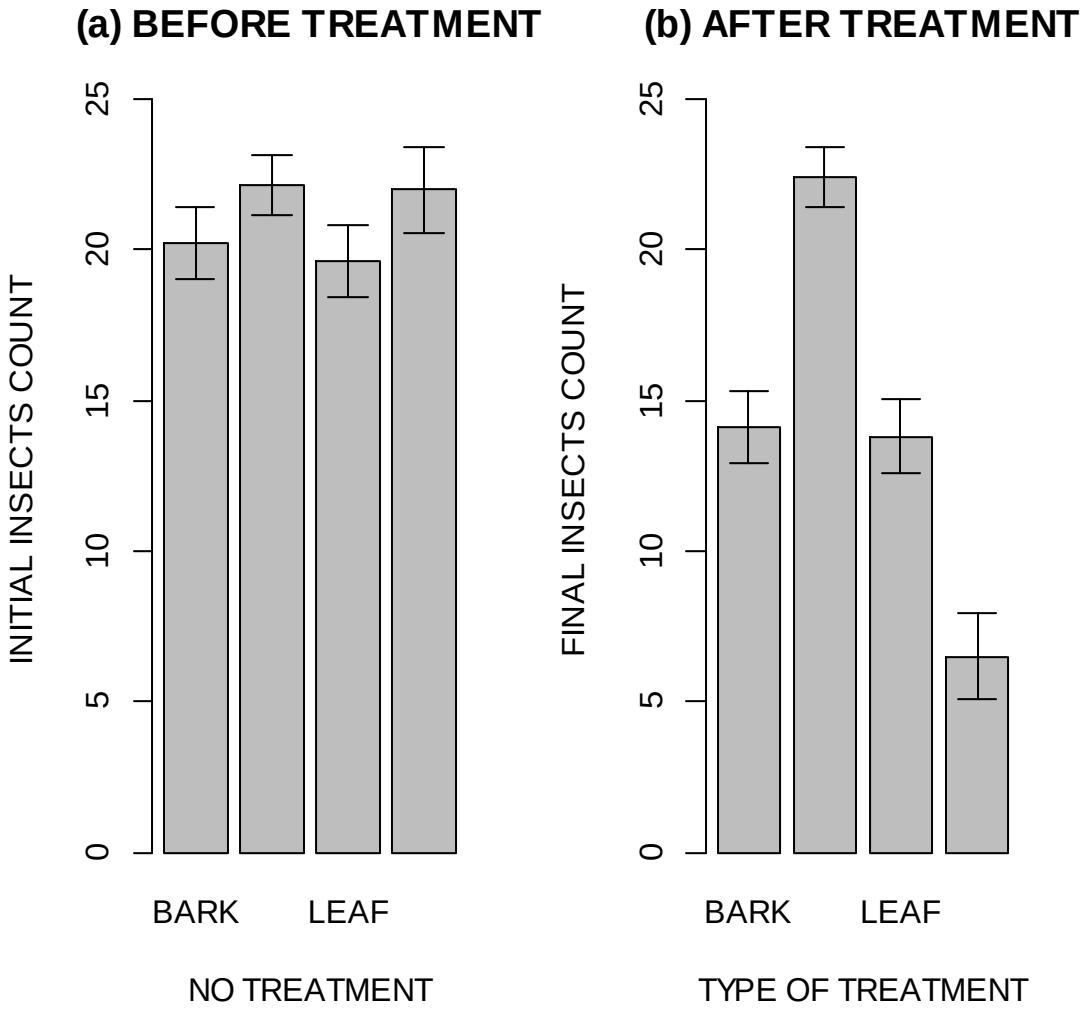
Simple linear regression analysis was carried out using "lm" Model in "R" statistical package. The results of the data analysed were summarised in figure 1, in which the initial insect counts which served as control (independent) variable is plotted on X-axis, while the final insect counts which served as response (dependent) variable plotted on Y-axis. The regression (abline) line which starts at the point of intercept with y-axis passes through the scatter plots. The range of initial insect counts was about thirty insects per catch, while that of the final insect counts was about 10 insects per catch.



SOURCE: Rajab, (2021)

Figure 1: Regression analysis comparing the initial and final insect counts on the field with ab-line passing through the dotted points, giving 0.1461 multiple R-squared at 62 degrees of freedom and p = 0.0018

Figures 2 (a) and (b) showed the differences in means of the insect catch, before and after the application of the different treatments respectively. The bars are arranged in alphabetic order (bark, control, leaf and seed). Initial and final insect counts are on the y-axes, while the treatments applied are on x-axis. The error bars on each of the treatment means show the degree of dispersion of the individual count form its mean.



SOURCE: Field Experiment, 2022

Figure 2: Comparison of the efficacies of different treatments before and after their application to establish their suppressing ability

Discussion -

Figure 1 shows that the range of scatter plots on the side of initial insect counts is greater than those on the final insect counts. It therefore indicates that the overall treatment exerts some slight suppressing effect on

the insect count. This is why about 15% of the total variance in the data is accounted for by the regression line at 1% level of significance as indicated by the multiple R-squared (0.1461) at 62 degree of freedom. Figure 2 shows that before the application of the treatments, there was as high as about 20 insects catch per designated beds (2a). However, significant reductions in the insect counts were noticed after the application of the treatments (2b), except for the control which shows slight increase in the insect count. Similarly, neem seed showed the highest suppressing ability on the insect count than the leaf and the bark. This result concur with the findings of Dhaliwal and Koul (2013) and Ghosh, (2014). Figure 2b indicates as low as six insect catch per bed compared to those which received leaf or bark treatment and give about 14 insect catch. On the overall, the three treatments applied gave positive results of insect suppression.

Conclusion and Recommendations

In conclusion, although the regression analysis on insect counts signifies that only 15% of the total variance in the data is accounted for by the regression line, however, the null hypothesis which says neem products have no effects in the control of field insect pests of cowpea will be rejected. However, the overall suppressing ability of the products is low as indicated by the multiple "R" squared. It is therefore, recommended that the low suppression ability of the neem products on field insect counts called for integrated pests control approach to be adopted by the local farmers. Among the three treatments applied, neem seed oil produced the best result and should be adopted by the farmers in the locality. Similarly, the null hypothesis which says no differences exist in the suppressing ability of the three neem products should be rejected. Also, more research to be carried out using individual neem product at varying concentrations to ascertain their effectiveness as bio-pesticides

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