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Insecticidal Effects of Neem Kernel Extracts on Flea Beetle (Podagrica Uniforma J.) Of Okra (Abelmoschus Esculentus L.) in Jega, Kebbi, Nigeria

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Abstract: *A study to investigate the insecticidal properties of aqueous extracts of neem kernel on Flea beetle (Podagrica uniforma J.) infesting okra plant was conducted in the rainy season of 2014, at the University Teaching and Research Farm of the Kebbi State University of Science and Technology, Jega, Kebbi State. The experiments consisted of three levels of Neem Kernel Extracts NKE 10%, NKE 20%, control (NKE 0%) and a synthetic insecticide (Lambdacyhalothrin) as a check. The experiment was laid out in a Randomized Complete Block Design replicated three replications. Data were obtained on Flea Beetle Count, number of leaf damage and number of pod damage. Results obtained showed that though synthetic insecticide conferred more protection on okra against flea beetles, neem kernel extract also significantly reduced infestation and population of beetles on okra in the field by conferring different levels of protection to the leaves, flowers and pods of okra.*
Keywords*: Neem kernel extract, Flea beetle, Insecticide, Okra.*

I. Introduction

Insect pests play a significant role in limiting crop production especially in the tropics where the climate favours their multiplication. There are nine major and thirty minor insect pests attacking okra in different parts of Africa (Egwuatu, 1982). Major insect pest of okra in Nigeria include Podagrica uniforma J., P. sjostedti J., Aphis gossypii G., Empoasca fascialis, Anoplocnemis curvipes F., Bemisia tabaci G. and Nezera viridula L. (Fasunwon and Banjo, 2010). The commonest pest control method is usually by the application of synthetic insecticides that are unfortunately dangerous to the ecosystem. One of such synthetic insecticides is Lambda-cyhalothrin. Is a member of a class of insecticides known as pyrethroids (Robert, 2008). Despite their efficiency in reducing insect pests, synthetic insecticides are associated with major problems such as environmental pollution, soil toxicity, effect on non-target organisms, pest resurgence, pest resistance and residual effects (NRC, 1992). Though decisive in their action against pests, the use of synthetic insecticides apart from being expensive, cause mammalian toxicity, environmental pollutions and in some cases develop genetic resistance in treated insects thereby leading to insect pest emergence and resurgence (Yar' adua et al., 2007). Neem is well known in India and its neighbouring countries where for 2000 years it was one of the most versatile medicinal plants, having a wide spectrum of biological activity (Alves et al., 2009; Atawodi and Atawodi, 2009). Highly concentrated azadirachtin is the main active ingredient in neem and is mainly found in the seed (NRC, 1992). Azadirachtin is extracted from compressed neem seeds, concentrated, and purified, azadirachtin are pest repellent sprayed onto leaves diluted with water. The neem seed cake is used primarily as a soil amendment and growth-promoting material. The neem tree synthesizes compounds for chemical defence to protect against herbivorous insects (Atawodi and Atawodi, 2009). These compounds function on the basis of interfering with insect hormones (Mordue and Blackwell, 1998, Anibal, 2007). Nine limonoid compounds with pest control properties have been extracted from neem seeds and shown to inhibited pest growth, and the most effective among this compound is Azadirachtin (Koul et al., 1990; Schmutterer, 1990; Alves et al., 2009). Azadirachtin induces a physiological effect on insects by interfering with the synthesis and release of ecdysteroids hormone which disrupts larval moulting in hemi- and holometabolous insects, interferes with pupation and growth of adults, and interferes with reproduction (Mordue and Blackwell, 1998). Salannin is another pest management component that is reported to have a strong repellent effect. Meliantriol is an insect feeding deterrent effective at low temperatures. The other limonoids comprise ninbin and nimbidin, which have antivirus activity, ninbiol, which has antiprotozoal and antitubercular activity, gedunin, which has antimalarial activity, sodium nimbinate, which has diuretic and spermicidal activity, and quercetin, which has antioxidant and antimicrobial activity (Dai et al., 1999; Subapirya and Nagini, 2005). On insect larvae, these compounds have growth regulatory effects which include disruption of moulting, growth inhibition, and malformation and may contribute to mortality. Neem-based insecticides are known for their pesticidal activity against more than 400 species of insects (Siddiqui et al., 2003). However, they are not toxic to humans and many beneficial arthropods, and targeted pests are unlikely to develop resistance; therefore, these insecticides have been advocated to replace synthetic insecticides as they are more sensible to be used in most pest management programs (Schmutterer, 1990; Ascher, 1993; Mordue and Blackwell, 1998; Mordue et al., 1998; Isman, 2006; Irigaray et al., 2010). Thus, neem pesticides are available for use against many pests and have been evaluated as an alternative to synthetic pesticides (Walter, 1999; Anibal, 2007).

II. Materials And Methods

A field experiment was conducted in the rainy season of 2014 at the University Teaching and Research Farm of the Kebbi State University of Science and Technology, Jega, Kebbi State. The experiment consisted of four (4) treatments 10% NSKE, 20% NSKE, Synthetic insecticide (Lamdacyhalothrin) and the untreated control, laid out in randomised complete block design and replicated four times. Plots of 3.0 x 3.0 m (9.0 m^2) with 0.5 m between plots were prepared. Ripe neem seeds were collected and de-pulped, washed and dried under the shade. Seeds were weighed according the respective concentrations (200 g and 400 g for 10% and 20% respectively). The weighed seeds were grinded separately using mortar and pestle, soaked in 2.0 litres of water, left overnight then filtered the following day using a muslin cloth and sprayed accordingly on okra. Okra were sprayed with neem kernel extract for the control of insects pests from 3 to 7s weeks after sowing using a CP_{15} Knapsack sprayer weekly by 7:00 am.

III. Data Collection

Data on flea beetle count was obtained by visual counting of all the flea beetles seen on upper and lower leaves in the early morning hours (7:00-8:00 am) when beetles are relatively inactive (Egwuata, 1982) and recorded according to plot. Healthy whole okra leaves from four randomly selected plants from each plot were detached; the leaf damaged area measurement was performed by the use of graph sheet method to grade the various feeding holes on the selected leaves. Data on the number of pod produced was obtained by weekly harvesting and counting the number of pods produced in the two middle rows of each plot.

Data generated from the experiment was statistically analyzed using Analysis of Variance (ANOVA); means found to be significant were separated using Least Significant Difference test (LSD) at 5% level of significance.

IV. Result And Discussion

Results obtained indicated that neem seed kernel extract is exhibited some degree of insecticidal activity in reducing flea beetle population on okra in the field. Both 10% NSKE (3.00) and 20% NSKE (3.00) conferred similar levels of protection with synthetic insecticide S. I. (2.70) to okra in reducing flea beetle population on okra, the untreated control (4.53) suffered significant ($P>0.05$) beetle infestations than treated plots (Table 1). This agrees with Olaniran et al. (2013) who stated that plant extracts from neem had potent insecticidal properties against flea beetles on okra.. Neem extracts at 10% NSKE (5.66) conferred protection on okra leaves similar to that conferred by the synthetic insecticide S. I. (5.33). This finding tallied with Amugi et al. (2012) who reported that plant extracts conferred similar protection to okra with synthetic insecticide Lambdacyhalothrin in the control of flea beetles. In contrast, 20% NSKE (6.66) and the untreated control (7.33) also produced the same level of protection on leaves as shown in Table 2. Neem extracts at 10% NSKE (3.0) and 20% NSKE (4.00) significantly ($P>0.05$) conferred protection to okra pods against damage by flea beetles than the untreated control 0% (7.25) that suffered heavy beetle infestations. This result corroborated with the findings of Parh et al., (1997) that significantly, higher beetle infestation was recorded in the untreated okra plot to those of the treated plots. Treatment with neem extracts produced similar protection to okra pods with that produced by the application of synthetic insecticide S. I. (3.50) as depicted in Table 3. Results in this experiment agreed with the findings of NRC (1992) and Schmutterer (1990), who stated that plants contain highly insecticidal properties against insect pests of crops by providing a rich source of biologically potent chemical compounds which can be used as safer insecticides.

V. Conclusion

From the Results obtained in this research in may be inferred that though, synthetic insecticide conferred more protection on okra against flea beetles, neem kernel extract also significantly reduced infestation and population of beetles on okra in the field by conferring different levels of protection to the leaves, flowers and pods of okra. Therefore, neem kernel extract could be a potential alternative for insect control in okra production.

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Table 1.0: Flea beetle count as influenced by NSKE and synthetic insecticide during the 2014 rainy season in Jega.

Treatments	Mean
(0% NSKE)	4.53^{a}
(10% NSKE)	3.00^{b}
(15% NSKE)	3.00^{b}
(S. I)	2.70^{b}
CV%	2.44
$LSD_{0.05}$	1.06

Means followed by the same letter(s) are not significantly different at 5% level of significance.

Table 2.0: Leaf damage count as influenced by NSKE and synthetic insecticide during the 2014 rainy season in Jega.

Treatments	Mean
(0% NSKE)	7.33^{a}
(10% NSKE)	6.66^{ab}
(15% NSKE)	5.66^{b}
(S. I)	5.33^{b}
CV%	2.44
$LSD_{0.05}$	1.66

Means followed by the same letter(s) are not significantly different at 5% level of significance.

Table 3.0: Pod damage count as influenced by NSKE and synthetic insecticide during the 2014 dry season in Jega.

Treatments	Mean
(0%)	4.53^{a}
(10% NSKE)	3.00^{b}
(15% NSKE)	3.00^{b}
(S.I)	2.70^{b}
CV%	2.44
$LSD_{0.05}$	1.06

Means followed by the same letter(s) are not significantly different at 5% level of significance.