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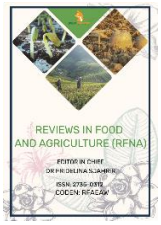

RESEARCH ARTICLE

EFFECT OF DIFFERENT CONCENTRATION OF NEEM OIL ON INSECT PESTS OF OKRA (*ABELMOSCHUS ESCULENTUS* L. MOENCH) IN MINNA, NIGER STATE

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ABSTRACT

The research was conducted to evaluate the effect of neem oil on the management of insect pests of okra, in the Teaching and research Farm of the Department of Crop Production, Federal University of Technology Minna, Niger State. Different concentrations of Neem oil; 75 ml, 50 ml, 25 ml and 0 ml were used to control the infestation of insect pests for four weeks on Clemson Spineless okra variety. Data on plant height, stem diameter, leaf length, pest population, number of flowers, number of fruits and fruit weight were subjected to analysis of variance (ANOVA) the means were separated using least significance difference (LSD). The result indicated that neem oil at 75 ml showed the highest level of effectiveness in the plant yield and morphological performance while 50 ml performed better on pest population hence the results of this study suggests that neem oil can be used as an alternative to chemical pesticides for managing insect pests of okra in Minna

KEYWORDS

Neem oil, okra, insect pests, Treatment

1. INTRODUCTION

Okra (*Abelmoschus esculentus* L. Moench) is a nutrient-rich economically important vegetable crop grown in tropical and sub-tropical regions of the world. Okra is an important annual fruit vegetable commonly grown in the tropics and warmer temperate regions of the world (Patil et al., 2015). It is generally a self-pollinating crop belonging to the family Malvaceae (Oppong-Sekyere et al., 2011). Okra in many parts of the world is relished and in many parts of Nigeria it is a special delicacy consumed with 'eba', 'fufu', pounded yam and many of such side dishes. Okra is a multipurpose and economic crop for farmers and marketers in Nigeria because of the income generated from the sale of immature fresh leaves, fresh, and dried fruits, which are made into diverse soup products. It is a nutritious food with many health benefits. It is rich in dietary fibre, minerals (Sodium, Calcium, Potassium, Zinc, and Iron), vitamins (A, B, and C), antioxidants, and folate.

Okra seed is rich in proteins (15–26%) which can be used for making non-caffeine coffee, the seed oil is edible (20–40%), and rich in unsaturated fatty acids like the linoleic acid essential for human nutrition. The mature fruit and stems are used in the paper industry. Okra mucilage can be used as food additives (Dubey and Mishra, 2017). In countries like Iran, Egypt, Lebanon, Israel, Jordan, Iraq, Greece, Turkey and other parts of the eastern Mediterranean, okra is widely used in a thick stew made with vegetables and meat. In Indian cooking, it is sautéed or added to gravy-based preparations and is very popular in South India. It became a popular vegetable in Japanese cuisine towards the end of the20th century, served with soy sauce and katsuobushi or as tempura. Breaded, deep fried okra is served in the southern United States. The immature pods may also be pickled. Okra leaves may be cooked in a similar manner as the greens of beets or dandelions. The leaves are also eaten raw in salads. Okra leaves may be cooked in a similar way to the greens of beets or dandelions. Since the entire plant is edible, the leaves are also eaten raw in salads. Okra seeds may be roasted and ground to form a caffeine-free substitute for coffee. Its medicinal value has also been reported in curing ulcers and relief from haemorrhoids. Unspecified parts of the plant were reported in 1898 to possess diuretic properties this is referenced in numerous sources associated with herbal and traditional medicine. Okra has found medical application as a plasma replacement or blood volume expander. It is also good source of iodine which is useful in the treatment of simple goitre and many other ailments.

As beneficial as okra is, it is not without major challenges that farmers face in its cultivation and one of these challenges is the infestation of pests which to a large extent affects its yield and development. Okra is vulnerable to attack by several sucking and chewing insect pests, responsible for 48.97% reduction of pod yield (Kumar et al., 2016). Among

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the sap suckers, is the Aphid (Aphis gossypii) which has been identified as one of the major problematic insect pest that accounts for 86% of the variation in leaf damages, they are vectors of the mottle viruses, they cause yellowing and curling of leaves, they cause stunted growth in plant. Another notorious pest of okra is the cotton leaf hopper (Amarasca bigutula) which causes yellowing and bronzing of leaf under attack, Bemisia tabaci not only sucks sap from the leaves but it is considered as the vector for Yellow Vein Mosaic Virus in okra, fruit and shoot borer of okra can lead to 88-100% damage of okra fruit.

Indiscriminate use of synthetic pesticides for controlling pests can give rise to resistance and environmental pollution which can be toxic to the human health especially in developing Countries, including Nigeria. With these in sight, there is a need to develop naturally occurring insecticides which may be less toxic to humans and animals but acts as effective insecticides. Toxicity of extract of the neem oil against insect pest has been reported by researchers. Hence, this present research work tends to use botanical means to control the infestation of insect pest on okra in a bid to replace synthetic insecticides and recommend its effectiveness to farmers and other agricultural development agencies.

2. Materials And Methods

The experiment was conducted at the Teaching and Research Farm of School of Agriculture and Agricultural Technology, Federal University of Technology Minna, (Gidan Kwano Campus) Niger State. The climate of Minna is sub-humid tropical, characterized with long termed mean rainfall of about 1284mm and a mono-modal pattern of rainfall. Minna lies within the Southern Guinea Savanah Agro-ecological zone of Nigeria (Ojanuga, 2006). The soil of Minna is generally classified as Alfisols (Adeboye et al., 2011). Afisols are moderately leached soils that have relatively high native fertility. These soils have mainly formed under forest and have a sub-surface horizon in which clay have accumulated. Afisols are primarily found in temperate humid regions of the world. The combination of generally favourable climate and high native fertility allows Alfisols to be very productive soils for both agricultural and silvicultural use.

2.1 Experimental Materials and Seed sowing

One variety of okra was obtained from a reputable agro-store in Minna. Neem oil was obtained from the Department of Biochemistry, Federal University of Technology Minna, Niger State. Okra seeds were sown after the full establishment of rainfall at inter-row and intra-row spacing of 50 cm and 40 cm respectively.

2.2 Experimental Design

The treatment were arranged in Randomised Complete Block Design (RCBD) with three replications. The net plot size of the field was 20 ×12 m. Each replicate consisted of four plots and measuring 12×4 m and plot measuring 3×4 m. Each plot consisted of four ridges with 1m as alley between the replication.

2.3 Cultivation and Management Practices

2.3.1 Land preparation

Land was cleared with machete for good ridge preparation and subsequent effective germination and seedling emergence. Ridges were made manually.

2.3.2 Weed control

First weeding was done two weeks after germination and subsequent weeding done at three weeks interval.

2.3.3 Fertilizer application

NPK 20:10:10 was applied four weeks after sowing.

2.3.4 Application of Treatment (Neem Oil)

Three concentrations (75 ml, 50 ml and 25 ml) of the neem solution were sprayed on the crops using the knapsack sprayer.

2.4 Data Collection

Data were collected on the following parameters

2.4.1 Plant height (cm)

10 plant stands were randomly selected from each replicate and measured from the base of the plant to the apex using a tape rule.

2.4.2 Number of leaves

The total number of visible leaves per tagged plant in each plot were counted.

2.4.3 Leaf length (cm)

The length of a single leaf per tagged plant were measured using a tape rule.

2.4.4 Number of fruit per plant

The number of fruits were counted from the tagged plant stands.

2.4.5 Stem diameter

The diameter of the stem were measured at 10 weeks after sowing using vernier callipers.

2.4.6 Fresh weight

Immediately after harvesting from the field the average weight of harvest was taken within each replicate.

2.5 Data Analysis

Data collected were subjected to analysis of variance (ANOVA) using statistical analysis system. The treatment mean were separated using Least Significance Difference (LSD) at 5% probability level.

3. Results

3.1 Effect of different concentrations of neem oil on the morphology of okra variety

The effectiveness of neem oil on plant height, leaf length, stem diameter and the number of leaves per plant observed at three, five, seven and nine weeks after sowing (WAS) showed significant differences ($P \leq 0.05$) across all treatments, indicating the neem oil application had a significant impact on the okra plant compared to the control group (Table 1). Also, it was observed that, as the concentration of neem oil increased, the morphological change becomes more pronounced, in other words, the treatment at 75 ml recorded the highest effect on the morphology of the plant.

Table 1: Effect of different concentration of neem oil on the morphological performance of okra variety

Neem Oil Conc.	No. of Leaf	Plant height (cm)				Leaf length	Stem diameter
		WK 3	WK 5	WK 7	WK 9		
0	10.53	19.67	23.13	28	12.6	2.05	8.33
25	10.73	19.47	27.67	31.27	17.63	2.5	10.67
50	11.13	19.93	28	31.73	16.33	2.3	9
75	11.57	20.03	28	32.33	16.9	2.1	9
LSD	*	*	*	*	*	*	*

key: *= Significance

3.2 Effect of different concentrations neem oil on the pest population of the okra variety

Result obtained from this research showed that neem oil is effective in controlling pest population on okra plants (Table 2) as all treatments (75ml, 50ml, 25ml) showed significant differences compared to the control group (0 ml) observed at three, five, seven and nine weeks after sowing (WAS). This result indicates neem oil's potential as a pest control substances. The igher the concentration of the neem oil, the greater the reduction in pest population, this shows a dose-response relationship, where 75 ml showed the highest reduction in pest population, followed by 50 ml and 25 ml. The 25 ml and 50 ml provided adequate pest control. While the 75 ml was more effective.

Table 2: Effects of different Concentrations of Neem oil on the population of Insects of Okra Variety

	Pest Population			
	3	**5**	**7**	**9**
	Weeks after sowing			
	Neem oil Conc. (ml)			
0	5	6.67	10	10
25	6	7	5	5.33
50	5	6	6	3
75	5.33	6.33	4.67	4
LSD	*	*	*	*

Key: *= significance

3.3 Effect of different concentrations of neem oil concentrations on the yield of okra variety

The result on Table 3 showed significant differences across all treatments, indicating that neem oil application had a significant impact on okra plant yield compared to the control group. Neem oil at 50 ml and 75 ml improved okra plant yield and were the most effective as they recorded higher number of flowers, fruits harvested, highest weight compared to 25 ml and the control group.

Table 3: Effects of different Concentrations of Neem oil on Yiel and Yield Components of Okra Variety

Neem oil conc. (ml)	Number of Flowers	Number of Fruits	Fruit Weight(g)
0	9.67	5.33	6.03
25	12	11.67	33.73
50	10.67	17.33	80.17
75	12	14.67	91.77
LSD	*	*	*

Key: *= significance

4. Discussion

The The major insect pests that infested the okra plant are brown beetle (Pyrrhalta viburni) and black beetle (Amara aulica). They cause damage by feeding on the plant leaves ruining their appearance, they tamper with the overall health of okra, cause low yield, fewer leaves were observed and recorded on tagged plant that were not treated with neem oil as opposed to plants that were treated with different concentration of neem oil which showed difference in appearance and yield.

The neem oil was effective on the infestation of insect pests. Results obtained from this study indicates an improvement in the health of plant, neem oil proved effective by repelling the insect pests and causing a restriction in their feeding, this was observed from their foliage. After treatment, appearance of leaves improved and new foliage had fewer pin holes on them and the population of insect pest reduced significantly. In the course of the study, it was observed that neem oil at 75 ml concentration had better effect on the okra plant yield and morphology, while at 50 ml it had the adequate effect on pest population.

Although all the treatment groups showed statistically significant differences, it is important to note that their level of effectiveness differed, with the control group recording the lowest level of effectiveness. This therefore, indicates as stated above that 75 ml showed the highest level of effectiveness. This study also confirms the result of research work by ResearchGate, 2020 which shows that neem oil was effective in curbing the damage caused by insect pests of okra. The study revealed that the plants treated with neem oil compared to untreated plants showed better performance in terms of yield, pest population and morphology of the plants.

5. Conclusion

The results of this study suggests that neem oil can be used as an alternative to chemical pesticides for managing insect pests of okra where the differences in their level of performances cannot be overlooked with the 75 ml treatment group which showed the greatest level of effectiveness in the plant yield and morphological performance and the 50ml on pest population while the control group showed the lowest performance in yield, morphology and pest population. Although, further studies are needed to confirm its efficacy and safety under different field conditions, neem oil can be used as an alternative for suppressing the infestation of insect pest which is environmental friendly and poses no threat to human health.

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