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Use of Bark and Leaf Extracts of *Ficus exasperata* L. as an Environmental Friendly Organic Insecticide in the Control of Insects in Eggplant

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Abstracts: *Different plant extracts have been tested by different scientists for their insecticidal properties. Some of these plant extracts have been used for bio-control. F. exasperate is among the plant species that has been reported to have ethno-botanical properties. Eggplant is one of the most important vegetables in Asia, where more than 90% of the world's eggplant production occurs. Attempts to control eggplant pests currently entail excessive use of pesticides. Intensive pesticide use in eggplant increases the cost of production and the residues pose serious risks to the health of growers, consumers, and the environment.*

This study was carried out on the teaching and research farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. The objectives of this present study is to evaluate the potential of F. exasperata parts in controlling insect infestation in eggplants and to identify the part of F. exasperata plant that effectively control insect in eggplants. Materials used include sand, bowl, plants extracts (leaves and bark) and black soap. Application of the treatments to the eggplant was done by using the hand sprayer. Treatment application was carried out every week. The collected data was subjected to analysis of variance (ANOVA) and the means separated using 5 % level of significance. The result obtained from this study shows that the application of leaves and bark extracts of F. exasperata was effective in the control of fruit boring insect when compared with control. Among the applied treatment lambda cyalothrin had the highest insecticidal efficiency. The fruits obtained from the applied extracts had the same significant effect with lambda cyalothrin treated fruit. However, the leaves and bark of F. exasperata compete effectively with lambda cyalothrin in respect to number of leaves and fruit length. Meanwhile, the applied plant extract and lambda cyalothrin did not have positive impact on the plant height and leaves of the target crop. However, plants treated with bark of F. exasperata compete effectively with lambda cyalothrin in reference to fruit yield. It was observed that all the plant extracts were effective in the control of insect infestation on eggplant while the bark extracts had positive effect on yield. Therefore, the leaves and the bark of F. exasperata can be used in the management of insect pest infestation of eggplant especially in the organic farming system.

Keywords: *Eggplant cultivation, Total leaf extract, Antifungal activities, Phytochemicals, Plant stands*

1. INTRODUCTION

Plants have always been part of human culture and are wide spread in Africa. During the last decades, herbs have been used in culinary and traditional therapeutic practices for the treatment of different ailments. The nutritional and medicinal properties of the plant may be inter-linked through the phytochemicals presents in these plants. It is common practice that many herbs (plants) and their derivatives are employed in the treatment of numerous diseases due to the increasing awareness that several plant species are known to have active constituents that maybe of medicinal advantage (Verma and Singh, 2008; Malla et al., 2015).

In Nigeria, F. exasperata is called Kawusa, Ameme, and Ewe epin, Anwerenwa in Nupe, Edo, Yoruba and Igbo languages respectively. F. exasperata roots, stems and leaves are traditionally employed to manage asthma, dyspnea and venereal diseases, treat high blood pressure, rheumatoid arthritis, intestinal pains and colic, epilepsy, bleeding and wounds and also for the treatment of cough and haemorrhoids (Wonder et al., 2010). Among the plant species that has been ethno-botanically reported to have diverse medicinal uses is the F. exasperata (Lawal et al., 2012).

F. exasperata is popularly referred to as sand paper tree in Nigeria because of the rough surface of the leaves (Bafor et al., 2009). The leaf extract has been reported to have diverse uses in the treatment of haemostative opthalmia, haemorrhoid (Odunbaku et al., 2008), epilepsy (Woode et al., 2009). Antifungal activities of F. exasperata have been described using the leaf extract (Mbakwem-Aniebo et al., 2012). The antifungal activities of young leaves of F. exasperata have also been reported by Sonibare et al. (2006). The leaf has also been reported to be useful for stabilization of vegetable oils, suppression of foaming and supplement as food stock (Odunbaku et al., 2008). Also, this leaf has been severally used for different medicinal treatments, it is important to know their elemental contents because some of these elements have either toxic effects or essential properties (Pandey et al., 2006). Elemental contents include; crude protein, crude fat, crude fibre, ash, carborhydrate, ascorbic acid, potassium, calcium, titanium, manganese, iron and copper (Muibat et al., 2014).

Furthermore, extracts from Neem (*Azadirachta indica*), Bael (*Aegle marmelos*), Jatropha (Jatropha curcas), Eucalyptus (*Eucalyptus globus*), Ber (*Ziziphus mauritiana*), Sarifa (*Annona reticulate*) and Congress grass (*Parthenium argentatum*) were found to be most effective in reducing the population of rice root knot nematode, Meloidogyne graminicola in rice (Mukesh and Sobita, 2013). Aqueous extracts of Baker tree (*Milletia ferruginea*), Bitter leaf (*Vernonia amygodalina*), Parthenium (*Parthenium hysterophorus*), Lantana *(Lantana camara*), Mexican marigold (*Tagetes minuta*), Mexican tea (*Chenopodium ambrosioides*), Neem (*Azadirachta indica*) and Pyrethrum (*Chrysanthemum cinerariafolium*) at 5%concentration recorded nematicidal properties against M. incognita in vitro. Mexican marigold leaf, Bitter leaf, Lantana leaf and Baker tree seeds were the most efficacious in nematode control which recorded about 95% inhibition of nematode eggs (Wondimeneh et al., 2013).

Eggplant is one of the most important vegetables in Asia, where more than 90% of the world's eggplant production occurs. Rich in nutrients, eggplant supplies vital vitamins, minerals, and dietary fiber to the human diet, especially in the rainy season, eggplant is well adapted to high rainfall and high temperatures, and is among the few vegetables capable of high yields in hot-wet environments (Hanson et al., 2006), when other vegetables are in short supply for the rural and urban people. Attempts to control eggplant pests currently entails excessive use of pesticides. Srinivasan (2009) reported that intensive pesticide use in eggplant increases the cost of production, making this vegetable expensive for poor consumers. Pesticide misuse and residues pose serious risks to the health of growers, consumers, and the environment. The World Vegetable Center developed and promoted an integrated pest management (IPM) strategy for the control of eggplant fruit and shoot borer in the Indo-Gangetic plains of South Asia in 2000–2005. Growers throughout the region are readily adopting this IPM strategy because it reduces pesticide use and labor requirements for eggplant cultivation, increases the economic return from eggplant, and leads to opportunities for expanding eggplant production (Srinivasan, 2009).

2. MATERIALS AND METHODS

The study was carried out on teaching and research farm latitude 80 10' 19'' N and longitude 40 16' 16'' E at 354 m above the sea level, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria.

Sand, Bowl and eggplant seeds were used for nursery preparation; Wooden rods were used for demarcation of the plant and replicate on the field and also for mixing during formulation; Buckets were used during formulation and application on the field; Measuring cylinder was used for measuring during formulation and application; Plant parts (leaf and bark), Texapon Nitro sol, Salt, Black soap and muslin cloth were materials used for the formulation of the botanicals to be applied; Gloves, Spoon, Water and Syringe was used during formulation and application; White kegs was used to keep the botanicals and for storage.

A bowl was perforated at the bottom to allow excess water passage; adequate amount of loamy soil was put inside the bowl, and then water was added to it for moistening. The viable seeds of eggplant were sowed inside the bowl containing the moist loamy soil and were then placed where photosynthesis process can be achieved. This process took up to four (4) weeks before it was transplanted into the prepared land.

The land was ploughed and harrowed. The experiment was set up in a Randomized Complete Block Design (RCBD) with three replicates, each replicate with four (4) plots. The plots were demarcated by

the wooden rods at 1 m by 1 m spacing in-between. The spacing between the plots in a replicate was 0.5 m and the spacing between one replicate to another was 1 m. The total land size to be used is 5.5 m by 5.0 m. Four treatments were used (i.e. leaf, bark, Lambda chyalothrin and control).The leaves of F. exasperata were air dried for two weeks and were later grinded with an attrition mill. The grinded leaves were then weighed to be 520 g. 5000 ml of water was added to it and then soaked for 24 hours. The soaked plant materials were sieved with muslin cloth and the filtrate collected. Collected filtrate was mixed with 10 g of texapon, 20 g of Nitrosol, 20 g of black soap and 20 g of salt, they were mixed together thoroughly until all the materials are evenly dissolved. The mixed content was measured and poured into a white keg. The volume of the mixed content was 3500 ml.

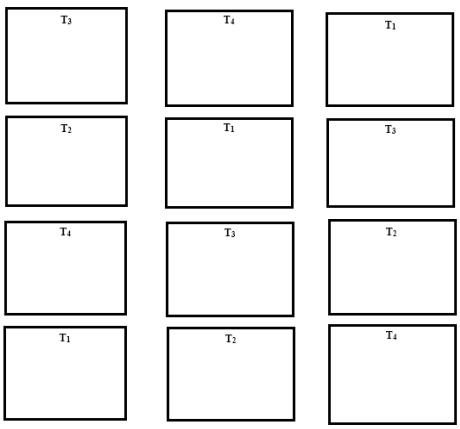
The bark of F. exasperata was air dried for two weeks and then crushed with a mortar and pestle to reduce the thickness so that the attrition mill could grind it. The grinded plant materials were weighed to be 386 g and soaked into 5000 ml of water for 24 hours. The soaked plant materials were sieved by muslin cloth and the extract collected. Extracts were mixed with 10 g of texapon, 20 g of Nitrosol, 20 g of black soap was dissolved thoroughly into the extract and 20 g of salt was added, and all the materials were thoroughly mixed together. The mixture content was measured to be 4000ml and poured into a white keg.

Both the leaf and bark extracts that was poured into white kegs were stored in the refrigerator for further use and to protect the botanical from microorganism invasion that can lead to biodegradability of the botanicals. Application of the botanicals to the eggplant was done by using the hand sprayer. Treatment application was carried out every week. Twenty percent (700 ml) of the total leaf extract was measured and 300 ml of water was added to it, which was measured using a measuring cylinder and then later poured into the hand sprayer, pressure was added to it so as to allow the flow from the sprayer. The solution was applied to the plot in which leaf extract falls in the plot through randomized process.

Twenty percent (800 ml) of the extract was measured into 200 ml of water to make sum total of 1000 ml with the aid of measuring cylinder. It will then be poured into the sprayer and pressure was added to it. The application was done immediately on the plant plot. One ml of Lambda cyhalothrin was measured with needle and syringe, it was then poured into the measuring cylinder and water was added to it to make 1000 ml, it was then poured into the sprayer for application on the assigned plot. All treatment application was done every week early in the morning before the sun rise, because if it's done while the Sun shines, it can cause the leaves on the plant to wither away and the growth of the plant was stunted.

Data collection was done by measuring the height of the plant from the root to the highest leaf on the plant stand. On each plot, the middle plants was measured and divided by the number of the plant stands measured which will give the average height of the plant stand. Also, the number of leaves on the plant stands was counted and divided by the number of the plant stands measured, which will give the average height of the plant stand. This process was done two weeks after planting and every two weeks after the first treatment application. The collected data was subjected to analysis of variance (ANOVA) and the means was separated using 5 % level of significance.

2.1. Field Layout



T1: Lambda cyhalothrin; T2: Control; T3: Leaf extract; T4: Bark extract.

3. RESULTS

The tables below show the results obtained from the analysis carried out.

Table1. *Effects of Insecticides on Insect Infestation*

	Week after planting				
Treatment	**5**	**7**	**9**	**11**	**13**
Lambda Cyalothrin	1.7[b]	2.0[a]	1.7[b]	0.3[c]	0.3[c]
Control	8.3[a]	6.7[a]	8.3[a]	11.0[a]	8.7[a]
Leaves	4.0[a]	3.0[a]	4.0[ab]	5.0[b]	4.3[b]
Bark	5.0[a]	5.0[a]	5.0[ab]	4.3[bc]	4.0[b]

Means with the same super script are not significantly different.

Table2. *Effects of Insecticides on Yield Parameters of Eggplant*

	Yield parameters		
Treatment	**No. of Flowers**	**Fruit Length**	**Fruit Girth**
Lambda Cyalothrin	76.7[a]	23.3[a]	42.0[a]
Control	54.7[b]	20.0[a]	20.0[b]
Leaves	77.7[a]	21.5[a]	21.5[b]
Bark	80.0[a]	21.2[a]	21.2[b]

Means with the same super script are not significantly different.

Table3. *Effect of Insecticide on Damaged Fruit*

	Fruit Damaged	
Treatment	**Fruit damaged (%)**	**Number of fruit damaged**
Lambda Cyalothrin	8.0[a]	0.2[b]
Control	38.7[a]	0.8[a]
Leaves	19.7[b]	0.3[b]
Bark	19.3[b]	0.3[b]

Means with the same super script are not significantly different.

Table4. *Effect of Insecticide on Plant Height*

	Week after planting (WAP)						
Treatment	**4**	**6**	**8**	**10**	**12**	**14**	**Average**
Lambda Cyalothrin	8.2[a]	15.4[a]	30.0[a]	35.3[a]	40.3[a]	37.9[a]	27.9[a]
Control	8.3[a]	12.5[a]	21.4[a]	31.7[a]	40.6[a]	41.3[a]	26.0[a]
Leaves	7.6[a]	14.9[a]	23.9[a]	36.0[a]	43.2[a]	45.8[a]	28.6[a]
Bark	9.3[a]	18.1[a]	30.7[a]	45.1[a]	55.8[a]	57.2[a]	36.0[a]

Means with the same super script are not significantly different.

Table5. Effect of Insecticides on Number of Leaves

	Week after planting (WAP)						
Treatment	**4**	**6**	**8**	**10**	**12**	**14**	**Average**
Lambda Cyhalothrin	7.2[ab]	16.8[a]	41.1[a]	60.8[a]	51.3[a]	42.8[a]	36.7[a]
Control	5.2[b]	4.8[a]	31.5[a]	52.9[a]	67.6[a]	56.2[a]	38.0[a]
Leaves	7.2[ab]	18.4[a]	47.4[a]	62.5[a]	74.1[a]	60.7[a]	45.0[a]
Bark	8.5[a]	26.8[a]	44.8[a]	69.5[a]	74.1[a]	64.8[a]	48.0[a]

Means with the same super script are not significantly different.

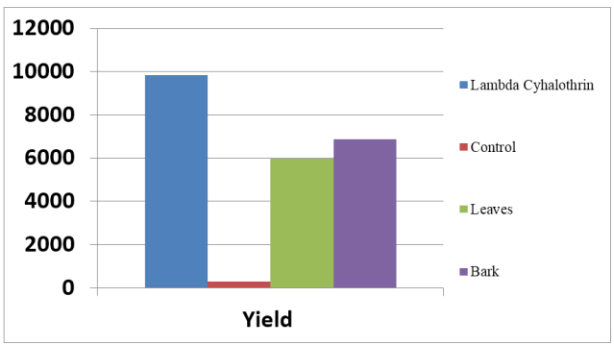


Figure1. *Histogram Showing the Effect of Insecticides on the Yield of Eggplant*

Table1 shows the effect of insecticides on insect infestation. The insects do not have much effect on the eggplants treated with lambda cyhalothrin compare with the eggplants treated with leaf and bark extracts of F. exasperata. But compared to the control eggplants that have the highest rate of insect's infestation. And also it shows that as the treatment is being applied consistently on the eggplant, it reduces the infestation of insects on the eggplants.The difference in yield parameters i.e. numbers of flower, fruit length and fruit girth. The numbers of flowers show that there is no significant difference between the leaf and bark extract of F. exasperata when compare to the eggplants treated with lambda cyhalothrin but there is a significant difference between the leaf and bark extracts of F. exasperata applied to the eggplant when compared to the control.

Table2 shows fruit length shows that, there is no significance difference between the treated plants (i.e. plants treated with leaf and bark extracts of F. exasperate and lambda cyhalothrin). While the fruit girth showed significant differences between the eggplants treated with the leaf and bark extracts of F. exasperata and lambda cyhalothrin but shows no significant difference between eggplants treated with leaf and bark extracts of F. exasperate compared to the control.

Table3 shows that there is no significant difference between the damaged fruits of eggplants treated with lambda cyhalothrin and the damaged fruits of eggplants treated with leaf and bark extracts of F. exasperata, while there is a significant difference between the damaged fruits of eggplants treated with the leaf and bark extracts of F. exasperata and the control.

Table4 shows that the leaf and bark extracts of F. exasperata together with lambda cyhalothrin has no effect on the eggplants height because the control eggplants has the same plant height with the treated eggplants.

At week four (4), table5 shows that the number of leaves of the eggplants treated with bark extracts of F. exasperata was higher while the eggplants treated with the leaf extracts of F. exasperata are the same. But the eggplants treated with lambda cyhalothrin have a slight difference from other eggplants. However, the plants treated with leaf and bark extracts of F. exasperata, lambda cyhalothrin and the control has no significant difference.

The yield from the eggplants treated with bark extracts of F. exasperata and those treated with leaf extracts of F. exasperata has no significant difference but there is a slight difference from the eggplants treated with the lambda cyhalothrin. But compared to the control eggplants which had a significant difference from the eggplants treated with bark extracts of F. exasperate and lambda cyhalothrin and then shows a slight difference from plants treated with leaf extracts of F. exasperate as shown in figure1.

4. DISCUSSION

Synthetic chemicals have been used to control plant pathogenic nematodes in the farmers' fields. These chemicals, though valued for their effectiveness, are costly and may constitute health hazards to farm households and the environment. Reducing these situations in the farms through use of natural plant extracts is one of the challenges in Nigeria (Ugwuoke et al., 2011). Botanicals are the natural plant products when applied to the field enhance the growth of the plants in addition to nematode control. Application of botanicals or botanicals based by products to the soil leaves no residues in the field and are economically viable to the farmers.

Concerning the environmental safety, now-a-days botanicals are gaining much importance in the integrated pest management (IPM) practices. Many botanical based products are available in the market for the control of insect pests. Efficient use of the botanicals will increase productivity of the crop by reducing the insect, pathogen and nematode damage in it which in turn improve the economic status of the farmers. Moreover, application of botanicals to the crops will yield healthy fruits and vegetables without chemical contamination which results in healthier human generations (Manju and Sankari, 2015).

The result obtained from this study shows that the application of leaves and bark extracts of F. exasperata was effective in the control of insect pest infestation when compared with control. Among the applied treatment cyhalothrin had the highest insecticidal efficiency. The fruit obtained from the applied extracts had the same significant effect with lambda cyhalothrin treated fruit. However, plants treated with bark of F. exasperata compete effectively with lambda cyhalothrin in reference to yield.

REFERENCES

[1] Bafor, E., Nwiko, E. M., Omogbai, E. K. I., Ozolua, R. I. and Nworgu, Z. A. M (2009). Evaluation of the proposed inhibitory effect of the aqeous stem-bark extract of *Ficus exasperata* on uterine preparations in vitro. *Int. Journal Pharmacology*. 5: 94 – 97.

[2] Hanson, P. M., Yang, R. Y., Tsou, S. C. S., Ledesma, D., Engle, L., Lee, T. C. (2006). Diversity in eggplant (*Solanum melongena*) for superoxide scavenging activity, total phenolics, and ascorbic acid. *Journal of Food Composition and Analysis* 19(6-7): 594-600.

[3] Lawal, I. O., Borokini, T. I., Oyeleye, A. Williams, O. A., Olayemi, J. O. (2012). "Evaluation of Extract of *Ficus exasperata* Vahl Root Bark for Antimicrobial Activities against Some Strains of Clinical Isolates of Bacterial and Fungi", *International Journal of Modern Botany*, vol. 2(1), pp 6-12.

[4] Malla, B., Gauchan, D. P., and Chhetri, R. B. (2015). An ethnobotanical study of medicinal plants used by ethnic people in Parbat district of western Nepal. *Journal of Ethnopharmacology* 165:103-117.

[5] Manju, P. and Sankari Meena K. (2015). Antinemic properties of the botanicals. Department of Nematology, Tamil Nadu Agricultural University, Coimbatore 641 003, India. *International journal of science and nature*. I.J.S.N., Vol. 6(2)

[6] Mbakwem-Aniebo, C., Onianwa, O., Okonko, I. O. (2012). "Effects of *Ficus exasperata* Vahl on Commercial Dermatophytes and Causative Agent of Pityriasis Versicolor in Rivers State, Nigeria", *American Journal of Dermatology and Venereology, vol.* 1(1), pp 1-5.

[7] Muibat, O. B., Misbaudeen, A., Precious, O. (2014). Nutrient and Anti-nutrient Phytochemicals in *Ficus exasperata* Vahl Leaves. *International Journal of Scientific and Engineering Research*, Volume 5, 2177. ISSN 2229-5518.

[8] Mukesh Dongre and Sobita Simon (2013). Efficacy of certain botanical extracts in the management of Meloidogyne graminicola of rice. *International Journal Agrl. Sci. and Res*. 3, 91-98.

[9] Odunbaku, O. A., Ilusanya, O. A., Akasoro, K. S. (2008). "Antibacterial activity of ethanolic leaf extract of *Ficus exasperata* on *Escherichia coli* and *Staphylococcus albus*", Scientific Research and Essay, Vol. 3(11), pp. 562-564.

[10] Pandey, M. A. B., Abidi, S., Singh, R. P. (2006). "Nutritional evaluation of leafy vegetables", *Paratha. Journal of Human Ecol.*, vol. 19, pp 155-156, 2006.

[11] Sonibare, M. O, Isiaka, A. O., Taruka, M. W., Williams, N. S, Soladoye, M, Emmanuel, O. (2006). Constituents of *Ficus exasperata* leaves. Natural product communications pp.23-26.

[12] Srinivasan, R. (2009). Insect and mite pests on eggplant: a field guide for identification and management. AVRDC – The World Vegetable Center, Shanhua, Taiwan. AVRDC Publication No. 09-729. 64 p

[13] Ugwuoke, K. I., Ukwueze, B. O. and Ogwulumba, S. I. (2011). Department of Crop Production Technology, Federal College of Agriculture Ishiagu, Nigeria.

[14] Verma, S., Singh, S. P. (2008). Current and future status of herbal medicines. *Veterinary World* 1:347– 50.

[15] Wonder, M., Abotsi, K., Woode, E., Aninoson, G. K., Amo-Barrimah, A. K., Gyasi, E. B. (2010). Antiarthritic and antioxidant effects of the leaf extract of *Ficus exasperata* (moraceae). *Phcog Res*. 2: 89 – 97.

[16] Wondimeneh Taye, Sakhuja, P. K. and Tadele Tefera. (2013). Root-knot nematode (*Meloidogyne incognita*) management using botanicals in tomato (*Lycopersicon esculentum*). *Academia Journal of Agriculture Res*. 1, 9-16.

[17] Woode, E., Poku, R. A., Ainooson, G. K., Boakye Gyasi, E., Abotsi, W. K. M., Mensah, T. L., Amoh-Barimah, A. K. (2009). An evaluation of the anti-inflammatory, antipyretic and antinociceptive effects of *Ficus exasperata* (Vahl) leaf extract. *Journal Pharmacol. Toxicology* vol. 4: 138-151. pp 138-151.

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