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Efficacies of some commercial insecticides on leaf spot disease of groundnut (*Arachis hypogaea*) in Ishiagu, Southeast Nigeria

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Abstract:

Three years experiments were carried out at the Research and Teaching Farm of Federal College of Agriculture, Ishiagu, Ebonyi State, Nigeria, during 2016, 2017 and 2018 cropping seasons to evaluate the effect of some insecticides on leaf spot disease of groundnut (*Arachis hypogaea* L.). The experiments were fitted into Randomized Complete Block Design (RCBD) with four treatments replicated three times. The various insecticides with different trade names used as treatments were Lambda-cyhalothin sold as Lara Force gold, dimethoate 40% EC sold as Dime Force, chlorpyrifos 48% EC sold as Act Force and zero treatment (Control). Data were collected on plant height, number of leaves and number of infected leaves at 100 days after planting, number and weight of pods at harvest. The data collected were subjected to statistical analysis of variance and significant treatment means separated at the 5% level of probability. Results obtained revealed that the treatments did not have any significant ($P > 0.05$) effect on the growth parameters but reduced significantly ($P < 0.05$) the number of infected leaves in 2016, 2017 and 2018. The number and weight of pods were significantly ($P<0.05$) increased in 2016, 2017 and 2018 when compared with plants in the control plots. Lambda-cyhalothin performed better than other treatments in the reduction of disease incidence and concomitant increase in the yield parameters of groundnut.

Introduction

Groundnut (*Arachis hypogaea*) is an important food and forage crop because of its high protein and oil content. Its seed is used as a source of cooking oil and in confectionery products for human consumption (Naab and Smart, 2005 and Nutsugah and Mecutcheon, 2007).

It is one the most popular and universal crops cultivated in so many countries, but mainly Asia, Africa and America (FAO, 2007). Groundnut is one of the crops grown due to its nutrient value. It can be transformed from one form to another for both human and animal consumption. Groundnut hay vine is a nitrous animal feed, particularly for in the subsequent dry season when green forage is not available. In addition, groundnut seed and hay are often sold in local markets,

providing income to the source poor farmers (Naab and Smart, 2005).

Fungi affect the leaves, which go a long way to reducing the growth and yield of the groundnut. Reduced yield as high as 37% in groundnut is being observed in Nigeria almost annually due to leaf spot disease. In Nigeria, leaf spot and rosette virus are the most serious damaging diseases of groundnut (Alabi *et al*., 2001). Worldwide loses as high as 50% of the seed yield and even higher for haulms due to *Cercospora arachidicola* and *Cercospora personata* have been reported by Dewaele and Swanevelder (2001).

Use of various fungicides to control fungal diseases has been the normal practice in groundnut producing areas, but resistance to the fungicides has been observed with increased yield losses annually. However, spraying with fungicides is required to achieve optimal yields during most years (Bailey, 2002).

Ogwulumba *et al*. (2008) posited that *Cercospora* leaf spot is the most important foliar diseases of groundnut in the world. In order to curb the increased resistance of this disease and yield losses, some insecticides commercially sold in the markets were evaluated for their efficacies against leaf spot diseases in addition to their insecticidal properties.

This development has therefore necessitated the need to evaluate their respective efficacies in the control of leaf spot disease and their effects on the growth and yield of groundnut in a three year trial.

Materials and methods

The experiments were carried out at the Research and Teaching farm of Federal College Agriculture Ishiagu, Ebonyi State during 2016, 2017 and 2018 cropping seasons. The site lies within a longitude of 72 ^{0}E and latitude 5 ^{0}N in the derived savannah zone of south eastern Nigeria. It has an annual temperature of 27 ^{0}C (Minimum) and 33 ^{0}C (Maximum) with an average relative humidity of 88% and annual rainfall between 1600 mm and 2000 mm (FCAI, 2015).

The experiment was laid on Randomized Complete Block Design (RCBD), with four treatments replicated three times in each year. The experimental sites measured 10 m X 10 m giving the total land area of 100 m^2 in each year. In each year, the experimental site was cleared, ploughed mechanically and divided into three blocks and twelve plots with each block measuring 1m apart, 0.5m between plots and each plot size was 2 m X 2 m. Samnut 10 varieties which is an erect type of groundnut was used for the research.

Two seeds were sown per hole and later thinned down to one, three weeks after germination with spacing of 40 cm X 40 cm. Twenty- five (25) plants were maintained in each plot. Weeding was done manually using a weeding hoe as the weeds arose to minimize weed interference. The insecticides used as treatments were: Lambda-cyhalothin with trade name Lara Force gold, dimethoate 40% EC with trade name Dime Force and chlorpyrifos 48% EC with the trade name Act Force.

The insecticides were applied according to manufacturers' specifications as obtained from the labels. Plots without insecticide application served as control. Sixteen (16) plants were randomly selected in each plot for data collection. Data were collected on plant height (By using a measuring tape from the soil to the apex of the plant), number of leaves (By counting the number of the main leaves produced by the plant) and leaf disease incidence (By counting the number of plants with disease symptoms) at 100

days after planting, number of pods and weight of pods at harvest.

Data collected were subjected to statistical analysis of variance (ANOVA). Significant treatment means were separated using Least Significant Difference (LS.D.) and all inferences were made at the 5% level of probability.

Results and discussion

The results shown in Table **(**1**)** showed that the insecticides did not have any significant (P >0.05) effect on the plant height and the number of leaves produced by the plants.

Table (1): Effect of various insecticides on plant height (cm) and number of leaves at 100 days after planting during 2016, 2017 and 2018 cropping seasons.

	Plant height (cm)			Number of leaves		
Treatments	**2016**	**2017**	**2018**	**2016**	**2017**	**2018**
Control	23.20	28.11	38.72	239.01	318.04	380.97
Lambda-cyhalothin	23.96	35.53	39.05	244.21	328.92	386.56
Dimethoate 40% EC	23.90	32.25	38.73	234.94	325.61	380.63
Chlorpyrifos 48% EC	23.33	29.31	37.91	241.11	311.22	375.02
LS.D. (0.05)	NS	NS	NS	NS	NS	NS

NS = Not significant

The result in Table (2) revealed that the insecticides significantly (P <0.05) reduced the number of infected leaves at 100 days after planting. Lambda-cyhalothin differed significantly (P<0.05) in the reduction of the infected leaves when compared with other insecticides and control. The plants in the control plots had the highest number of infected leaves. These results were consistent across the years evaluated.

Table (2) : Effect of various insecticides on Number of infected leaves 100 days after planting in 2016, 2017 and 2018.

Treatments	**2016**	**2017**	**2018**
Control	97.61	94.83	91.71
Lambda-cyhalothin	17.82	20.81	16.09
Dimethoate 40% EC	54.31	59.23	60.42
Chlorpyrifos 48% EC	44.82	72.10	79.17
LS.D. (0.05)	7.91	5.97	6.05

The plants that were treated with the insecticides significantly (P<0.05) had increased numbers of pods and pod weight as recorded in Table (3). Plants treated with Lambda-cyhalothin recorded significantly (P<0.05) higher number of pods and pod weight than plants treated with other insecticides and control across the years under study.

Table (3) : Effect of the various insecticides on number and weight of fresh pods (kg) at harvest in 2016, 2017 and 2018.

	Number of pods			Mean weight of fresh pods (kg)		
Treatments	**2016**	**2017**	**2018**	**2016**	**2017**	**2018**
Control	35.51	33.34	48.49	0.14	0.12	0.18
Lambda-cyhalothin	96.27	65.92	71.66	0.26	0.17	0.28
Dimethoate 40% EC	71.12	60.91	66.18	0.15	0.15	0.20
Chlorpyrifos 48% EC	76.07	49.14	64.694	0.16	0.13	0.19
LSD (0.05)	3.43	13.80	7.23	0.343	0.11	0.12

The control plots, however, produced the lowest number of pods and pod weight. The application of the insecticides did not affect the plant height and number of leaves produced by the plants. This demonstrated that the insecticides did not have any growth inducing compounds in their formulations. The plants depended on the relative availability of plant nutrients in the soil for their growth. The incidence of the fungal disease on the foliage of the crops was highly reduced by the application of the various insecticides. This was attributed to the relative efficacies of the insecticides in controlling the menace of the leaf spot disease caused by *Cercospora arachidicola*. The symptoms were brown spots surrounded by a yellow colour on the upper part of the leaves. Comparing the number of diseased leaves observed in the leaves of the control plots clearly brings out the relative fungicidal potentials of the fungicides.

Petit *et al.*(2012) posited that fungicides are a vital solution to the effective control of plant diseases which are estimated to cause yield reductions of almost 20% in major food and cash crops worldwide. Sharma *et al.* (2018) stated that application of fungicides reduces intensity of diseases in crops. The reduction of the disease incidence in the leaves of the crops by the application of the fungicides resulted in increased number and weight of the pods when compared with that obtained from the control plots. The increased yields also revealed the deleterious effects leaf spot disease could have on groundnut when left untreated, as evidenced by the plants in the control plots.

This underscores the importance of the fungicides in the control of ravaging leaf spot disease of groundnut. This further revealed that fungicides inhibit the occurrence of diseases in plants. Massalatchi *et al*. (2017) posited that the use of plant protection products plays a very important role in agriculture. Leaf spot disease causes enormous yield loss in groundnut producing areas.

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