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Comparative efficacy of cypermethrin and plant extract in the control of cucumber pests in ado Ekiti, Southwestern Nigeria

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Abstract
Cucumber (*Cucumis Sativus*) is widely grown and consumed in the tropical and temperate regions as a source of fruit vegetable for man due to its numerous health benefits. Attainable yield in the farmers farm is considerably low due to the problem of insect pest attack. As a result of this, experiment was carried out to investigate the potency of cypermethrin and extracts from three plants (*Datura stramonium*, *Ricinus communis* and *Sida acuta*) in the control of insect pest associated with cucumber. Cucumber variety Cu 999 was planted on a 2 x 2 m at a spacing of 40 cm x 40 cm. three concentrations of the extracts was used in the control of the pest and cypermethrin insecticide was used as a standard check. The control plot in each case was sprayed with distilled water. Data obtained were analyzed using analysis of variance and means separated using least significant different at ($p \leq 0.05$). Result from the experiment shows statistically significant variations. Eight insect pests belonging to different orders and families were observed on the cucumber. Incidence of normal fruits were generally higher than abnormal fruits at all the concentrations observed in the study. At 65% concentration with extracts of *D. stranmonium*, incidence of normal fruit (80.3%) was not significantly different from that of cypermethrin insecticide (82.6%). Yield of cucumber sprayer with 65% concentration of *D. stramonium* (250 kg/ha) was not significantly different from that of cypermethrin insecticide (254 kg/ha). The study concluded that extracts of the three plants can be used to replace insecticide in the management of the insect plant of cucumber with corresponding yield.

Keywords: Cucumber, plant extracts, cypermethrin, insect pests

1. Introduction
Cucumber (*Cucumis sativus*) belong to the family Cucurbitaceae. It is a plant that is grown in the tropics as a source of vegetable for man (Falade, 2022) [6]. Cucumber is rich in vitamin C and an antioxidant nutrient rich in beta carotene and manganese. Cucumber is also useful as body dehydration. Apart from that, it has been reported that its use on the skin helps to ease sun burn pain, swellings and damage of skin (Mary, 2020). Cucumber originated from India about 3000 years ago and from there, it spread to Greece and Rome and later, it was introduced to China (Sikarwar and Hardaha, 2017) [12]. It was introduced to Africa through Namibia, Botswana, South Africa and Swaziland. Today it is grown virtually in all countries of Africa (Akinwole *et al*., 2019) [1]. Estimated world production in 2020 was 91, 258, 272 million metric tonnes (MMT) and China is the largest producer in the world accounting for about 80% production (72, 779, 73 MMT). This is closely followed by Turkey (1,926,883) and Russia (1,686,976). The key cucumber producing countries in West Africa are; Nigeria, Egypt, Ghana and Niger. (Babalola *et al*., 2016) [3]. Egypt is the largest producer with record of about 488,723 tonnes (FAOSTAT, 2017) [7] while Nigeria produces about 27,000 tonnes, this output is generally low due to some limiting factors which hinder production like problem of soil, climate, seed, pest and diseases. Scarcity of planting materials, lack of capital, high fruit perishable and lack of production experience (Falade, 2021) [5].
In Nigeria, production of cucumber has not been rated. It is grown mostly in Jos, Kano, Kaduna, Jigawa and more recently in the southern part of the country particularly in Ekiti, Ondo and Osun (Falade, 2021) [5]. Cucumber performs better on well drained fertile soils with pH of about 6-7 and ample richness of organic matter (Okafor and Japhet, 2021) [11].

It is often planted on raised soils and the crop require a good amount of sunshine, warmth and high amount of rain fall.

Insect pests had been reported to affect the yield or productivity of cucumber with serious economic implications. From previous study of Odewale *et al*., 2018 [10], insect pest has been reported to affect cucumber production in Ogbomoso agricultural zone. The study observed that four insect pests belonging to two families were reported to affect the yield of cucumber. In another development, Arogundade *et al*., 2021 [2] reported four beetles and three aphids are known to attack cucumber production.

Similarly, Falade, 2022 [6] reported that about 23 insect pests belonging to fifteen families affect the yield or productivity of cucumber in Ado-Ekiti South Western Nigeria. Control of these insect pest has been achieved in time past with the use of insecticides. These insecticides are usually very effective in reducing insect population beyond economic injury level. However, they have adverse effect on soil and environment, apart from that some of the insecticides are generally costly and beyond the reach of the farmers. In addition, there is always the problem of insect resistant to insecticide and resurgence of sprayed pest. Based on the above, there is therefore the need to search for botanicals that are affordable, accessible which does not have adverse effect on the soil and environment in the management of cucumber pests (Lowell, 2004) [9].

Leaf extracts of drumstick tree (*Moringa oliefera*) (Marala, *et al*., 2017), Jimson weed (*Datura stramonium*) (Falade, 2021) [5] and Tobacco (*Nicotiana tabacum*) (Anne, 2004) has been successfully used in the control of diseases, but its application in the control of cucumber pest has not been exploited. Therefore, the present study was carried out to compare the effect of the extracts of the three plants at three concentrations with that of cypermethrin insecticide in the management of cucumber pest.

2. Materials and Methods

2.1 Experimental Site

This experiment was carried out at Ekiti State University Teaching and Research Farm Ado-Ekiti, The University Teaching and Research Farm is located in latitude 7.7129ºN and longitude 5.2523ºE with mean annual rainfall of 1478mm, the average minimum and maximum temperature are 27.2 °C and 22.9 °C respectively. The relative humidity ranges from 47.38% to 88.19%.

2.2 Preparation of Plant leaves

Leaves of the three plants used in the study were; *D. stramonim* (Linn), *R. communis* (Linn) and *S. acuta* (Burm.f.). They were obtained at Ekiti State University, Ado Ekiti and air-dried at 28º±2 ℃ for 5-6 weeks to constant weight. Dried leaves were milled using a blender (Okapi, Mixed-Grinder), packaged into sealable nylon and refrigerated at 4 ℃ for 2 weeks (until they were required for bioassay).

2.3 Pre-Planting, Planting and Post Planting Operations

The experimental site was cleared using cutlass and the debris were packed before it was made into ridges. The land was cultivated using a hoe and poultry manure was incorporated into the soil before planting. Cucumber variety Cu 999 was planted at a spacing of 40 cm x 40 cm. Two seeds were planted per hole and thinning was done to one seed per stand after germination, wetting of the plant was done twice in the morning (6-7 am) and evening (6-7 pm. Weeding was done twice with the use of a hoe. Three weeks after germination, staking was done and the rope was used to twine the cucumber to support the stem of the plant and also prevent trailing of the branch on the ground. Harvesting was done six weeks after planting.

2.4 Preparation of plant extracts

The extract used in the study were prepared by mixing equivalent grams of prepared plant powder (65, 50 and 30/g) with 100ml of distilled hot water maintained at 70 ℃ in 500ml bottles and kept in hot water bath-shaker for 30 minutes. Thereafter, the liquid extract was separated by using two folds cheese cloth and poured inside standard bottles which were refrigerated at 4 ℃. These extracts were used as the stock solution from which 65%, 50% and 30% of each extracts were prepared.

2.5 Field Experiment

The field experiment was carried out between April and May, 2022 at the Teaching and Research Farm, Ekiti state University. Cucumber variety (Cu 999) was planted on 2 x 2m plot at a spacing of 40 cm x 40 cm. two seeds were planted per hole which was later thinned to one per stand. Total area of the farm (120m^2) was laid in a randomized complete block design and three leaf extracts: *D. stramonium*, *R. communis* and *S. acuta* was applied at three concentrations (65.50 and 30%). This was used as a foliar spray to control the insect pest frequently observed on the plot while cypermethrin insecticide was used as a standard check. The control plot in each case was sprayed with distilled water. The spraying of the extracts was done every week starting from two weeks after germination till period of maturity. Throughout the experiment, spraying was done with the aid of a hand operated sprayer in the morning between 7 am - 8 am

2.6 Identification of the insects

The identification was carried out using a stereomicroscope and family identification was carried out in respect to its morphology. Before the identification of insects, petri dish were sprayed with ethanol and cleaned with tissue paper. Filter paper was spread inside the petri dishes before the identification of insect, the insects were washed with ethanol and then placed in a petri dish and later preserved in the refrigerator.

2.7 Data analysis

Data collected were analyzed using analysis of variance (ANOVA) and means separated using Least significant difference with the aid of SPSS statistical software.

3. Results

Table 1 shows the list of insect pest associated with the production of cucumber in Ado-Ekiti, result from the study shows that eight insect pests belonging to different families were frequently observed on the cucumber plot. They have different feeding habit, some of them feed on leaves and stem while other ones feed on the fruits.

Table 1: List of Insect Pest associated with Cucumber production in Ado-Ekiti

Common name	Order	Family	Genus	Spp
Orange cucumber beetle	Coleopetra	Chrysomelidae	*Aulacophora*	*Aulacophora* spp
Blue cucumber bettle	Coleopetra	Chrysomelidae	`	*podagrica malvae*
Cotton Stainer	Hemiptera	Pyrrhocoridae	*Dysdercus*	*Dysdercus flavidus*
Long Horned grasshopper	Orthoptera	Tettigonidae	*Phlugis*	*Phlugis manstipa*
Grasshopper	Orthoptera	Acrididae	*Schistorcera*	*Schistorcera Americana*
Cinnabar moth caterpillar	Lepidoptera	Erebidae	*Tyria*	*Tyria jacobaeae*
Black cotton stainer	Hemiptera	Pyrrhocoridae	*Dysdercus*	*Dysdercus mimulus*

Table 2 shows the incidence of normal and abnormal fruits of cucumber sprayed with different concentrations of plant extracts and cypermethrin insecticides. Result from the study shows that incidence of normal fruits were generally higher than abnormal fruits in all the treated plots than the control. Incidence of abnormal fruits recorded in all the treated plots were generally low. At higher concentrations of plant extracts (65%), there was no significant difference ($p \leq 0.05$) in the incidence of the disease treated with plant extracts and cypermethrin insecticide. However, at lower concentrations (50 and 30%), significant differences were observed.

Table 2: Incidence of normal and abnormal fruit of cucumber sprayed with plant extract and cypermethrin

	Incidence of Normal/abnormal Fruit Cucumber (%)		
Plant Extract	**Conc.**	**Normal Fruit**	**Abnormal Fruit**
D. stramonium	65	80.20	19.80
	50	68.30	31.70
	30	54.10	45.9
	0	35.4	64.6
	65	77.64	22.36
R. communis	50	64.70	35.30
	30	51.20	48.80
	0	33.60	66.40
	65	75.60	24.40
S. acuta	50	62.50	37.50
	30	50.30	49.70
	0	34.70	65.30
Cypermethrin	0.1g/litre	82.6	17.40

Table 3 reveals the effect of the three plant extracts and cypermethrin insecticide on the yield of cucumber. Yield of cucumber was generally higher in plots sprayed with plant extracts and cypermethrin insecticide compared to the control. The control plot gave the lowest yield. Similarly yield of the cucumber was concentration dependent, at higher concentrations (65%), yield was relatively higher and comparable with that obtained from the use of insecticide. However, as concentration reduced from 65% to 50 and 30%, the yield obtained from plots treated with insecticides were significantly higher than those treated with plant extracts.

Table 3: Effect of plant extracts and cypermethrin on yield of cucumber

Plant extract	Conc. % (w/v)	Yield (kg/ha)
D. stramonium	65	250
	50	234
	30	150
	0	57
	65	244
R. communis	50	229
	30	146
	0	58
	65	240
S. acuta	50	223
	30	147
	0	57
Cypermethrin	0.1g/litre	254

4. Discussion

Cucumber as a fruit vegetable consumed by man has been implicated to have many health benefits thus increasing longevity, production in the tropics has been increasing. However, attainable yield in the farmers farm has been considerably low due to the problem of insect pest known to reduce the yield and quality of output with serious economic implications (Falade, 2022) [6]. In this study, eight insect pests belonging to six families and orders were observed on the cucumber. Some of them eat the leaf, fruits and stem, the insect pest were observed at various stages of growth and their effect reduced the yield or productivity of the cucumber which have a direct effect on the farmer's income.

The result of this study agrees with the previous study of Odewale *et al*., 2018 [10], indicating that insect pest has been reported to affect cucumber production in Ogbomoso agricultural zone. The study observed that four insect pests belonging to two families were reported to affect the yield of cucumber. In another development, Arogundade *et al*., 2021 [2] reported four beetles and three aphids are known to attack cucumber production.

In this study, Incidence of normal fruits were generally higher than abnormal fruits at all the tested concentration. Normal fruits were the cucumber that were straight and strong without spots or any wrinkles abnormal fruits were those that were curved with oblong shapes. At high concentrations of all the plant extracts (65%), the incidence of normal fruits observed was not significantly different from the one obtained with the spray of cypermethrin

insecticide. This may be due to the presence of chemicals released by the spray of extracts that inhibit the feeding of the insect pests on the cucumber. However, at lower concentrations of the extracts, significant differences were noticed. Incidence of abnormal fruits was significantly ($p \leq 0.05$) higher in the control plot than the treated plots. This study is in line with the work of Jimoh *et al*., (2016) [8] who reported that incidence of cercospora species and fusarium species was significantly ($p \leq 0.05$) reduced on seeds sprayed with the extract of *Chromotoena odoratum* and *Tithonias diversifolia*. The report also indicated that higher number of abnormal seeds were observed on the control. Similarly, Eno *et al*., (2016) [4] reported that the extract of *Anacardium* occidentalis, *Gmelina arborea*, and *C. odorata* reduced the incidence of cowpea anthracnose disease.

In this study, the leaves of D. *stramonium, R. communis and S. acuta* were collected, air dried, powered and sprayed in the control of the insect pest found on the cucumber. Result from the study shows that all the extracts at the tested concentration reduced the frequency of the insect pest attack compared to the control, this has a direct effect on the quality and quantity of cucumber produced. Also, the yield of the cucumber sprayed with different concentrations of the extract were generally higher than the control and it was concentration dependent. Higher yields were observed at high concentrations and as the concentration reduces from 65% to 30%, there was a corresponding reduction in yield. The yield obtained from the spray of cypermethrin insecticides was not significantly different from those obtained from extract sprayed plots at high concentration (65%). This study agreed with the work of Falade *et al*., 2018 who reported the control of cowpea anthracnose disease with extracts of *D. stramonium*, *R. cucumis* and *J. gossypifolia*. The study concluded that yield of cowpea was relatively higher at high concentrations of all the extracts.

5. Conclusion

In conclusion, cucumber cultivation faces significant challenges from insect pests, impacting both yield and crop quality. This study demonstrates the efficacy of plant extracts from *D. stramonium*, *R. communis*, and *S. acuta* in reducing pest incidence, offering promising alternatives to traditional insecticides. Concentration-dependent effects on yield and fruit quality highlight the potential of these extracts. Their performance, comparable to cypermethrin, suggests a sustainable solution for pest management in cucumber farming. This research contributes to eco-friendly agricultural practices, emphasizing the importance of innovative strategies to ensure crop resilience, farmer income, and long-term sustainability in the face of pest-related adversities.

6. References

1. Akinwale AO, Dauda AB, Oyewole. Growth and fruits Quality of cucumber (*Cucumis sativus* L) irrigated with African catfish cultured Waste water. Nigerian Journal of Basic and Applied Science. 2019;27(2):95-100.
2. Arogundade I, Titilayo A, Johua O, Adeyemi I. Current and Emerging Pests and Diseases of cucumber (*Cucumis sativus* L) in Africa; c2021.
3. Babalola F, Oduola L, Akanni K. Bioeconomic Analysis of cucumber production. Research Gate. 2016;2(14):22-28.
4. Eno IP. Field Trail on the potential of *Anacardium occidentalis* for the control of cowpea anthracnose disease in Nigeria. M.Sc Thesis. Department of Plant Health Management. Michael Okpara University of Agriculture Umudike; c2011. p. 180.
5. Falade MJ. Management of Cucumber Downy Mildew caused by *Pseudoperonospora cubensis* with use of Benonly, plant extracts and intercropping. International Journal of Research Students in Agricultural Sciences. 2021;6:25-32.
6. Falade MJ. Investigation on the entomological and beneficial insect pests associated with cucumber (*Cucumis sativus*) production in South Western Nigeria. Journal of Entomology and Zoology Studies. 2002;10(2):57-61.
7. FAOSTAT. Food and Agriculture Organization. The United Nations Site [Internet]; c2012. Available: http://www.fao.org/statistics.
8. Jimoh M, Enikuomdinh OA, Afolabi CG, Olowo VO, Egbontan A. Achieving improved control of foliar Disease of sesam (*Sesamum indicum* L) Intercropped with maize through foliar spray of plant extract. Archives of Phytopathology and Plant Protection. 2016;49:586-600.
9. Lowell JF. Producing food without pesticide. Editors Macmillan Publishers; c2004, 22.
10. Odewale AF, Adebayo TA, Olaniran OA, Akanbi WB, Onifade OS. Preliminary Investigations of Insect pest of cucumber (*Cucumis sativus* L) in Ogbomoso Agricultural Zone of Nigeria; c2018.
11. Okafor BN, Japhet J. Soil and Agronomic Management of Cucumber Production in Nigeria. In: Studies on cucumber (*Cucumis sativus* L); c2021.
12. Sikarwar P, Hardaha MK. Response of Cucumber to Different Irrigation Levels under Poly House. Journal of Multidisciplinary Advances. 2017;6(1):40-46.