

Preliminary study of insect pests of cucumber (*Cucumis sativus* L.) in Ogbomoso Agricultural Zone of Nigeria

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A field experiment was conducted in 2014 to determine insect pests associated with cucumber in Ogbomoso (Southern Guinea Savanna), Oyo-state Nigeria. Market More and Pointset cucumber varieties were used as treatments. Data were collected at three different phenological growth stages. Data collections commenced at 2 weeks after planting (WAP) and were on weekly basis for six weeks. Four major insect pests were observed namely *Phyllotreta cruciferae* Fabricius, *Diabrotica undecimpunctata* Howard Barber, *Epilachna vigintipunctata* Fabricius and *Monolepta* spp Coquilletta on the two varieties. Except *Epilachna vigintipunctata*, which belong to the family Coccinellidae others are from the family Chrysomelidae. Also, all the insect pests recorded the highest population at seedling and the population reduces at flowering to fruiting stage while *Epilachna* recorded the highest population at fruiting stage. The same trend was also observed for distribution across the age of the plant.

Keywords: Cucumber, insect pest, *Epilachna vigintipunctata*, population species and Market more

1 Introduction

Vegetables are important in the human diet for the provision of carbohydrates, proteins, vitamins and trace elements they contain (Bakre et al., 2004). In addition to dietary benefits, there are important supplementary sources of food and nutrition and also serve as one of the major sources of income for small scale farmers to highly commercial farmers. (Selleck and Opena, 1985). Vegetables constitute the fourth largest group of commodities produced in Africa (FAO, 2000). Cucumber is a fruit vegetable which belongs to the Cucurbitaceae family that has been cultivated by man for over 3,000 years (Adetula and Denton, 2003; Okonmah, 2011). Today, Cucumber (*Cucumis sativus* L.) and water melon (*Citrullus lanatus* L.) was ranked best among the 20 most important vegetable crops worldwide (FAOSTAT, 2008). Cucumber is resident to Africa and Asia continent (Sebastian et al., 2010). The crop is cultivated in most parts of northern and eastern Nigeria by peasant farmers (Ekwu, 2007).

Insect pests are major constraints to cucumber production in Nigeria. They cause defoliations on leaves, flowers abortion and fruits damage. Thus, causing reduction in

quality and quantity of the crop (Gballab, 2011). Apart from causing direct damage many insect pests also act as vectors for several viral diseases (Kuhar and Speese, 2002). Birch et al. (2011) has reported that insect pests worldwide consume crops sufficient to feed an additional one billion people, hence ability to identify them prior to infestation can lead to higher productivity. Information on range and relative importance of different pests on cucumber in Southern guinea savannah are scanty. Information on species and population are required to determine the insect pests associated with cucumber especially in Southern guinea savannah area of Nigeria and the most critical phenological stage at which the insect pests do attack cucumber. Moreover, determining the importance of an insect in any agro-ecosystems, contributes to the description of its status. Such information is necessary for the formulation of a good pest management strategy. The objective of this study therefore, is to determine the insects pests associated with cucumber at different phenological stage in southern guinea savannah of Nigeria.

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2 Material and methods

2.1 Study Area

Field experiment was conducted in the cropping seasons of 2014, at Ladoké Akintola University of Technology (LAUTECH) Teaching and Research Farm, Ogbomoso, Nigeria. Ogbomoso Southern Guinea Savannah of Nigeria is on Latitude 10° 05' N, Longitude 04°, 30' E, 34.1 m). The region's climate is known to be hot humid tropical falls in with mean temperature of 27 °C, annual rainfall of 1,400 mm and marked with wet and dry season

2.2 Collection of cucumber seeds

Seeds of cucumber (*Cucumis sativus*) var. Point-set and Market more, used for this study were obtained from Agro Allied shop in Ogbomoso, Nigeria.

2.3 Agronomy practices

Land was cleared manually, and the thrash were removed. Each plot was divided into beds having 3 × 3 m dimension with a planting distance of 1 × 1 m between and within plant rows, respectively. Randomized Complete Block Design (RCBD) was used to arrange the treatments and was replicated three times. Each plot had 4 rows with 4 plants per row which amounted to 16 plants per plot. Two plant rows from the middle were tagged for data collection. Cucumber seeds were planted in early season of May, 2014 at the rate of three to four seeds per stand. Thinning was done two weeks after planting (WAP) to achieve one plant per stand. Weeding was done manually to reduce competition with the crop.

2.4 Data collection and Data Analysis

Insect pests' species were counted visually from middle plant rows tagged plant stands in the middle row of the experimental plot. The collected insect pests were taken to the Insect Collection Museum of the Department of Crop and Environmental Biology, University of Ibadan for identification. Data were collected on insect species and population at three different developmental stages of cucumber.

1. At seedling (0–4 weeks after planting).
2. At flowering (5–6 weeks after planting).
3. At fruiting (6–8 weeks after planting).

According to BBCH scale, germination and sprouting (0), leaf development (1), formation of lateral shoots (2), stem elongation (3), inflorescence emergence (5), flowering (6), development of fruit (Mishchenko, 2017).

Data Analysis

The number of insect pests encountered on the field was square root transformed before analysis. Data collected were pooled and later subjected to analysis of variance (ANOVA) using SAS software package (SAS Package

2002). Significant means were compared using least Duncan Multiple Range Test (DMRT) at 5% probability level.

3 Results and discussion

It was observed from the field that four major insect pests of cucumber were common in the area of study. Observed insect pests were flea beetle (*Phyllotreta cruciferae*), spotted cucumber beetle (*Diabrotica undecimpunctata*), leaf beetle (*Monolepta* species) and Hadda beetle (*Epilachna vigintioctopunctata*). These insects do cause damage in different phenological stages of cucumber as presented in Table 1. These insects were found at seedling, flowering and fruiting stages of cucumber. They were found defoliating the leaves and damaging fruits. This findings corroborate the work of Shama et al. (2016). *P. cruciferae* was considered as the most destructive among the insect pests observed because it had direct effect on the crop by feeding on the leaves. *P. cruciferae* adult feed on the leaves of young plant leaving shot-hole appearance. This agrees with the report of Indra and Kamini (2003) that occasionally seedlings may be completely destroyed as a result of their infestation. Also it was reported by same author that the larvae live in the soil and feed upon the roots of the host plants, although this was not observed throughout the period of the study.

P. cruciferae recorded the highest number 40, 20 and 16 at seedling, flowering, and fruiting stage respectively on the crop at different phenological stages (growth stages) when compared with other insect pests of cucumber (Table 1). The population of *P. cruciferae* was highest at seedling stage. This has been reported by Alao et al. 2017 that *P. cruciferae* has the highest insect population at seedling stage thus corroborated the report of Root (1973) that flea beetle, *P. cruciferae* is a quick colonizer of cruciferous hosts growing in dense or nearly pure stands and will remain on these plants, depending on the vigor and quality of the hosts plants (Kereiva, 1982). This is as a result of defoliation of the leaves which will eventually reduce the photosynthetic ability of the plant. Moreover, it has been reported that flea beetle adult feeding on young seedlings results in reduced crop stands and plant growth, delayed maturity and lower yield (Mayoori, 2009).

On the other hand, the time of planting of cucumber which was the month of May favors the increase in *P. cruciferae* population. This is in consonance with Burgess and Spur (1984) that warm and sunny conditions favor its large population. Distribution of *P. cruciferae* across the age of the plant showed that *P. cruciferae* was observed at two weeks after planting with higher population of (3.33). At 3, 4 and 5 WAP, the population of *P. cruciferae*

Table 1 Species population of insect pests on two varieties of cucumber planted in an unsprayed plot in 2014 in Ogbomoso (southern guinea savannah) Nigeria

Insects	Order/ Family	Growth stages			Observed damage on cucumber plant parts
		seedli stage	flowering stage	fruiting stage	
Market more					
<i>P. cruciferae</i>	Coleoptera/ Chrysomelidae	40	20	16	feeds on leaves, flowers and young fruits
<i>D. undecimpunctata</i>	Coleoptera/ Chrysomelidae	28	12	11	defoliates the leaves, flowers and feeds on young fruits or leaves
<i>Monolepta spp</i>	Coleoptera/ Chrysomelidae	35	10	0	defoliates the young leaves
<i>E. vigintioctopunctata</i>	Coleoptera/ Coccinellidae	0	0	20	feed on leaves and young fruits
Point-set					
<i>P. cruciferae</i>	Coleoptera/ Chrysomelidae	39	20	15	feeds on leaves, flowers and young fruits
<i>D. undecimpunctata</i>	Coleoptera/ Chrysomelidae	30	12	12	defoliates the leaves, flowers and feeds on young fruits or leaves
<i>Monolepta spp</i>	Coleoptera/ Chrysomelidae	34	11	0	defoliates the young leaves
<i>E. vigintioctopunctata</i>	Coleoptera/ Coccinellidae	0	0	21	feed on leaves and young fruits

Pooled data on insect abundance at different cucumber phenology

Table 2 Distribution of insect pests associated with cucumber across the age of the plant

Phenology	Weeks after planting	<i>P. cruciferae</i>	<i>Monoleptasp</i>	<i>D. undecimpunctata</i>	<i>E. vigintioctopunctata</i>
Seedling	2	3.33 ^a	2.91 ^a	2.79 ^a	0.70 ^c
	3	2.76 ^b	2.90 ^a	2.91 ^a	0.70 ^c
Flowering	4	2.72 ^b	2.95 ^a	2.67 ^{ab}	0.70 ^c
	5	2.48 ^b	2.41 ^{ab}	2.41 ^{ab}	0.70 ^c
Fruiting	6	1.77 ^c	2.03 ^b	2.03 ^c	2.67 ^b
	7	1.65 ^c	1.87 ^b	1.95 ^c	2.85 ^a

Means with the same alphabet(s) along the column are not significantly different using DMRT at 5% probability

had reduced but were not significantly different from one another (2.76, 2.72 and 2.28). Infestation of *P. cruciferae* at 6 and 7 WAP were not statistically different (1.77, 1.65) from each other (Table 2).

Monolepta spp population was high at seedling; it reduced at flowering stage and were not noticed at fruiting stage (35, 10, 0 respectively). Infestation by *Monolepta spp* was the second most abundant at seedling and flowering stage of plant growth. However at fruiting, there were no infestations by *Monolepta* beetles. *Monolepta spp* which comprises *Monolepta australis*, *M. apicalis* and others were the second most abundant at seedling stage among the observed insects. They are polyphagous insect like *P. cruciferae* and are usually referred to as leaf beetles. However, the infestation of *Monolepta spp* across the

age of the plant commenced at 2 WAP while infestation at 2, 3 and 4 weeks were not statistically different from one another with population of (2.91, 2.90 and 2.95, respectively). Meanwhile at 5 WAP the population of *Monolepta spp* was significantly lower (2.41) and at 6 and 7 WAP the infestation were not significantly different from each other with a reduced population respectively (2.03, 1.87) (Table 2).

The activities of Haddabeetle (*E. vigintioctopunctata*) was not noticed at seedling (late May) and flowering stage (June) but seven weeks after planting of cucumber, the insect was noticed which was the month of July. This is in agreement with the report of Khan et al. (2000) who reported that the peak activity of infestation of this species has been noticed from July to August where

both the imago and the larvae energetically feed on the epidermal tissues of the host plants.

Also, the number of *D. undecimpunctata* was higher at seedling stage but the population reduced as it developed into flowering stage and fruiting stage, respectively. The population of *D. undecimpunctata* was high at seedling stage but gradually reduced at flowering and fruiting stage Table 1. Moreover, infestation of *D. undecimpunctata* across the age of the plant was high at 2 and 3 WAP (2.79, 2.91) the infestation reduced at 4 WAP (2.67). At 5 WAP the infestation was significantly lower than the previous week i.e 2 and 3 WAP (2.41). However, at 6 and 7 WAP, there were no significant difference between them (Table 2). This observation is in line with Kuhar and Speese (2002) who reported that *D. undecimpunctata* damage to all cucurbits at seedling stage and they feed on the leaves which can lead to the death of the plant.

E. vigintioctopunctata was observed at fruiting stage, feeding on the leaves and fruits of cucumber on the two varieties. It was not noticed at seedling and flowering stage but at the onset of fruiting, it manifested. Its population was higher than other insect pests at fruiting stage. Generally, *P. cruciferae* had the highest population at seedling and fruiting stage, while *E. vigintioctopunctata* had the highest population at harvest (Table 1). Also, *E. vigintioctopunctata* infestation was observed to be higher at 7 WAP (2.85) (Table 2). The population of *P. cruciferae*, *Monolepta* spp and *D. undecimpunctata* were higher at seedling and flowering stage while the infestation by these insects reduced at maturity. Reverse was the case for *E. vigintioctopunctata* with higher population than other insect pests at maturity stage.

Generally it was observed that, insect infestation throughout the period of this study revealed that the infestation starts at 2 weeks after planting (WAP) except for *E. vigintioctopunctata* and the insect population reduces as number of week after planting increased. More insects were found on the leaves than any other part of the plant and this is in consistent with the work of Bidein et al. (2016) who reported that most parts of plant attacked by cucumber insect pests are leaves. Insect population at flowering was low when compared with seedling stage. According to Parachnowitsch et al. (2012); flowering phenology and late flowering genotypes often escape insect pests. Conclusively, this research on insect pests infestation will greatly assists in the management of insect pests of cucumber.

4 Conclusions

Four major insect pests were observed infesting cucumber plants at different phonological stages. They were Flea

beetle (*Phyllotreta cruciferae*), Leaf beetle (*Monolepta* spp), Spotted cucumber beetle (*Diabrotica undecimpunctata*) and Hadda beetle (*Epilachna vigintioctopunctata*). Among the insect pests, *P. cruciferae* has the highest population at seedling stage while its population decreases as the age of the plant increases. This showed that it could cause a major infestation at seedling stage. *Monolepta* spp and *Diabrotica undecimpunctata* were observed at vegetative stage but with lower population. *E. vigintioctopunctata* was observed at fruiting stage which was the economic part of the plant. Conclusively, this assessment of insect pests will greatly assists in the management of insect pests of cucumber.

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