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## Insect species associated with sweet potatoes (*Ipomoea batatas* L.)

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**Abstract**

This experiment was conducted in Igboora, southwest Nigeria to identify different insects affecting sweet potatoes in the study area in order to develop suitable control measures for the insect pests. One of the most widely root crops grown in Nigeria is sweet potatoes. It is particularly important in many other countries of the world for consumption. The vine was planted on a plot of 10m by 10m with 6 mounds and replicated 6 times with a spacing of 1m by 1m between each vine on a plot. Data collection on insects that affected the crop commenced five weeks after planting with the aid of a sweep net and hand-picking. All data collected were taken to the laboratory for identification with a hand lens and microscope using insect identification keys and in consultation with the insect collection museum of the Crop Protection and Environmental Biology department, University of Ibadan. The result shows that different insect pests were associated with sweet potatoes at different week intervals, these insects were Orthoptera (*Chrotogonus Senegalensis*, *Dnopherula descampsi*) which attacked the leaves, Coleoptera (*Lema coelestis*, *Cheilomenes Lunata*, *Lunata*) also attacked the leaves, Hymenoptera (*Crematogaster* spp, *Pollistes Spilophorus*) attacked the vines, while *Odynerus* spp, *componotus* spp2, *Scapisdepus morginatus* were picked on the soil. Farmers and crop scientists should identify insect pests in the field, especially during the cultivation of sweet potatoes, to ascertain the method of control measures to use to improve productivity.

**Keywords:** Sweet potatoes, insect pests, species, identification

**Introduction**

Sweet potato (*Ipomoea batatas* Lam.) is a dicotyledonous plant species that belongs to the Convolvulaceae family. It is an herbaceous perennial plant, generally cultivated as an annual crop from vegetative tissues using storage roots or vegetative cuttings (Ngailo *et al.*, 2016) [4]. Sweet potatoes play a major role in the food industry and human nutrition because of their valuable content being a rich source of carbohydrates, some amino acids, vitamins, minerals, dietary fiber, and other bioactive compounds. It is an important food and industrial crop worldwide. Sweet potato is grown for both home consumption and to supplement household income when sold in local markets and in some urban centers. FAO (2012) [1] reported that over one hundred (100) developing countries cultivate sweet potatoes and in more than fifty (50) of these countries, the crop is among the five most important. It is a low-input crop that can almost always offer some yield, and can be harvested at almost any time, from 4 to 6 months after planting (Kramer *et al.*, 1999) [2]. The sweet potato crop is a main staple food and makes a significant contribution to poverty alleviation and household food security in Nigeria. The crop is grown mainly by small-scale farmers, especially in marginal areas. Although several varieties have been bred for high yields, production has been stagnant (Ray *et al.*, 2012) [5]. The production of sweet potatoes could be affected by several biotic constraints such as viral diseases, insect pests, and weeds (Echodua *et al.*, 2019) [8]. This factor has masked the role of insect pests in the reduction of crop yield, especially because the crop is grown by low-input users, who rarely manage pests.

Identification is the ability to give a name to a specimen received or picked using various procedures. The name given to a specimen identified should be in line with scientific nomenclature, getting to know these make it easy to deal with certain insect pest problem in the field.

It also helped in the process of elimination, while trying to identify them and for suitable management procedures on the field, therefore it is pertinent to know and identify the different insect species associated with sweet potato cultivation at different stages of development for ease of proper management procedure.

## Materials and Methods

### Experimental Site

This study was carried out on the Teaching and Research farm of the faculty of Plant and Environmental Sciences, Oyo State College of Agriculture and Technology, Igboora, Oyo State Nigeria. Oyo State College of Agriculture and Technology, Igboora lies between Latitude 7.42° North and 3.31° East. (7° 26' 0''N, 3° 17' 0''E). The average annual rainfall is 1278mm, 80% of which occurs between the months of August and September. Precipitation is low in January, with an average of 7mm; most of the precipitation here falls in September, averaging 175 mm. The maximum and minimum temperatures are 28 °C and 21 °C. The average relative humidity is 83% (Paul, 2015) [10].

### Vine Procurement

The vines of sweet potato were procured from the Ministry of Agriculture Osogbo, Osun State, Nigeria. The variety of sweet potato is Orange Flesh.

### Land Preparation and Planting Material

Hoes and cutlasses were used to clear and cultivate the farmland. The planting material was orange flesh sweet potato vine.

### Planting of vine

The vine was planted on a plot of 10m by 10m with six mounds and replicated six times with a spacing of 1m by 1m between each vine on a plot; all the plants were 30 vines on the field.

### Data Collection

Four quadrants of 0.5m by 0.5m were made, which were thrown randomly on the plot a week before data were collected and repeatedly throughout the period of the study (Nderitu *et al.*, 2009) [3], the area of quadrant was the place where the insects were picked. Data collection commenced six weeks after planting and was done every week respectively. This was achieved by:

- i. Handpicking of slowly moving insects into a container for preservation with ethanol before identification.
- ii. Sweep net for fast-moving and flying insects.

### Data Analysis

All data collected were taken to the laboratory for identification with a hand lens and microscope using insect identification keys and in consultation with the insect collection Museum of Crop Protection and Environmental Biology Department, University of Ibadan.

## Result

### Insect species affecting sweet potatoes six weeks after planting

It was observed that different insects attacked sweet potatoes (Orange Flesh) on the field during the course of this work. At week six after planting (WAP), five insects were identified to attack the crop, with different orders and species, orders were:

Orthoptera, Hymenoptera, Hemiptera, and Coleoptera. The specie of insects was Orthoptera (*Chrotogonus senegalensis*) and Hemiptera nymph (*Graptostethus spp*) attacked the leaves while Hemiptera (*Camponotus spp*) and Hymenoptera (*Crematogaster spp*) attacked the vines and Coleoptera was picked from the soil (Table 1). All these insects possess many features, for example, Orthoptera have large size body with well-developed Exoskeleton, two pairs of wings, forewings modified as tegmina and hind wings are membranes.

### Insect species affecting sweet potatoes seventh week after planting

Observation at 7WAP showed that four insects were identified on the field. Two of the insects were located on the leaf, while others are found in the soil. All the insects during this week were similar with common physiological attributes but were different species. Insects found were of the same order and family which are Orthoptera and Acrididae respectively. The development of Orthoptera is an incomplete metamorphosis. Orthoptera is small to large insects (~7 – 90 mm) that are most easily recognized by hind legs modified for jumping. Orthoptera has biting/chewing mouthparts. The African grasshopper identified in this study chewed the sweet potato leaves and cause damage to them (Table 2).

### Insect species affecting sweet potatoes eight weeks after planting

The highest insect infestation was observed on the leaves of the crop at 8WAP. The insects were in the order Hymenoptera *Crematogaster sp.* known as saint valentine's ant. Other insects that also attacked the crop leaves at 8WAP belong to the same order of Coleoptera, (*Cheilomenes lunata lunata*, *Lema coelestina*) (Table 3) they were the largest order of insects observed. Coleoptera has two pairs of wings, the forewings are not used for flight but are modified into hard horny cases (elytra) protecting the membranes of hind wings, and their development is complete metamorphosis with chewing mouthparts and well-developed mandible.

### Insect species affecting sweet potatoes ninth week after planting

As for before only a few insects were identified 9WAP these were Orthoptera found in the soil, it as Gryllidae (*Scapsidepus morganatus*) commonly known as cricket. Cricket has special sound-producing and receiving organs often present, antennae long and filamentous. The other one is Hymenoptera, this ant used to walk to and fro on the vine and it's known as the golden paper Wasp.

### Insect species affecting sweet potatoes tenth weeks after planting

It can be observed that some insects that occurred at 8WAP also occurred at 10WAP, these insects were *Cheilomenes lunata* (Coleoptera) and Hymenoptera e.g. carpenter ant. Hymenoptera is larvae-bodied and legless, except the sawflies, some species are social insects (ants and bees), terrestrial in habit, some are beneficial pollinators, (bees), some are very important biological control agents (Wasps), while others are very destructive pests e.g. (sawflies).

### Insect species affecting sweet potatoes eleventh weeks after planting

The result in table 5 shows that two insects (*Crematogaster spp*, *Trienopa parodoxa*) were located on the vines while only one insect (*Odynerus spp*) was located in the soil.

Hymenoptera are small to large insects usually with two pairs of wings but apterous (wingless) forms are common, wings when present, have larger forewings and heavier textures than hind wings (uniformity) and their development is incomplete metamorphosis.

#### Insect species affecting sweet potato twelfth weeks after planting

Only two insects were identified at 12WAP, both insects damage the leaves, and there was a reduction of insects because of heavy rainfall. Hymenoptera (sausage flies, ants, bees, and wasps) are biting–chewing mouthparts but may be modified for lapping (chewing-lapping) and their development is a complete metamorphosis Insect species affecting sweet potato thirteenth weeks after planting

Four insects were identified at 13WAP two of them damaged the leaves namely *Aspidomorpha quinquefasciata* (flea beetle) while another specie of Coleoptera, Lepidoptera (*Eldana saccharina* (pyralid moth)) also damages the leaves (Table 7). The characteristics of Lepidoptera are small to large insects with two pairs of large membranous wings, covered with scales, body and legs are also covered with scales and hairs. Adults have siphoning mouthparts while larvae have biting chewing mouthparts and their development is complete

metamorphosis.

#### Discussion

According to the result obtained through the identification of insect pests associated with sweet potatoes in the study area, different insect pests, which are: Orthoptera (*Chrotogonus senegalensis*, *Dnopherula descampsi*) which attacked the leaves, Coleoptera (*Lema coelestina*, *Cheilomenes lunata*, *lunata*) also attacked the leaves and Hymenoptera (*Crematogaster spp*, *Pollistes Spillophorus*) attacked the vines. While some others were picked on the soil, these insects consist of *Odynerus spp*, *Componotus spp2*, and *Scapsidepus morginatus*, which is in line with the research of Reed *et al.* 2009<sup>[6]</sup>, which listed twenty-two species of insects that damage sweet potatoes and are members of Lepidoptera, Thysanoptera, Orthoptera, and Hemiptera. Also, this research revealed that heavy rainfall reduced the population of insects on the field which was in line with the report of (Zvereva and Kozlov, 2010)<sup>[9]</sup>, which states that the main effects of climate change on insect pests and natural enemies communities result in decreased, in an abundance of decomposers and predators, and increased herbivores, and it also states that responses of insect pests and natural enemies depend on both temperature and precipitation.

**Table 1:** Insects species affecting sweet potato six weeks after planting

S/N	Order	Family	Genus	Species	Common Name	Number of Insect	Part attacked
1	Orthoptera	Pyrgomorphidae	<i>Chrotogonus</i>	<i>senegalensis</i>	Ear Wig/ European earing	1	Leaves
2	Hemiptera (nymph)	Lygaeidae	<i>Graptostethus</i>	<i>Sp</i>	Stink bug	1	Leaves
3	Hemiptera	Formicidae	<i>Camponotus</i>	<i>Sp1</i>	Carpenter ant	1	Vine
4	Hymenoptera	Formicidae	<i>Crematogaster</i>	<i>Sp</i>	Saint valentine	1	Vine
5	Coleoptera	Lagriidae	<i>Chrysolagra</i>	<i>Nairobena</i>	Potato leaf beetle	1	Soil

**Table 2:** Insects species affecting sweet potatoes seventh weeks after planting

S/N	Order	Family	Genus	Species	Common Name	Number of insects	Part attacked
1	Orthoptera	Acrididae	<i>Dnopherula</i>	<i>Descampsi</i>	African grasshopper	2	Leaves
2	Orthoptera	Acrididae	Acrida	<i>Sulphuripennis</i> (1869)	Long headed grasshopper	2	Soil

**Table 3:** Insects Species affecting sweet potato eighth weeks after planting

S/N	Order	Family	Genus	Species	Common Name	Number of insects	Part attached
1	Hymenoptera	Formicidae	<i>Crematogaster</i>	<i>Sp</i>	Saint valentine ant	1	Leaves
2	Coleoptera	Coccinellidae	<i>Cheilomenes</i>	<i>Lunata lunata</i>	Leaf lady beetle	3	Leaves
3	Coleoptera	Chrysomelidae	<i>Lema</i>	<i>coelestina</i>	Potato leaf beetle	2	Leaves
4	Orthoptera (nymph)	Pyrgomorphidae	<i>Pyrgomorpha</i>	<i>bispinosa</i>	Gaudy grasshopper	1	Leaves

**Table 4:** Insect species affecting sweet potato ninth week after planting

S/N	Order	Family	Genus	Species	Common Name	Number of insects	Part damage
1	Orthoptera	Gryllidae	<i>Scapsidepus</i>	<i>morginatus</i>	Cricket	1	Soil
2	Hymenoptera	Vespidae	<i>Pollisties</i>	<i>spillophorus</i>	Golden paper wasp	1	Vine

**Table 5:** Insect species affecting sweet potato tenth weeks after planting

S/N	Order	Family	Genus:	Species	Common name	Number of insects picked	Part damaged
1	Coleoptera	Coccinellidae	<i>Cheilomenes</i>	<i>lunata lunata</i>	Lave lady beetle	2	Leaves
2	Hymenoptera	Formicidae	<i>Camponotus</i>	<i>sp 2</i>	Capenter ant	1	Vine
3	Hymenoptera	Vespidae	<i>Pollistes</i>	<i>spillophorus</i>	Golden paper wasp	1	Soil

**Table 6:** Insect species affecting sweet potato eleventh weeks after planting

S/N	Order	Family	Genus:	Species	Common name	Number of insects picked	Part damaged
1	Hymenoptera	Formicidae	<i>Crematogaster</i>	<i>Sp</i>	Saint valentine ant	1	Vine
2	Hemiptera	Issidae	<i>Trienopa</i>	<i>parodoxa</i>	Yellowjackets	1	Vine
3	Hymenoptera	Vespidae	<i>Odynerus</i>	<i>Sp</i>	Spiny mason wasp	1	Soil

**Table 7:** Insect species affecting sweet potato twelfth weeks after planting

S/N	Order	Family	Genus	Species	Common name	Number of insects	Part damaged
1	Hymenoptera	Formicidae	<i>Dorylus</i>	<i>nigricans</i>	Sausage flies	1	Leaves
2	Coleoptera	Chrysomelidae	<i>Aspidomorpha</i>	<i>concinna</i>	Leaf beetle	1	Leaves

**Table 8:** Insects species affecting sweet potato thirteenth weeks after planting

S/N	Order	Family	Genus	Species	Common name	Number of insects	Part damaged
1	Coleoptera	Chrysomelidae	<i>Aspidomorpha</i>	<i>quinquefasciata</i>	Flea beetle	1	Leaf
2	Lepidoptera	Pyralidae	<i>Eldana</i>	<i>saccharine</i>	Pyralid moths	1	Leaf
3	Hymenoptera	Formicidae	<i>Camponotus</i>	<i>spp 2</i>	Capenter ant	2	soil

## Conclusion

Insect infestation was observed to be at its highest level in week three, with different numbers of insects on the field and all these insects attacked the leaves because it was noticed that there was no rainfall throughout the week, compared to other weeks of little and heavy rainfall which has the ability to wash away the egg, larvae, and nymphs of some insects. Each insect is associated with characteristic damage or symptoms on the plant. Getting to know these make it easy to deal with a certain pest problem in the field. They also helped in the process of elimination, while trying to identify them. Therefore, it can be recommended that farmers and crop scientists should identify insects on the field, especially during the cultivation of sweet potatoes. To know the various parts of the plant that the insect is attacked and observe whether it is physical damage, disease symptoms (caused by various pathogens), and arthropod pests e.g. insect, and the control measure to be taken.

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