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FIELD SURVEY OF INSECT PESTS ASSOCIATED WITH SWEETPOTATO (*IPOMOEA BATATAS* L.) GENOTYPES PLANTED IN OTOBI BENUE STATE, NIGERIA

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ABSTRACT

Sweet potato (Ipomoea batatas L.) plays a major role in human and animal nutrition and enterprise. The production of sweetpotato in the world has been low due to several abiotic and biotic factors. The aim of the study was to determine theinsect pests associated with sweetpotato genotypes planted in the open field in Otobi Benue State, Nigeria. The research was carried out in a plot of land (9m^2)at National Root Crops Research Institute substation in Otobi, Benue State from July to November, 2021. Three months old sweetpotato vine cuttings of between 25 and 30cm long, with 3 to 4 nodes were planted on the ridges made in the plot of land. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. A total of 1,575different insect species were collected in Otobi, Benue State. The insects represent fourteen species of five orders at different stages of development were found to be associated with sweet potato crop in the study area. The grasshopper recorded the highest number of 214(13.59%) while the Hawk moth recorded the least number of 18(1.14%). The result has provided a comprehensive list of important pests of sweet potato and beneficial species that can be exploited as components of future integrated management approaches.

Keywords: Insect pests, Beneficial insects, Sweetpotato, Genotypes.

INTRODUCTION

Sweetpotato (*Ipomoea batatas* L.) is the world's sixth most important food crop, afterrice (*Oryza sativa* L.), wheat (*Triticum aestivum* L.), potato (*Solanum rootosum* L.), maize (*Zea mays* L.) and cassava (*Manihot esculenta* Crantz) (CIP, 2020). In developing countries, it is the fifth most important food crop (CIP, 2020). The crop belonging to the family Convolvulaceae, it is an important root crop in most countries (Ochieng*et al*., 2017). Sweetpotatoes 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 (Akanji*et al*., 2023). FAO (2012) 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 (Akanji *et al*., 2023). The sweet potato crop is a main staple food and makes a significant contribution to poverty alleviation and household food security in Nigeria.Although there are several varieties that have been bred for high yields, the production has been stagnant (MOA, 2007). The main reason has been reported as adverse weather conditions (MOA, 2007). This factor has masked the role of pests in reduction of the crop yield, especially because the crop is grown by low input users, who rarely manage pests. Sweetpotatoes are usually inhabited by many insect species. Talekar (1982) reported at least two hundred species of insects that feed on sweetpotatoes both in field and storage worldwide. The roots, foliage and even seeds of the plant were found to be vulnerable to the damage by these pests. There is a possibility of improving the sweet potato yields if pests are managed well. However, this can occur only if the pests are known particularly in terms of their damaging effects.

Sweetpotato is also grown for its vines as planting material; leaves are often eaten as a vegetable while shoots and roots are used as animal feed in many countries. In Africa, the sale of fresh sweetpotato roots, vines and processed foods in both local and urban markets is becoming increasingly popular regarding contribution to household cash income (Abidin 2004; Kaguongo *et al*., 2012). Orange- fleshed sweet potato is also a rich source of beta-carotene, a precursor of bio-available vitamin A, and has potential of combating Vitamin A deficiency among rural resource constrained farmers in many developing countries (Mwanga *et al*., 2003; Jaarsveld *et al*., 2005; Low *et al*., 2007; Burri, 2011).

The production of sweetpotato in the world has been low due to several abiotic (drought, low rainfall, poor soils) and biotic (insect pests and diseases) factors (Gibson and Aritua, 2002; Ochieng*et al*., 2017). Among the major biotic constraints for sweet potato production, insect pests are recoded as the most important (FAO, 2013). The most serious and commonly reported insect pests for sweet potato in Africa are caterpillars of the sweetpotato butterfly (*Acraea acerata* Hew., Nymphalidae), the Sweetpotato weevils (*Cylas brunneus* F. and *Cylas puncticollis* Boheman), the clearwing moth (*Synanthedon* spp.), the sweetpotato hornworm (*Agrius convolvuli* L.) and vectors of the sweet potato virus diseases, such as the sweet potato whitefly (*Bemisia tabaci*) (Nderitu*et al*., 2009). The two African *Cylas spp.* (*C. puncticollis* and *C. brunneus*) usually appear together in fields and cause huge yield losses of up to 100% especially during dry periods (FAO, 2013).

This study was, therefore, done to specifically document the insects that infest the crop in the field.

MATERIALS AND METHODS

This research was carried out at National Root Crops Research Institute (NRCRI) Sub-Statation in Otobi, Benue State.Otobi _is located in Southern Guinea Savannah of Nigeria and lies within latitude 07^0 7'0" N and longitude 08^0 5'0" E, with an altitude of 111m above sea level. The annual rainfall is about 2000-2500mm with its peak in the month of July to September. The area is characterized by daily minimum and maximum temperature of 25.5ºC and 27.2ºC respectively, with humidity of about 61%.

Sources of Planting Materials

The materials were collected from National Root Crops Research Institute (NRCRI) Umudike, Umuahia, Abia State.

Method of Collection of Genotype

Twenty-five sweetpotato genotypes were collected and each genotype was first fastened together with a twine. These were put in a collection bag and labelled both within the bag and outside it. Each genotype was given a unique number or name for easy identification as shown in table 1.

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Table 1: List of the sweet potato genotypes used for the experiment

S/N	Names of Genotypes	Maturation period
1	PGA 14008-9	Three months
2	OBARE	Three months
3	KWARA	Four months
4	NAN	Three months
5	CRI-APOMUDEN	Three months
6	PG17362-NI	Three months
7	87/OP/195	Three months
8	PGN16021-39	Three months
9	CEMSA74-228	Three months
10	TIS87/0087	Three months
11	PGA14442-1	Three months
12	BUTTERMILK	Four months
13	PGA14011-43	Three months
14	PGA14398-4	Three months
15	CRI-DADANYUIE	Three months
16	LOCAL BEST	Three months
17	PGA14372-3	Three months
18	CRI-OKUMKOM	Three months
19	PO3/35	Three months
20	PGA14351-4	Three months
21	UMUSPO/3	Three months
22	TU-PURPLE	Three months
23	PG17265-NI	Three months
24	NWOYORIMA	Three months
25	PO3/116	Three months

SweetPotato Planting

Three months old sweetpotato vine cuttings of between 25 and30cm long, with 3 to 4 nodes were planted on the ridges of 3m long at an inter and intra row spacing of 1m and 0.3m respectively. Weeding was done at 6 and 12 weeks after planting. Compound fertilizer (NPK 20:10:10) was applied at 4 weeks after planting using side placement. The study was carried out from July to November, 2021. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The collected pests were later identified and grouped based on their taxonomic characteristics according to Ekman and Lovatt, (2015).

Data Analysis

The data gathered were analyzed in SPSS version 16.0 using simple descriptive statistics of frequencies and percentages and results presented in tables.

RESULTS AND DISCUSSION

Out of the seventeen insect species found, fourteen species in five insect orders at different stages of development were found on the Leaf, vine and tubers of sweet potato crop in Otobi, Benue State. Their infestation level was, however different. Individuals belonging

to 6 species (*Bemisia tabaci, Myzus persicae* Sulzer, *Cylas spp, Branchmia convolvuli, Agrius convolvuli* and *Synathedon dascyleles*) were noted as major pests of sweetpotato. Further individuals of 8 species (*Amrasca spp, Phenacoccus solenopsis*, *Pulvinaria* spp, *Colasposoma spp, Aspidomorpha spp, Acraea acerata Hew*, *Zonocerus variegatus* and *Eugaster loricatus* Gerst) were minor pests while 3 species (*Cheilomensis lunata* F, *Apis spp* and *Pheidole spp*) belonging to two orders were represented by beneficial insects. Coleopteran and Hemipteran pests were the most abundant and widely distributed of the total insect order recorded (Table 2). Twelve (12) of the insect species caused damage on the leaf, *Acraea acerata Hew* and *Synathedon dascyleles* only caused damages on the vine. *Bemisia tabaci*, *Cylas spp, Pulvinaria* spp and *Agrius convolvuli* caused damages on the leaf and vine while only *Cylas spp* caused damage to both the leaf, vine and the tuber. The insects that were classified as minor pests caused a minimal damage compared with those that were recognized as the major pests.

Table 2: Characterization of insect species sampled in sweet potato genotypes and their orders in 2021.

Common name	Scientific name	Order	Part damaged	Pest status
White fly	*Bemisia tabaci*	Hemiptera	Leaf and vine	Major
Leafhopper	*Amrasca spp*	Hemiptera	Leaf	Minor
Mealy bug	*Phenacoccus solenopsis*	Hemiptera	Leaf	Minor
Aphids	*Myzus persicae* Sulzer	Hemiptera	Leaf	Major
Scale	*Pulvinaria* spp	Hemiptera	Leaf and vine	Minor
Sweet potato weevil	*Cylas spp*	Coleoptera	Leaf, vine and tuber	Major
Sweet potato beetle	*Colasposoma spp*	Coleoptera	Leaf	Minor
Tortoiseshell beetle	*Aspidomorpha spp*	Coleoptera	Leaf	Minor
Ladybird	*Cheilomensis lunata* F	Coleoptera		Beneficial
Leaf rolling caterpillar	*Branchmia convolvuli*	Lepidoptera	Leaf	Major
Hawk-moth	*Agrius convolvuli* (L.)	Lepidoptera	Leaf and vine	Major
Clearwing moth	*Synathedon dascyleles*	Lepidoptera	Vine	Major
Sweet potato butterfly	*Acraea acerata Hew*	Lepidoptera	Vine	Minor
Grasshopper	*Zonocerus variegatus*	Orthoptera	Leaf	Minor
Giant cricket	*Eugaster loricatus* Gerst	Orthoptera	Leaf	Minor
Bees	*Apis spp*	Hymenoptera		Beneficial
Carpenter ants	*Pheidole spp*	Hymenoptera		Beneficial

A total of 1575 insect species were collected in Otobi Benue state in which 1271 were insect pests of sweet potato (Table 3). The grasshopper recorded the highest number of 214(13.59%), followed by Sweet potato weevil which recorded 209(13.27%), others are Giant cricket 139(8.83%), Sweet potato butterfly 132(8.38%), white fly 89(5.65%), Aphids 89(5.65%), Leaf rolling caterpillar 78(4.95%), leaf hopper 76(4.83%), Sweet potato beetle 69(4.38%), Clearwing moth 66(4.19%), Tortoiseshell beetle 36(2.29%), Mealy bug 36(2.29%), Scale 20(1.27%), while the least was Hark moth 18(1.14%).

Beneficial insects were also observed on the crop. They included predators such as carpenter ants 167(10.60%), parasitoids (Ladybird) 92(5.84%) and pollinators (Bees) 45(2.86%).

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Table 3: The prevalence of the sweet potato pests encountered in Otobi in 2021.

Name of insect	Number encountered	Percentage (%)
Zonocerus variegatus	214	13.59
Cylas spp	209	13.27
Pheidole spp	167	10.60
Acraea acerata Hew	132	8.38
Bemisia tabaci	89	5.65
Eugaster loricatus Gerst	139	8.83
Cheilomensis lunata F	92	5.84
Amrasca spp	76	4.83
Synathedon dascyleles	66	4,19
Colasposoma spp	69	4.38
Myzus persicae Sulzer	89	5.65
Branchmia convolvuli	78	4.95
Aspidomorpha spp	36	2.29
Apis spp	45	2.86
Phenacoccus solenopsis	36	2.29
Pulvinaria spp	20	1.27
Agrius convolvuli (L.)	18	1.14
Total	1575	

The results of this study showed that insect pests severely undermine sweet potato production in Nigeria. The result is in agreement with the works of Agbessenou *et al*., (2016) and Ezin *et al*., (2018) who reported the Leaf rolling caterpillar and Swee tpotato butterfly as major and minor insect pests in their works. Few insects, lady beetles, carpenter ants and beesfrom the Order Coleoptera and Hymenoptera respectively, were identified as beneficial insects but their populations were relatively lower than the pest species. It may be possible to exploit these beneficial insect species in future inundation biocontrol programmes, but more studies would be required on their bioecology and methods of breeding (Uwaidem *et al.,* 2018). The crop attracted a wide spectrum of pests and was a refuge of several other insects. Coleopteran and Hemipteran pests were the most abundant and widely distributed of the total insect order recorded.

Out of 1575 insect species collected in Otobi Benue State, 1271 were insect pests of sweet potato. The grasshopper recorded the highest number followed by sweet potato weevil while the least was Hark moth. However, economic damage was caused by white fly, leaf rolling caterpillar, sweet potato beetle and aphids. These species have been reported as major pests of sweet potato in other parts of West Africa (Agbessenou *et al*., 2016; Ezin *et al*., 2018) and they are considered in the current study as the key pests.

CONCLUSION.

Sweet potato is a well-adapted staple crop cultivable in all agro-ecological areas of Nigeria, integral to different cultural diets and a potential crop for food security. Minimising pest attacks on sweet potato can be considered a trajectory to sustainable production, but this could be a serious hurdle, as the use of chemical pesticides is being discouraged in Nigerian cropping system. Though the study

did not assess yield loss, continued infestation of the crop by these insects evidently showed that there were losses which could be incurred overtime. The result has provided a comprehensive list of important pests of sweet potato and beneficial species that can be exploited as components of future integrated management approaches.

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