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FIELD EVALUATION OF FOUR SWEET POTATO CULTIVARS FOR YIELD AND SWEET POTATO WEEVIL (CYLAS PUNCTICOLLIS BOH.) DAMAGE DURING THE EARLY CROPPING SEASON IN SOUTH EASTERN NIGERIA.

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ABSTRACT

Four sweet potato cultivars (TIS 87/0087, TIS 8441, TIS 2532 OP. 1. 13 and Ex Igbariam) were evaluated for yield and damage of *C. puncticollis* during the period June to October in 1999 and 2000, respectively. The trials were conducted in a randomized complete block design and replicated three times. Plants were sampled forthnightly for tuber yield and *C. puncticollis* incidence and damage. Marketable tubers were recorded at 8 weeks after planting (WAP) and this increased with the age of the plant. TIS 87/0087 consistently gave higher marketable tuber numbers at all the different times of harvesting than other cultivars. There was no incidence of C. *puncticollis* on tubers between 8 to 14 WAP. However, *C. puncticollis* damage was higher in 1999 than the year 2000 at 16 WAP. Although the percentage tubers infested and severity of damage did not significantly differ among the cultivars. TIS 2532. OP. 1. 13 showed consistent high incidence and severity of damage.

INTRODUCTION

Sweet potato (Ipomoea batatas (L) Lam.) is one primarily because of its capacity to produce dry of the important food crops in the tropical and matter for a long time (Hahn, 1994). sub - tropical countries of the world (Okigbo It is often the most important household food 1987, Wolfe 1992). The importance ofsecurity and complements other food crops and the crop has increased in the recent years serves to bridge period of food shortage because of its high solar energy fixing efficiency, in Tanzania (Kapinga *et al.*, 1995).

It ranks seventh among all the world food crops, third in value of production, fifth in caloric contribution to human diet (Bouwkamp, 1985). Lack of the use of improved varieties and damage by insects are among the most important constraints to the production of sweet potato world-wild. Yield from farmers field can be low as 7 t/ha while improved cultivars with improved production technology, yield of about 30-35 tonnes per hectare are obtained (Wolfe, 1992; Larbi *et al*, 1998). The most destructive insect pest of sweet potato world-wild is the sweet potato weevil (*Cylas* species). In West Africa, *C. puncticollis* and C. *brunneus* have been recorded while C. *puncticollis* is dominant in Nigeria (Nwana 1979, Talekar 1987, Kumar 1991, Skoglund and Smit 1994). The losses due to sweet potato weevil damage range from 0- 100% (Alvarez 1987, Jansson 1991). The weevil damage varies from season to season and from location to location. The damage by weevils is higher during the dry season (Talekar 1987 and 1991). The amount of damage by weevils to sweet potato will depend on the level of resistance of the crop and also on the times of planting and harvesting. New cultivars are being developed

yearly by plant breeders based on agronomic characters.

For sustainability of these technologies, it is necessary to evaluate these improved cultivars of sweet potato both for yield and for damage by *C. puncticollis* before recommendations are made to farmers.

MATERIALS AND METHODS:

The experiments were carried out during the early cropping seasons in 1999 and 2000 respectively at the National Root Crops Research Institute (NRCRI), Umudike, on latitude 05^0 29^1 N and longitude 07^0 31^1 E of the equator and on an elevation of 122m above sea level. The experiments were carried out on 2 years fallow farm from the month of June to October each year. The field were cleared and burnt, ploughed and horrowed: Ridges were made at 1.0m apart and 0.5m high. Soil samples were taken before planting at the dept of 0-20cm and analysis for texture and nutrient levels were carried out at the Soil Science Laboratory, NRCRI, Umudike (Table 1.) Four Sweet potato cultivars VIZ TIS. 87/0087, TIS 8441, TIS 2532 .OP. 1.13 and Ex Igbariam were planted in randomized complete block design and replication three times. Sweet potato vines each with at least 3 nodes were spaced 03m. on 1.0 m ridges in plots of 6.0 x 7.0 m. One hand weeding was carried out at 6 WAP and thereafter NPK 20:10:10 fertilizer was applied at 255kg per hectare. The plants were sampled forthnightly from 8-16 WAP. At each sampling, eight plants were harvested using digging forks.

The tubers were separated into marketable (> 100g) and unmarketable (< 100g) sizes and weighed separately using 10kg Salter scale.

The number of tubers from marketable tubers infested by *C. puncticollis* were recorded in percentage which were further transformed using Angular transformations. The severity of damage of the tubers by *C. puncticollis* were scored using the scale of 1 –5 where 1= no damage and 5 = very severe damage. All the data were statistically analysed using Computer Learner General Procedures for analysis of variance and significant means were separated by Student Newman-Keuls test (SNK).

Table 1. Soil physical and chemical properties of top soil (0-20) before planting in early season.

Soil parameter	Values	
	1999	2000
Sand %	68.40	75.10
Silt %	10.00	10.60
Clay %	21.60	14.20
Texture	Sandy clay loam	Sandy loam
Soil pH	4.15	4.60
Organic carbon (O.C.)	2.64	2.06
Organic matter (O.m)	4.54	3.60
Total N	0.23	0.069
Available P	9.00	11.00
Exchangeable		
Ca (m.e/100g)	1.80	2.40
Mg	1.20	2.00
K	0.123	0.138
Na	0.044	0.078

RESULTS

Number Of Marketable Tubers

The four sweet potato cultivars produced marketable tubers as early as 8 WAP in both 1999 and 2000 (Table 2). The number of marketable tubers did not significantly differ between the cultivars in 1999 at each time of harvesting. The number of marketable tubers was higher in the year 2000 than in 1999. In the year 2000, there were no significant differences in the number of tubers among cultivars at 8 and 16 WAP. At 10

WAP, TIS 87/0087 gave the highest number of tubers followed by TIS 8441, while TIS 2532. OP.1. 13 gave the least number, which did not differ from Ex Igbariam and TIS 8441 respectively. At 12 and 14 WAP. TIS 87/0087 also gave significantly higher number of tubers than other cultivars while TIS 2532. OP. 1 13 gave least number. Cultivar means showed that in 1999, TIS 87/0087 and TIS 2532. OP. 1. 13 gave the highest number of tubers while TIS 8441 gave the least. In the year 2000, TIS 87/0087 gave the highest and TIS 2532 OP. 1. 13 gave the least number of tubers. The number of marketable tubers increased in all the cultivars with the age of plants in both 1999 and 2000.

Damage by C puncticollis

The data on the percentage of tubers infested are presented on Table 3. There were no incidence of *C. puncticollis* on marketable tubers in 1999 and the 2000 at 8, 10, 12, and 14 WAP. However, at 16 W.A.P. in 1999, the highest infestation was on TIS 2532. OP. 1. 13 followed by Ex- Igbariam. The least was on TIS 8441. The level of infestation was not however significantly different between the cultivars. In the year 2000 the trend was the same as in 1999.

Severity of damage of *C. puncticollis* on the marketable tubers at 16 W.A.P. did not show any significant differences between the cultivars. In 1999 and the year 2000, TIS 2532. O.P. 1. 13 was the most damaged followed by Ex-Igbariam while was least damaged. The level of damage was lower in the year 2000 than in 1999 (Table 4).

Table 2 Time of harvesting of sweet potato and number of marketable tubers 1999

Cultivar	.Weeks After planting (W.A.P.)					
	8	10	12	14	16	Mean
TIS 87\0087	1.00a	1.67a	1.67a	2.17a	2.50a	1.20
TIS 8441	1.00a	1.00a	1.00a	1.67a	1.33a	1.20
TIS 2552. OP.1.13	1.17a	1.67a	2,00a	1.50a	2.67a	1.80
Ex Igboriam	1.00a	1.00a	1.67a	2.00a	1.50a	1.43
Mean	1.04	1.34	1.34	2.09	2.00	
SE±		0.02	0.03	0.06	0.09	
2000						
TIS 87/0087	3.17a	11.50a	13.50a	17.17a	17.83a	11.63
TIS 8441	2.33a	8.17ab	9.83b	14.00a	14.17a	9.70
TIS 2532.OP.1.13	1.83oa	5.33b	5.67c	6.83b	9.50a	5.83
Ex Igboriam	1.00a	6.50b	8.00bc	14.67a	13.33a	8.90
Mean	2.08	7.88	9.25	13.17	12.71	
SE±	0.14	0.31	0.19	0.39	0.33	

Means with the same letter(s) down the columns are not significantly different from each other at P = 0.05 by Student Newman – Keuls Test (SNK)

DISCUSSION

The results showed that the four sweet potato cultivars produced marketable tubers within 8 WAP. in 1999 and 2000 respectively. The number of tubers increased with the age of sweet potato irrespective of cultivar. However the yield of marketable tubers from the cultivars in the year 2000 was enhanced by the favourable growth condition of well-distributed rainfall especially during the early growth of the crop (Onwueme, 1978, Gollifer 1980; Anioke 1996) (Table 5). Another contributory factor is the soil type which was sandy clay loam in 1999 and sandy loam in 2000 (Table 1). Sandy clay loam soils are easily water logged, and with high rainfall in 1999 the soil was not good for optiman plant growth and production of marketable tubers. Soil suitable for sweet potato production is sandy loam (Onwueme 1978, Bautista and Santiago 1981). This is because it makes the movement of roots, water and nutrients easy. The non significant differences in the number of marketable tubers at different times of harvesting in 1999 may be attributed to the poor development of the cultivars.

Table 3 Percentage of marketable tubers infested (T) by C. puncticollis at various times of harvesting [Weeks After Planting (W. A.P)] of sweet potato

Cultivar	8 W. A.P	10 W. A.P	12 W. A.P	14 W. A.P	16 W. A.P	8 W. A.P
TIS 87/0087	0.00	0.00	0.00	0.00	22.57a	4.51
TIS 8441	0.00	0.00	0.00	0.00	15.62a	3.12
TIS 2532.O.P 1.13	0.00	0.00	0.00	0.00	29.64a	5.93
TIS 8441	0.00	0.00	0.00	0.00	23.30a	4.66
Mean	0.00	0.00	0.00	0.00	22.78	
SE±	0.00	0.00	0.00	0.00	0.87	
2000						
TIS 87/0087	0.00	0.00	0.00	0.00	7.32a	2.61
TIS 8441	0.00	0.00	0.00	0.00	6.71a	2.49
TIS 2532.O.P 1.13	0.00	0.00	0.00	0.00	11.65a	3.48
Ex Igbariam	0.00	0.00	0.00	0.00	7.81a	2.71
TIS 87/0087	0.00	0.00	0.00	0.00	7.32a	2.61
Mean	0.00	0.00	0.00	0.00	8.37	
SE±	0.00	0.00	0.00	0.00	0.48	
T*	Transformed data					

Means with the same letter(s) down the columns are not significantly different at P = 0.05 by Student Newman -Keuls Test (S N K.).

Table 4 Time of harvesting of sweet potato and the severity by *C. puncticollis* on the marketable tubers 1999

	Severity of *C. puncticollis at:*					
Cultivar	8 W. A.P	10 W. A.P	12 W. A.P	14 W. A.P	16 W. A.P	8 W. A.P
TIS 87/0087	1.00a	1.00a	1.00a	1.00a	2.58a	1.32
TIS 8441	1.00a	1.00a	1.00a	1.00a	1.75a	1.15
TIS 2532.OP. 1. 13	1.00a	1.00a	1.00	1.00a	2.92a	1.38
Ex-Igbariam	1.00a	1.00a	1.00a	1.00a	2.50a	1.30
Mean	1.00	1.00	1.00	1.00	2.44	
SE±	1.00	1.00	1.00	1.00	0.08	
Mean	1.00	1.00	1.00	1.00	2.44	
TIS 87/0087	1.00a	1.00a	1.00a	1.00a	[illegible]	1.07
TIS 8441	1.00a	1.00a	1.00a	1.00a	1.33a	1.07
TIS 2532.OP. 1. 13	1.00a	1.00a	1.00a	1.00a	1.42a	1.08
Ex-Igbariam	1.00a	1.00a	1.00a	1.00a	1.83a	1.17
Mean	1.00	1.00	1.00	1.00	1.48	
SE±	1.00	1.00	1.00	1.00	0.09	

T*Transformed data

Means with the same letter(s) down the columns are not significantly different at P = 0.05 by student Newman Keuls Test (S N K.)

The non-incidence of *C. puncticollis* on the marketable tubers from 8 to 14 WAP in 1999 and 2000 (Table 3) showed that wet condition is not favourable for the development of the pest. This is in agreement with Alghali and Moifula (1996) who showed that there is strong negative correlation between *Cylas* count and moisture indices. The regulatory role of moisture on insect number (and damage to crop) were recorded for several insects and crops (Passlow, 1954, Talekar 1987, Alghali 1993). *C. puncticollis* enters the tubers through soil cracks which occur when there is water deficit in the soil (Sutherland 1986). Infestations which occurred at 16 WAP were probably due to tubers exposed by erosion and rodents. The results showed that delaying harvest beyond 16 WAP will further expose the tubers to erosion and rodents and to higher insect damage (Anioke 1996, Mbilinyi *et al,* 1999). Although there were no significant differences between cultivars at 16 WAP on the percentage of tubers infested and the severity of damage, TIS

2532.OP.1.13 showed consistent high damage score in 1999 and 2000 which indicates that the cultivar is potentially susceptible to *C. puncticollis.*

Table 5 Rainfall and temperature data for 1999 and 2000

	1999				2000			
	Rainfall (mm)		Temp		Rainfall		Temp	
	Amt	Days	Max	Min	Amt	Days	Max	Min
Jan.	45.6	4	32	23	14.8	2	33	23
Feb.	98.1	4	32	24	0.9	1	34	22
March	203.4	10	32	23	13.6	4	35	23
April	192.0	13	32	32	164.5	13	33	24
May	319.9	14	32	23	153.6	14	32	24
June.	296.6	19	31	23	265.5	20	31	23
July	284.4	23	30	22	265.2	21	30	23
Aug.	382.2	18	30	22	216.9	16	30	24
Sept.	395.3	24	29	22	277.5	23	30	24
Oct.	433.7	26	30	22	228.4	19	31	24
Nov.	50.1	4	31	23	75.9	3	32	24
Dec.	0.0	0	32	22	3.8	2	32	21
Total	2701.3	159	373,0	272.0	1680.6	138	383.0	279.0
Mean	225.1mm	13.31	31.1°c	22.7°c	140.1mm	11.5	13.9°	23.3oc

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