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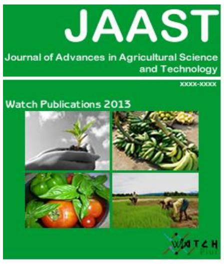

FIELD SCREENING OF C.I.P INTRODUCED SWEETPOTATO *IPOMOEA BATATAS* (L) LAM. CULTIVARS AT UMUDIKE FOR RESISTANCE TO ROOT-KNOT NEMATODES *MELOIDOGYNE SPP*.

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Abstract

The available International Centre for Potato (C.I.P.)-introduced sweetpotato varieties were field- grown and screened for their resistance to natural populations of root-knot nematodes in the National Root Crops Research Institute farm fields at Umudike. Results showed that Accession33 (Naspot 5); accession 36 (K134); accession 39 (Santo Amaro) and accession 5(CIP breeding line) were resistant while most of the other accessions were susceptible and a few, hypersusceptible. In addition, significant results were obtained for saleable tuber yield and the highest root yielder was found to be accession 50 (Cemsa, (476g)), followed by accession 4 (one of the CIP breeding lines). It was also observed that most of the orange fleshed accessions were susceptible while those that appeared resistant were poor root yielders. With the appearance of some sources of resistance in some accessions, it is expected that further breeding work will be carried on in order to develop more resistant sweetpotato varieties

Key words: *Sweetpotato, resistance, field screening, root-knot nematode, Meloidogyne sp*

INTRODUCTION

Root-knot nematodes *Meloidogyne* spp are a major obstacle in sweet potato production worldwide especially when they complex with other disease pathogens to drastically reduce yield and marketability of the crop (Scurrah et. al. 2005 Onyeka et.al.2013). For example in South Africa,sweetpotato cv. Blesbok is susceptible to both M. incognita and M. javanica and the nematodes can cause over 11% decrease in the marketable yield due to a reduction in the storage roots (Kitsner et. al. 1993, Scurrah et. al. 2005) Screening for resistance and development of resistant cultivars is presently viewed as highly necessary and basic in integrated crop protection and crop breeding programmes (Taylor et al 1978, Sasser and Kirby 1979 Sasser et. al.1984, Sasser 1989). It is remarkable that the newly introduced CIP varieties have proved difficult to establish in micro plots and have high incidences of sweet potato virus disease (SPVD). Sweet potato is the seventh among all food crops worldwide, from the point of total production, third in value of production and fifth in caloric contribution to human diet (Bouwkamp, 1985). China accounts for the highest sweet potato production in the world, followed by Uganda and Nigeria in that order (FAO, 2004). Sweet-potato is becoming popular as a substitute to yam and garri in Nigeria. It contributes significantly as a starch staple in providing the needed daily calorie intake and also serves as a breakfast meal. Some varieties have been used in raw mash at 50:50 wheat/sweet potato flour for bread making, biscuits and other confectioneries. Sweet potato tubers can be reconstituted into fofoo. It may be used as a major source of industrial starch for pharmaceutical products, adhesives, textile, paper and alcohol production (Woolfe, 1992). In Akwa Ibom State, the government encourages cultivation of this crop, using the Agricultural Development Programme (ADP) to reach out and educate farmers on the advantages of the crop over other root and tuber crops (Antiaobong and Bassey, 2009). The objective of this work therefore was to evaluate the reaction of all the varieties in the CIP germplasm to natural populations of root-knot nematode in the field and thus discover any sources of resistance to root-knot nematode amongst them.

MATERIALS AND METHODS

The experiment was set up in 2008 in the Eastern farms of the National Root Crops Research Institute Umudike (5^0 29^1 N 7^0 23^1 East). Two node vine cuttings of 33 of the available accessions in the CIP germplasm including 3 local checks (TIS87/0087, TIS8164, and TIS2532.0P.1.13 were planted in randomized complete block design (RCBD) consisting of 36 varieties and 3 replications. There were 108 plots in all and they were planted at a spacing of 1m x 0.3m and plot size of $6m^2$ (i.e. 2m x 3m) to give 20 stands /plot. Fertilizer NPK

Table 1: Rating Scale for the Presence of Root – Knot Nematode Galls or Egg Masses on Roots. (Taylor and Sasser 1978)

Number of Galls or Egg Masses	Gall Index (GI) or Egg Mass Index (EI)	
0	0	
1 – 2	1	
3 – 10	2	R
11 – 30	3	S
31 – 100	4	
100 +	5	

Table 2: Quantitative Scheme for Assignment of Canto – Saenz's Host Suitability Designations.

Plant Damage	Gall Host Efficiency Index (R Factor) $\frac{P_f}{P_1}$	Degree of Resistance Designation
≤ 2	≤ 1	Resistant
≤ 2	> 1	Tolerant
> 2	≤ 1	Hypersusceptible
> 2	> 1	Susceptible

Table3: Screening of Sweetpotato Germplasm for Resistance to Root-knot nematodes *Meloidogyne spp* (2008)

S/NO	ACCN NO	CIP NAME	FLESH COLOR	Saleable Tuber Wt(g)/plant	Non-Saleable Tuber wt (g)/plant	Gall Index	R Factor Pf/Pi	Resistance Designation	RKNIND
1	1	CIP BREEDING LINE	LIGHT ORANGE	243	43.7	2.042	1.46	Susceptible	
2	2	CIP BREEDIG LINE	INTERMEDIATE OR	370	85.8	2.042	1.32	Susceptible	
3	3	CIP BREEDIING	INTERMEDIATE OR	230	54.2	2.667	1.14	Susceptible	
4	4	CIP BREEDING LINE	LIGHT ORANGE	444	141.6	4.333	0.47	Hyper Susceptible	
5	5	CIP BREEDING LINE	LIGHT ORANGE	160	36.6	1.667	0.46	Resistant	
6	21	TIB-4	ORANGE	107	30.8	3.000	2.09	Susceptible	
7	440293	BP-SP-2	ORANGE	187	90.4	2.855	2.44	Susceptible	
8	8164	TIS 8164	CREAM	415	59.6	4.223	0.75	Hyper Susceptible	
9	27	SPK004	ORANGE	61	12.5	2.042	1.46	Susceptible	
10	10	CIP BREEDING LINE	LIGHT ORANGE	151	50.8	3.000	2.65	Susceptible	
11	26	NEMANETE	PALE-ORANGE	154	54.0	2.542	1.04	Susceptible	
12	OP	2532.OP.1.13	WHITE	295	57.1	3.333	3.28	Susceptible	
13	13	SALYBORO	ORANGE	126	43.6	1.667	1.90	Susceptible	
14	29	NASPOT-1	_	211	59.3	2.000	1.19	Susceptible	
15	24	JULIAN	ORANGE	257	55.3	2.667	1.79	Susceptible	
16	87/0087	TIS 87/0087	CREAM	169	83.0	3.000	0.56	Hyper Susceptible	
17	31	NASPOT-3	_	128	35.0	3.042	1.04	Susceptible	
18	18	CENTENNIAL	ORANGE	154	41.8	2.542	7.18	Susceptible	
19	39	SANTO AMARO	YELLOW	61	25.0	1.857	0.74	Resistant	
20	49	KEMP37	WHITE-FLESHED	344	46.0	2.042	1.04	Susceptible	
21	34	NASPOT-6(1)	_	120	56.1	2.667	1.14	Susceptible	
22	33	NASPOT-5	_	20	37.5	1.667	0.37	Resistant	
23	37	CARROT-C	ORANGE	-45	32.0	3.042	1.75	Susceptible	
24	35	K118	ORANGE	83	41.5	2.542	0.75	Hyper Susceptible	

Table 3: Contd

25	43	MUGAMBA	WHITE-FLESHED	364	100.7	2.333	1.83	Susceptible
26	41	MUGANDE	WHITE-FLESHED	200	78.5	2.000	2.18	Susceptible
27	52	NASPOT-2(2)	_	209	46.0	2.333	0.84	Hyper Susceptible
28	47	HELENA	WHITE-FLESHED	314	45.4	2.227	1.89	Susceptible
29	48	IMBY3102	WHITE-FLESH	135	26.5	3.000	1.68	Susceptible
30	50	CEMSA	WHITE-FLESHED	476	105.0	2.667	1.95	Susceptible
31	32	NASPOT-4	_	230	30.1	1.542	1.32	Susceptible
32	36	K134	ORANGE	80	11.1	2.000	0.75	Resistant
33	45	WAGABOLIGE	WHITE-FLESHED	201	40.3	2.227	1.06	Susceptible
34	44	TANZANIA	PALE-ORANGE	339	78.8	1.072	2.03	Susceptible
35	25	BP-SP-2(1)	ORANGE	335	87.5	2.333	3.12	Susceptible
36	30	NASPOT-2(1)		377	57.0	2.227	1.06	Susceptible
LSD(0.05)				202.5 *	62.47 n.s	1.276 *	2.962 n.s	

* =significant , n.s = not significant

15:15:15 was applied at 4 WAP at rate of 240g/plot. Soil samples were also collected at planting, midseason and at harvest at 16 weeks after planting and analyzed for nematode populations/200cc of soil in the Laboratory. The rating scale of Taylor and Sasser (1978) used for rating the presence of root-knot nematode galls is shown in Table 1 while the Quantitative scheme of Canto-Saenz's host suitability designation is shown in Table 2. Several parameters including those in the tables of results (Table 3) were also measured.

RESULTS AND DISCUSSION

The Table 3 shows results of the screening of the CIP germplasm for resistance to root-knot nematodes.

Significant results were obtained for saleable tuber yield and the highest root yielder was found to be accession 50 (Cemsa), followed by accession 4 (one of the CIP breeding lines). For the damage symptoms, significance was obtained for the root-knot severity index but not for the reproductive factor (Rfactor =final nematode population /initial nematode population). When the varieties were rated with the Canto-Sacnz's (1985) suitability rating in Table 2, a number of resistant accessions were observed. These were Accession33 (Naspot 5); accession 36 (K134); accession 39 (Santo Amaro) and accession 5(CIP breeding line). Most of the other accessions however were susceptible and a few, hyper susceptible. It does appear that most of the orange fleshed varieties were susceptible while those varieties that appeared resistant were poor root yielders.

CONCLUSION

It is therefore expected that with the appearance of sources of resistance in the germplasm, further breeding work can now be initiated with the resistant accessions to develop higher agronomic qualities so that improved *Meloidogyne spp*.- resistant sweet potato varieties can be developed.

REFERENCES

Antiaobong EE, Bassey EE (2009). Constraints and prospects of sweet potato (Ipomeoa batatas (L) Lam): Production in Southeastern Nigeria. Afr. J. Agric. Res. Dev., 2(2): 16-20.

Canto- Saenz M (1985). Nature of resistance to *Meloidogyne incognita* pp.225-231, In: An Advanced Treatise on Root-knot nematodes (*Meloidogyne spp*.), Vol. 1, Bil. conntrol, (eds J.N. Sasser and C.C. Carter). North Carolina State Univ. Graphics, Raleigh.

Onyeka TJ, Okorocha EA, Anioke SC (2013). An Overview of Pests and Diseases of Sweet Potato. Yam, Cocoyam and Sweet Potato Production and Post-Harvest Management. Eds UJ Ukpabi, KI Nwosu. Published by National Root Crops Research Institute(N.R.C.R.I.), P.M.B.7006 Umuahia, Abia State, Nigeria. X+265pp.

Sasser JN, Kirby MF (1979). Crop cultivars Resistant to Root-Knot Nematodes Meloidogyne species. A cooperative Publication of the Dept. of Plant Pathology, North Carolina State University and the U.S. Agency for Internationa Development.

Sasser JN (1989). Plant Parasitic Nematodes: The Farmer's Hidden Enemy.Publi. Dept. of Plant Pathology and the Consortium for International Crop Protection. Designed and Printed by University Graphics North Carolina State University Raleigh, North Carolina U.S.A. p. 115.

Sasser JN, Carter CC, Hartman KM (1984). Standardization of Host Suitability Studies and Reporting of Resistance to Root-Knot Nematodes. North Carolina State Graphics Raleigh NC USA. 7 PP.

Scurrah MI, Niere B, Bridge J (2005). Nematode Parasites of Solanum and Sweet Potatoes CAB 18 J. Advan. Agric. Sci. Technol. International 2005. Plant Parasitic Nematodes in Subtropical and Tropical Agriculture 2nd Edition (eds. M. Luc, R.A. Sikora & J. Bridge). P. 193-219

Taylor AL**,** Sasser JN (1978). Biology, Identification and Control of Root-knot Nematodes (Meloidogyne spp.) North Carolina State University Graphics. Vii+111pp.

Woolfe JA, (1992). Sweet Potato: An Untapped Food Resource, in Collaboration with International Potato Centre (CIP). Peru, Cambridge University Press, Cambridge, pp: 16-19