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SCREENING YAM (Dioscorea) CULTIVARS FOR YAM MINISETT TECHNOLOGY AND BIOTIC STRESSES IN GUINEA SAVANNAH ZONE OF NIGERIA.

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ABSTRACT

Five cultivars of D. rotundata Poir and two of D. alata L. were evaluated in a randomized complete block design experiment for their response to yam minisett technology, field pests and diseases at Otobi in Southern guinea savannah, Nigeria. The cultivars showed good response to the technology though the D. alata cultivars were better than the D. rotundata_cultivars in terms of establishment and the number of plantable seed tubers for the generation of ware yams. The cultivars response to Aspidiella hartii CKll and to yam nematodes differed among the cultivars. The incidence of A.. hartii was significantly highest in D. alata cultivar Um 680 for the two years. Nematode infection observed in all the yam cultivars of D. rotundata was identified as being caused by a biotic factor that should be controlled for the completeness of the yam minisett technology for seed yam production.

INTRODUCTION

Yam production is labour and capital intensive. The cost of seed yam (the planting materials) alone accounts for more than one-third of the total outlay (Oyolu, 1978; Iwueke et al., 1983). The yam minisett technology developed at the National Root Crops Research Institute (NRCRI, Umudike, Nigeria, in the early 80s, had made it possible for some farmers to now generate their seed yams thereby reducing the high outlay in yam production. Yam cultivar response to the technology has been reported to vary by several workers (Igbokwe *et al.*, 1988; Igwilo and Okoli, 1988). The varietal response is bound to affect the adoption of the technology unless recommendations are based on ecologically responsive yam varieties.

In Nigeria a lot of yams are produced in Southern guinea savannah. Several States including Benue, Plateau, Nassarawa, Yobe and Kogi which lie within this agro-ecological zone still produce seed yams using the traditional methods (Wilson, 1978; Oyolu, 1978) which entail high outlay. Past studies on cultivar response to yam minisett technology which were carried out in the rainforest of southern Nigeria, had been silent on cultivar response to soil pests and diseases (Igbokwe et al., 1988; Igwilo and Okoli, 1988). Soil pests and diseases are known to reduce seed viability, establishment and total yield (Nwana, 1977; Akinlosotu, 1984; Emehute et al., 1991). The present study aims at identifying yam cultivars' responses to both the yam minisett technology, a method of producing seed yams (250-500g) using cut yam setts of 25g and soil pests and diseases in the Southern guinea Savannah of Nigeria whiere the bulk of yams is produced in Nigeria. This will enable the farmers to select yam cultivar (s) that show positive response to the technology and unaffected by some pests and diseases.

MATERIALS AND METHODS

Five yam cultivars (cvs) of Dioscorea rotundata Poir (cvs Abi, Nwopoko, Obiaoturugo, Amola and Audu) and two of D. alata L. (cvs Um 680 and Ominelu) were evaluated in a

field trial at Otobi, Benue State in the guinea Savannah belt of Nigeria, for their response to the yam minisett technology and soil pests and diseases. Five (Abi, Nwopoko, Obiaoturugo, Um 680 and Ominelu) of the 7 cvs are among the elite cvs of the NRCRI , Umudike, Nigeria, while Amola and Audu are the widely cultivated local yam cvs. The trial was set up on 31 May 1990 and repeated on 13 May 1991. The design for the two years was randomized complete block replicated 4 times. Seed yams (150-300g) were cut into 25g setts (yam minisetts) and dressed with NRCRI yam minisett dust, 30-45 minutes after cutting, for protection against soil pests and pathogens. Plot size was 5m x 5m. Planting was on the crest of 1.0 x 1.0 m ridges at intra row spacing of 0.25 m giving 100 yam minisetts $plot^{-1}$ or 40,000 ha^{-1}. N.P.K. (15:155) fertilizer was applied (banding) at 12 weeks after planting (WAP). All other recommended agronomic operations such as weeding, staking, linking and training of yam vines were timely carried out. Yam sprout count was taken at 4 and 8 WAP and establishment count at 12 WAP. Yam tubers were harvested at 8 months after planting (MAP). Data on total tuber weight, tuber grades and per cent infestation and/or infection by soil insects and disease pathogens were recorded. Data collected were analyzed using aanalysis of Variance (ANOVA) method and Least Significant Difference (LSD) at 5% probability level to separate the means.

RESULTS AND DISCUSSION

D. alata cultivars sprouted and established better than the *D. rotundata* cultivars (Table 1). At 12 WAP the establishment of D. alata cvs was over 85.0% while the establishment for the best established D. rotundata cvs, Amola and Abi, was 72.5% and 71.6% respectively (Table 1).

The lowest establishment (65.4%) was obtained from Audu, one of the *D. rotundata* cvs. The results here are in consonant with the findings of Igbokwe et al. (1988), Igwilo and Okoli (1988) who reported higher sprouting in D. alata than in D. rotundata in their separate trials at NRCRI Umudike, a high rainfed ecology. The higher establishment of D. alata also culminated in

Table 1: Means of Sprouting and establishment (%) of directly field planted minisetts of

Dioscorea cvs	Sprouting			Establishment		
	4 wap		8 wap		12 wap	
D. alata	1990	1991	1990	1991	1990	1991
Ominelu	20.5	62.1	90.5	92.5	93.5	95.0
Um 680	21.0	58.8	83.0	72.9	85.3	82.9
D. rotun-						
Abi	7.5	34.6	62.8	54.2	70.3	72.9
Nwopoko	12.3	31.7	55.0	47.9	67.5	70.0
Amola[8]	14.8	53.4	71.8	72.1	74.6	70.4
Audu[8]	19.5	26.3	62.5	50.4	72.5	58.3
Obiaotu-	11.5	35.0	53.0	51.3	73.0	61.5
L S D		9.9	14.6	8.2	8.4	9.5

1. * = Local yam cultivars evaluated

the higher tuber yields both in terms of total tuber weight and the per cent of seed yams (150-300 g) and miniseed tubers (100-<150 g) in D. alata than D. rotundata (Table 2).

However, this yield of D. rotundata was statistically the same as the yield obtained in D. alata cultivars when the per cent of the seed yams and the miniseed tubers were summed up (Table 2). In yam production both seed yams and miniseed yams are acceptable planting materials for the generation of yam tubers weighing 1,000 g and above (ware

Table 2: Means of fresh tuber (t/ha), miniseeds and seed yams (%) yeilds of minisett field plots of Dioscorea cultivars, 1990 and 1991.

Dioscorea Cvs	Fresh tuber (t/ha)		Miniseeds (%)		Seed yams (%)		Means of Miniseed + seed yams (%) (plantable tubers
	1990	1991	1990	1991	1990	1991	
D. alata							
Ominelu	24.5	19.2	29.1	12.3	64.2	77.6	91.6
Um 680	28.7	23.7	18.4	10.0	77.1	77.3	91.4
D. rotundata							
Abi	12.1	7.5	28.1	23.3	64.5	50.6	83.3
Nwopoko	20.6	9.5	34.5	21.6	54.3	63.8	87.2
Amola[8]	20.4	8.1	40.2	22.1	53.0	45.5	80.5
Audu[8]	11.1	6.4	41.5	23.2	52.4	49.2	83.2
Obiaotu-rugo	16.6	27.5	23.8	20.5	74.4	49.9	84.4
L S D (0.05)	5.8	4.5	10.6	8.2	13.5	17.3	

= Local yam cultivars evaluated.

Percentages were based on the total number of tubers obtained from each cultivar at harvest.

yams). Since the 7 cultvars evaluated generated over 80.0% plantable yam tubers it is concluded that all the cultivars responded favourably to the yam minisett technology. The yield figures obtained could be improved upon

through research into factors that could improve sprouting and establishment of the D. rotundata cvs when their minisetts are planted directly in the field plots. Higher field establishment has been suggested through pre-sprouting of the yam minisetts and transplanting the plantlets into the field plots (Otoo et al., 1987). The tedium of pre-sprouting and transplanting, and the loss of minisetts during these two ag-

Table 3: Estimates of incidence (%) of soil insects and diseases on tubers of Dioscorea spp. From yam minisett plots, 1990 and 1991.

Dioscorea cvs	Crickets		A. Hartii		Nematode		Rot	
	1990	1991	1990	1991	1990	1991	1990	1991
D. alata								
Ominelu	N.o.	3.1	1.0	0.0	0.0	0.0	0.5	0.7
Um 680	N.o.	4.1	61.8	42.9	0.0	0.0	0.8	0.4
D. rotundata								
Abi	N.o	5.3	32.2	3.5	34.5	42.3	3.2	2.9
Nwopoko	N.o	21.3	8.7	3.6	23.1	28.8	7.1	6.9
Amola[8]	N.o.	13.1	19.9	0.0	21.1	49.9	6.5	1.8
Audu[8]	N.o.	6.8	1.3	11.2	42.2	43.0	4.3	3.0
Obiaoturugo	N.o	6.5	19.7	3.2	34.7	34.9	5.9	6.5
LSD(0 05)		N.s.	8.2	6.7	11.3	25.2	N.s.	N.s.

1. N.o. = none was observed
2. N.s. = not significant at 5.0% level
3. * = local cultivar evaluated

ronomic operations may likely negate the adoption of this method.

Although the cultivars including the two local cvs showed acceptable response, in terms of the generation of planatable materials, to the yam minisett technology, yet some of them showed high susceptibility to soil biotic factors. Though rot and cricket incidence was low, for the two years the incidence (%) of A, hartii on Um 680 and yam nematodes, scutellonema and Meloidogyne spp. On D. rotundata was high (Table 3). All the D. rotundata cvs had a mean nematode infection (incidence) of over 25.0% compared to the complete absence of nematodes in the two D. alata cvs (Table 3).

The infected plantable tubers of D. rotundata will not constitute planting materials in order to avoid reduced sprouting and tuber yield depression (Nwauzor et al., 1991). On the other hand, all the plantable tubers of D. alata will be fully utilized in planting since the cultivars are free from yam nematode infection. The present result has shown that yam nematodes constitute a major constraint in the use of D. rotundata cultivars for the genertion of seed yams through yam minisett technology. To utilize the potentials of D. rotundata cvs in yam minisett technology, it is desirable and relevant to control yam nematodes, for tuber generated through the yam minisett technology should be free from diseases and pests particularly yam nematodes which feed below the skin (periderm) of the tuber (Igwilo and Okoli, 1988). Furadan 3G at 0.45 kg a.i/ha has been recommended for the control of yam nematodes (Nwauzor et al., 1991). This could be adopted in the interim, despite the additional cost to the farmers, to generate high number of sound plantable yam tubers from yam minisett plots. Meanwhile research efforts are aimed at identifying nematode antagonistic crop(s) that could be intercropped with yam minisetts to achieve environmentally sound control of plant parasitic nematodes in yam minisett plots.

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