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PERFORMANCE OF YAM MINITUBER/MAIZE INTERCROP IN THE HUMID TROPICS OF SOUTHEAST NIGERIA

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ABSTRACT

Trials were conducted in Umudike in 2000 and 2001 to determine the response of yam minituber from D. alata (UM 680) and D. rotundata (Obioturugo) to intercropping pressure, using maize as the component crop. Four sizes of minitubers (25g; 50g; 75g and 100g) were intercropped with a full season maize (TZSR-Y) in randomized complete blocks design replicated three times. The maize component depressed minituber yield by only 5% but improved the calorie productivity of the minituber/maize system by 33%, thus indicating that maize is a compatible and productive intercrop of yam minitubers. Farmers can therefore intercrop yam minitubers with maize.

INTRODUCTION

Minitubers ranging from below 25g to 150g have been produced from 6g and 8g yam minisetts as alternatives to the conventional 25g yam minisett technique for seed yam production (Ikeorgu *et al.* 2001). The yam minituber technique eliminates the drudgery of cutting seed yams into 25g setts, curing, treatment with minisett dust and other associated constraints. Perhaps the most important benefit of this new technology is that it eliminates the problem of non-uniform sprouting of cut setts inherent in the yam minisett technology developed two decades ago by National Root Crops Research Institute Umudike (Okoli *et al*, 1982).

Root and rubber crops are commonly intercropped with maize in tropical and subtropical Africa. The advantages and disadvantages of intercropping were reviewed by Okigbo and Greenland (1976) and Andrews and Kassam (1975). Okigbo and Greenland reported that over 59% of yams and 75% of maize grown in Nigeria are intercropped. Agboola (1979) and Ezeilo (1975) showed that yam/maize melon and yam/maize/cassava are the most dominant yam-based crop combinations in the acid soils of the rain forest zone of Nigeria. Yam/Maize/cassava intercrop has been shown to be productive and compatible mainly because maize is a short season crop while cassava and yams are long duration (7-12 months) crops. The two component crops provide an example of the presence of competition gap in the periods each of the component crops makes maximum demands on the environmental growth resources (soil moisture, soil nutrients, light, etc) which results in higher total yields than the sole crops (Andrews, 1972; Kassam and Stockinger, 1973; Okigbo and Greenland 1976; Ikeorgu et al, 1989).

Farmers' feedback show that technologies that are developed in accordance with the farmers' prevailing farming systems are more readily adopted. One of the major reason yam minisett technique recorded

low adoption rate after two decades of extension was because the technology was developed under mono-cropping system while the clientele practices intercropping. But after the work by Ikeorgu et al., (1998) farmers could choose from a number of component crops for intercropping with yam minisetts. There is need to study and develop a compatible minitubers-based intercropping system like that reported for yam minisetts to enhance the adoption of the minituber technique.

METHODOLOGY

This work was carried out at Umudike in 2000 and 2001. Umudike (5^0 27' N; 7^0 32' E and 122m above sea level) is located in the humid rain forests of Southeast Nigeria and has annual rainfall of 2200mm bi-modally distributed. The soil in Umudike is best described as ultisol. This experiment was previously designed for a two to three-crop mixture (yam minituber/maize/melon) but it was discovered that egusi melon is already late by mid-May found to be best time to plant the minitubers (Ikeorgu and Nwokocha, 2001). Minitubers weighing 25g, 75g and 100g (Table 1) from D. alata (UM 680) and D. rotundata (Obioturugo) were combined with a full season maize variety (TZSR-Y, procured from National Seed Service Umudike) in a two-crop combination. A sole crop plot of each minituber size was grown beside the intercrop plots as checks. The land was ploughed and harrowed before 1m ridges were made. Layout was in split plot arrangement of RCB design and was replicated three times in each year. The cropping systems (sole or intercrop) formed the main plots while the minituber size were the sub-plots. The plot sizes measured 5m x 6m.each.

Planting in 2000 was done on 15th May but in 2001, planting was delayed by one week. The 25g minitubers were spaced at 25cm on the crest of the ridge while the 50g and 75g setts were spaced 50cm on the crest of the ridge. The 100g setts were spaced 1m apart on the crest of the ridge, The plots were weeded at 3,8 and 12 weeks after planting (WAP) and NPK fertilizer was applied to the maize at 3 WAP and to the minitubers at 8 WAP at the rate of 400 kg/ha. All other cultural operations were carried out when due.

The two-year data were subjected to ANOVA for split plot arrangement of RCB design and means were compared using the LSD at 5% level of significance (Gomez and Gomez, 1984). As there was no variety x cropping system interaction, the mean yields of the two yam cultivars were used in this report.

RESULTS AND DISCUSSION

The seed yam yields from the first trial in 2000 are presented in Table 1. There were no real differences in seed yam yields from intercropped plots when compared with those from sole minituber plots

This shows that the maize component did not significantly depress seed yam yields.

Table 1 Seed yam yield (t/ha) from minitubers grown sole and intercropped with maize in 2000 in Umudike

	Seed yam yield (t/ha)		
Crop combination	Sole crop	+ Maize	Mean
25	6.77	6.34	6.56
50	9.23	8.64	8.94
75	10.02	9.13	9.58
100	10.12	10.40	10.26
Mean	9.02	8.63	

LSD (0.05) Cropping system = NS
Minituber size = 3.22
System x size = NS

Ikeorgu et al. (1989) had earlier shown that maize could depress cassava tuberous root yield by as much as 28%, but that the yield loss was compensated for by maize grain yield. There were significant seed yam yield differences resulting from the various minituber sizes. This was expected since there was 25g weight differences between the various sizes used. However, only the seed yam yields from 25g and 100g minitubers differed from each other. The other means did not differ and there was no significant cropping system x

minituber size interaction. The implication of this is that a farmer could produce as much seed yams from 25g minitubers as with 50g or 75minitubers.

This trend was maintained the second year of this trial where seed yam yields from sole minituber plots did not significantly differ from that intercropped plots (Table 2). There were however significant differences in seed yam yields from 25g and 100g minitubers.

Intercropping maize with the various sizes of minitubers did not significantly depress maize grain yield in any of the of years of this investigation This was also observed in the work of Ikeorgu *et al.* (1989) and is indication of the principle of complementarily of component crops (Willey, 1979). Each of the crops makes demand on the environmental growth resources at different times from each other during the growth season. The combined component crop yields and the system productivity calculated from FAO (1968) show that although inclusion of maize depressed minituber yield by only 5%, the presence of maize increased the calorie productivity of the minituber/maize intercrop by 33%. This indicates that maize is as suitable and compatible intercrop of minitubers.

Table 2. Seed yam yield (t/ha) from minitubers grown sole and intercropped with maize in 2001 in Umudike

Minituber Size (g)	Cropping System Sole	+ Maize	Mean
25	6.97	6.03	6.50
50	9.92	8.12	9.02
75	9.02	8.45	8.74
100	10.90	10.34	10.64
Mean	9.20	8.24	
LSD (0.05) Cropping system = NS Minituber Size = 3.39 System x size = NS			

CONCLUSION

From this two-year trial, we could conclude that minitubers can be intercropped with maize with minimal yield loss and high benefit to the farmer.

Table 3. Grain yield of maize (t/ha) intercropped with various sizes of yam minitubers in 200 and 2001.

Crop Combination	Maize grain yield (t/ha) 2000	2001	Mean
Maize/Minituber	1.17	1.25	1.21
Maize/Minituber	0.73	0.65	0.69
Maize/Minituber	0.95	0.72	0.84
Maize/Minituber	0.85	0.80	0.83
$LSD_{(0.05)}$	NS	NS	

Table 4: Combined Yield of Component Crops in 2000 and 2001 and calorie productivity of each system

Minituber size (grams)	Sole minituber	Intercropped minituber	Maize Yield	Calorie Productivity (10^3 Kcals/ha)	
				Sole	Intercrop
25	6.66	6.40	1.22	4.72	9.90
50	9.28	8.68	0.69	6.59	8.62
75	10.46	8.79	0.84	7.43	9.24
100	9.66	10.37	0.83	6.86	10.34

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