

**EVALUATION OF THE PRODUCTIVITY OF YAMS
PLANTED IN DRY AND RAINY SEASONS IN BENUE STATE.**

T.O EZULIKE, G.C. ORKWOR and E.C. NWAUZOR

**National Root Crops Research Institute,
Umudike, P.M.B. 7006, Umuahia,
Abia State Nigeria
(Accepted July, 2000)**

ABSTRACT

The trial was carried out at the research farm of National Root Crops Research Institute sub-station, Otobi, Otukpo, Benue State, Nigeria. The objective of this study was to compare seed yams planted in the dry and rainy seasons.

Four cultivars of *D. rotundata* and one cultivar of *D. alata* were used in the study. The seed yams were planted in mounds. The trial was carried in 1994 and 1995.

The percentage sprouting was significantly higher in the rainy season than in the dry season planted yams. The percentage establishment was similar for the two seasons. The percentage average gross stand count at harvest was higher in the dry (66.1%) than in the rainy (57.1%) season planted yams. The scores of the thickness of the yam vines, leaf production and crop vigour for the two years were not significantly different. The tuber yield per hectare was significantly higher for the dry, than for the rainy season planted yams. For the two years, it was 15.7t/ha and 12.2t/ha for dry and rainy seasons planted yams, respectively. It seemed that the tuber yield was a function of time of planting.

INTRODUCTION

Nigeria is the world's largest producer of food yams (FAO 1988, Onwueme 1978) Global production of food yams is now estimated at 32.9 million metric tonnes per annum with about 96% of this coming from the West Africa yam belt and Nigeria alone accounts for

about 70.71% of the World total. Almost all the food yams produced in Nigeria are consumed internally (FAO 1988). The importance of yam in Nigeria and indeed throughout the West African yam belt is not only for its role as a major staple but its socio-cultural significance in the life of the people, well over 160 million

throughout the yam belt of West Africa especially in Nigeria.

Yam is a tropical tuber crop which is usually grown as rainfed crop for its edible tubers for a period of 6-12 months depending on the cultivar and purpose of production. One of the 600 species of yams in the genus *Dioscorea* accounts for an estimated 75% of world food yams (IITA 1995). The edible yams grown in Nigeria are *D. rotundata* Poir (white guinea yam), *D. alata* (water yam), *D. cayenensis* (yellow yam), *D. bulbifera* (aerial yam) and *D. dumetorum* (bitter yam or trifoliate yam).

In the recent crop area and yield survey conducted by Agricultural Project Monitoring and Evaluation Unit (APMEU), Kaduna in the Federal Department of Agriculture in Nigeria, it was shown that annual production of yam in Nigeria now stands at 25.2 million tonnes (APMEU 1996) and this was cropped on a land area of 2.4 million hectares and at yield average of 10.7 t/ha. This is a tremendous increase in national output of yam from 18.2 million tonnes in 1988.

The yam zone in Nigeria is now widened to cover the rainforest, derived guinea savanna and the southern guinea savanna ecological zones. The short drought resistant varieties of *D. rotundata* are well adapted to the savanna, ecologies,

with the highest production areas located at Benue and southern Plateau States. Cultural operations involved in yam cultivation in Nigeria are carried out at different times of the year and vary from one yam ecological zone to the other depending on locations and types of yams produced. Land clearing could be done two to three months before planting which is dependent on rainfall pattern (Azih, 1977). Yam as a rainfed crop is usually planted at the onset of rains but in Benue State, farmers plant seed yams both in the dry season (December to February) and also at the onset of rains from April to May.

The objective of this study was to compare the performance of seed yams planted in the dry season when there are no rains and those planted at the beginning of the rains in April.

MATERIALS AND METHODS

The experiment was conducted at the research farm of National Root Crops Research Institute Otobi Sub-station, Otukpo, Benue State, Nigeria, situated at about longitude $08^{\circ}10'E$ and latitude $08^{\circ}15'N$. The Station lies in the Southern Guinea Savanna. Land preparation consisted of land clearing, burning, removal of thrashes and making of mounds.

Four cultivars of *D. rotundata* (Ododio, Asangwu, Nwopoko and Obiaoturugo) and one cultivar of *D. alata* (Um 680) were used for the study. The seed yams (200-250g) were planted on the crest of mounds in January 1994, for the dry season planting and in April of the same year for the rainy season planting. The experimental design was a randomized complete block design in four replications with plot sizes of 5m x 6m. The experiment was repeated in 1995 on a different site close to the first year site in Otobi.

Green mulch was applied to the dry season planted yams in order to reduce direct heat on the seed yams. The yams were staked singly on stakes of about two meters high. The experiment was manually weeded with hoe, three times at 4, 8 and 12 weeks after planting (W.A.P.). Compound fertilizer, N.P.K 15:15:15 was applied at the rate of 400kg per hectare. Data were taken on sprouting and establishment at eight and 18 W.A.P. Data were also collected on the thickness of vine, leaf production (canopy) and crop vigour, using a scoring scale of 1-5 for each growth parameter; where 1 = lowest value and 5 = the highest value. All the yams were harvested in December of each year. The yams were graded into ware yams (40g and above per sett size) and seed

yams (less than 400g per sett size). The yield was given in tones per hectare. The data were analyzed using variance method and differences were tested for statistical significance using Duncan's New multiple Range Test at 5% probability.

RESULTS AND DISCUSSION

Sprouting and Crop

Establishment:

The percentage sprouting at eight weeks after planting was significantly higher in the rainy than in the dry season planted yams for the two years, 1994 and 1995 (Table 1,3,5 and 7). The yams planted at the onset of rains in April sprouted earlier than the seed yams planted in January. This is probably because they were stored through the dry season after harvesting and were able to break their dormancy before they were planted. There was also moisture to help them sprout. Oneueme (1978) reported that yam setts planted during the dry season preceding the rainy season could remain in the soil for two to three months before the onset of rains. He further stated that setts will survive and sprout without water and even tolerate drought after sprouting to a greater extent than other crops. Invariably, the percentage establishment of seed yams

planted in the dry season and rainy seasons for the two years, were similar (Table 1, 3, 5 and 7). This is probably due to the fact that the dry season planted yams were mulched to protect them from the hot and dry weather. The combined analysis of data from the two years experiments showed the same trend. The percentage sprouting was significantly higher at eight w.a.p in the rainy (79.3%) than in dry (13.1%) season planted yams. There was no significant difference in the average percentage establishment at 18 w.a.p. for both seasons, dry (88.9%) and rainy (88.3%).

The seed yams planted in the dry season picked up in growth when they received water at the onset of rains in April. However, the percentage gross stand count at harvest was significantly higher in the rainy (88.5%) than dry (67.3%) season planted yams in 1994 (Table 2 and 4). Similarly, in 1995, the result followed the same trend. It was 64.9% in the dry and 80.5% in the rainy season planted yams (Table 6 and 8). When the two years results were combined the percentage gross stand at harvest was higher in the rainy (84.5%) than in the dry (66.1%) season planted yams.

Table 1: Percentage sprouting establishment and growth parameters of dry season planted yams, 1994.

Yam cultivars	% sprouting 8 w.a.p	% establishment 18 w.a.p	Thickness of vine (1-5)	Leaf prod. (1-5)	Crop vigour (1-5)
Ododio	14.2b	82.5a	3.5b	3.5b	3.8ab
Asangwu	21.7a	97.5a	5.0a	3.5b	4.5
Nwopoko	16.7b	91.7a	4.0ab	3.8ab	3.5ab
Obiaoturugo	4.2c	88.3a	4.0ab	3.8ab	3.3b
UM 680	2.5c	90.8a	4.0ab	4.5a	3.8ab

Table 2: Stand count at harvest and tuber yield of dry season planted yams, 1994.

Yam cultivars	% Gross stand	No. seed yams	No. ware yams	Total No. Yam tuber	Yield (t/ha)
Ododio	48.4c	8.5b	11.3a	14.3c	11.1bc
Asangwu	80.0a	11.5ab	5.8b	22.8ab	22.3a
Nwopoko	76.7ab	21.8a	3.8b	25.4ab	15.5ab
Obiaoturugo	58.3bc	15.0ab	2.3b	17.3bc	9.8bc
UM 680	73.3ab	22.0a	5.0b	27.0a	7.7c

Table 3: Percentage sprouting, establishment and growth parameters of rainy season planted yams, 1994.

Yam cultivars	% sprouting 8 w.a.p	% establishment 8 w.a.p	Thickness of vine (1-5)	Leaf prod. (1-5)	Crop vigour (1-5)
Ododio	53.3b	80.0ab	4.3a	3.8a	3.3b
Asangwu	86.7a	95.9a	4.5a	4.0a	4.5a
Nwopoko	47.5b	72.5b	3.5a	3.3a	4.0ab
Obiaoturugo	75.8a	84.2ab	3.8a	4.0a	3.8ab
UM 680	89.9a	92.5a	3.5a	3.5a	3.5ab

Table 4: Stand count at harvest and tuber yield of rainy season planted yams, 1994.

Yam cultivars	% stand	Gross No. seed yams	No. ware yams	Total No. yam tuber	Yield (t/ha)
Ododio	80.0bc	18.0b	4.0b	22.0b	9.3c
Asangwu	94.2ab	18.8b	11.3a	30.0ab	17.4a
Nwopoko	78.4c	20.5b	3.5b	24.0ab	10.0c
Obiaoturugo	90.0abc	36.0a	3.3b	39.3a	13.3b
UM 680	100.0a	32.3ab	5.0b	37.3ab	13.2b

Table 5: Percentage sprouting, establishment and growth parameters of dry season planted yams, 1995.

Yam cultivars	% sprouting 8 w.a.p	% establishment 18 w.a.p	Thickness of vine (1-5)	Leaf prod. (1-5)	Crop vigour (1-5)
Ododio	16.7a	73.3d	3.0a	3.0a	3.0b
Asangwu	18.4a	94.2ab	3.5a	3.2a	3.5ab
Nwopoko	18.4a	83.3c	3.5a	3.0a	3.5ab
Obiaoturugo	11.7a	88.3bc	3.5a	3.0a	3.5ab
UM 680	6.7a	98.2a	3.3a	3.5a	3.8a

Table 6: Stand count at harvest and tuber yield of dry season planted yams, 1995.

Yam cultivars	% Gross stand	No. seed yams	No. ware yams	Total No. yam tubers	Yield (t/ha)
Ododio	45.8b	6.3b	13.8ab	20.0b	16.4ab
Asangwu	75.9a	13.3ab	15.5ab	28.5ab	22.3a
Nwopoko	73.4a	12.3ab	10.5b	22.5b	15.7b
Obiaoturugo	57.5b	17.3a	11.5ab	29.3ab	16.1ab
UM 680	71.7a	17.0a	16.5a	33.5a	20.5ab

Table 7: Percentage sprouting, establishment and growth parameters of rainy season plant yams, 1995.

Yam cultivars	% sprouting 8 w.a.p	% establishment 18 w.a.p	Thickness of vine (1-5)	Leaf prod. (1-5)	Crop vigour (1-5)
Ododio	72.5c	76.7c	3.0a	3.0a	2.8b
Asangwu	85.8b	89.2b	3.3a	3.0a	3.0b
Nwopoko	96.7a	98.4a	3.3a	3.0a	2.8b
Obiaoturugo	86.7b	93.3ab	2.8a	2.5a	2.5b
UM 680	97.5a	100.0a	3.0a	3.0a	4.0a

Table 8: Stand count at harvest and tuber yield of rainy season planted yams, 1995.

Yam cultivars	% Gross stand	No. seed yams	No. ware yams	Total No. yam tubers	Yield (t/ha)
Ododio	73.0b	9.8c	14.3a	24.3bc	9.5c
Asangwu	87.0a	8.3c	12.5a	20.8c	12.4b
Nwopoko	82.3a	18.8b	12.0a	30.8ab	10.3bc
Obiaoturugo	75.0b	28.5a	11.0a	39.5a	9.2c
UM 680	85.2a	26.0a	13.5a	39.5a	16.8a

Growth Parameters

The scores of the thickness of the yam vines, leaf production and crop vigour for the two years were not significantly different (Tables 1, 3, 5 and 7). The data obtained appeared similar for both dry and rainy season – planted seed yams, irrespective of the time of planting. However, dry season planted yams developed canopy earlier than rainy season planted yams. The combined analysis for the two years showed that there was no significant difference in the thickness of vines, leaf production and crop vigour in the dry and rainy season planted yams.

Crop Yield

The mean number of seed yams

produced was significantly higher in rainy than dry season planted yams. In 1994, the mean number was 13 and 25 for dry and rainy season planted yams, respectively (Table 2 and 4). In 1995, it was 13 and 18 for dry and rainy season planted yams, respectively (Table 6 and 8). There was no significant difference in the number of ware yams produced in the dry season planted yams, respectively (Tables 2 and 4). In 1995, it was 27 and 31 for dry and rainy season planted yams, respectively (Table 6 and 8). It followed the same trend when the two years results were analyzed. The tuber yield per

hectare was significantly higher for the dry, than for the rainy season planted yams, respectively (Table 2 and 4). In 1995, it was 18.2 and 11.6 t/ha for dry and rainy season planted yams, respectively (Table 6 and 8). When the results of the years were combined, it was 15.7 and 12.2 t/ha for dry and rainy season planted yams, respectively.

The higher tuber yield of yams planted in the dry season could be attributed to higher insolation which the yams received before heavy cloud cover in the middle of the rainy season. These yams produced leaves first, had enough solar radiation to manufacture photosynthates. The yams planted during the rainy season had problem of cloud cover and as a result had less solar radiation which

subsequently affected the amount of photosynthates. The results indicate that yield is a function of time of planting and that in the area of the study, it is better to plant bulk of the seed yams in January (dry season planting) than in April (rainy season planting). However, farmers in Benue state plant seed yams both in January and at the onset of rains in April.

ACKNOWLEDGEMENT

The authors sincerely wish to acknowledge the contribution of late Dr. N.O.A. Ezeh, who passed on the great beyond in 1997. he was a member of the research team. May God grant his soul eternal rest.

REFERENCES

- Azih, V.A. (1977). Influence of ecological and socio-economic factors on yam production in Nigeria. *Journal of Root Crops*, 3 (2): 5-22.
- APMEU (Agricultural Project Monitoring and Evaluation Unit). (1996). Crop area and yield survey. Federal Department of Agriculture, Kaduna, Nigeria.
- FAO (Food and Agricultural Organization). (1988). *Production year book for 1988*, FAO Rome. Vol. 42.
- IITA (International Institute of Tropical Agriculture). (1995). *Yam Research at IITA: 1971-1993*. IITA Ibadan, 38pp.
- ONWUEME, I.C. (1978). *The tropical tuber crops*. John Wiley and Sons Ltd, New York, 3-102.