Effect of seed yam weight on growth and tuber yield of white yam (*D. rotundata* Poir)

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ABSTRACT

The effect of different weights of seed yam (250, 300 and 350 g) on growth and tuber yield of white yam were evaluated. The results showed significant differences (P<0.05) among the three seed yam weights in vine length, number and basal diameter, and leaf number measured at 8, 10, and 12 weeks after planting, respectively. There were gradual increases throughout the sampling period. The highest mean values of 4.5, 175 cm, 8 mm, and 69.8 were recorded for vine number, length and basal diameter, and leaf number, respectively, at 12 weeks after planting. The results showed that there were no significant differences (P>0.05) between seed yam weight of 300 and 350 g, but they were significantly higher than seed yam weight of 250 g for vine number, and basal diameter and leaf number. The results on yield parameters showed that tuber number, length and fresh weight increased. The results showed that there were no significant differences (P<0.05) between seed yam weight of 300 and 350 g, but they were significantly higher than seed yam weight of 250 g for fresh tuber weight, number, and length. However, the highest values were recorded in seed yam weight of 350 g. There were no significant differences between 300 and 350 g. Thus, this study suggests that seed yam weight of 300 g could be the ideal size for farmers growing white yam in acidic soils of Anwai, Delta State, Nigeria.

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RÉSUMÉ

AKPAROBI, S. O. & OKONMAH, L. U.: *Effet de poids d'igname de semence sur la croissance et le rendement de tubercule d'igname blanche* (D. rotundata *Poir*). L' effet de poids (250, 300 et 350 g) d'igname de semence sur la croissance et le rendement de tubercule d'igname blanche étaient évalués. Les résultats montraient des différences considérables (P < 0.05) parmi les trois poids d'igname de semence, longueur de vigne nombre de vigne, diamètre basal de vigne et le nombre de feuilles mesuré à 8, 10 et 12 semaines respectivement après la plantation. Il y avait des augmentations graduelles en longueur et en diamétre basal de vigne et le nombre de feuilles comme le poids d'igname de semence augmentaient pendant toute la période d'échantillonage. Les valeurs moyennes les plus élevées de 4.5, 175 cm, 8 mm et 69.8 étaient enregistées pour le nombre, la longueur et le diamètre basal de vigne ainsi que le nombre de feuilles respectivement à 12 semaines après la plantation. Les résultats montraient qu'il n'y avait pas de différences considérables (P > 0.05) entre le poids d'igname de semence de 300 et 350 g, mais les différences étaient considérablement plus élevées que le poids d'igname de semence de 250 g pour nombre de vigne, le diamètre basal et nombre de feuille. Les résultats sur les paramètres de rendement revélaient que le nombre de tubercule, longueur et poids de tubercule frais augmentaient. Les résultats montraient qu'il n'y avait pas de différences (P < 0.05) entre le poids d'igname de semence de 300 et 350 g mais les différences étaient considérablement plus élevées que le poids d'igname de semence de 250 g pour le poids de tubercule frais, nombre et longueur de tubercule. Toutefois, les valeurs plus élevées étaient notées en poids d'igname de semence de 350 g. Il n'y avait pas de différences considérables entre 300 et 350 g. Ainsi cette étude de poids d'igname de semence de 300 g pourrait être la dimension idéale pour les agriculteurs de la culture d'igname blanche dans les sols acides d'Anwai, dans l'État du Delta.

Introduction

Yam belongs to the genus Dioscorea, which contains about 600 species (Coursey, 1967). Of these, only six species are cultivated in Nigeria. These are *Dioscorea rotundata* (white guinea yam), *D. alata* (water yam), *D. cayensis* (yellow yam), *D. bulbifera* (aerial yam), *D. esculenta* (Chinese yam), and *D. dumentorum* (trifoliate yam) (Onwueme, 1972; Aighewi, Akoroda & Asiedu, 2002). The world's production of yam amounted to about 23.9 million tonnes in 1991 (FAOSTAT, 1997). *Dioscorea rotundata* Poir (white yam) is the principal commercial yam, and constitutes about 80 per cent of the total yam produced in Nigeria (Asadu & Akammigbo, 1996; FAOSTAT, 1997; Aighewi *et al.*, 2002). White yam contributes over 200 dietary calories per person each day for an estimated 60 million people, especially in the yam growing zones; from Cote d'Ivoire to Cameroun (Onwueme, 1972; Brereton, 1986). Nigeria is the largest producer of yam (IITA, 1993b; FAOSTAT, 1997; Aihgewi *et al.*, 2002).

Yam is a valuable starchy staple food in the tropical and subtropical countries (Asadu & Akammigbo, 1996). It plays an important role in the cultural lives of certain communities in the yam belt of West Africa (Onwueme, 1972; Asadu & Akammigbo, 1996). Yam is the most appreciated staple food by millions of people of West Africa and sub-Saharan Africa (IITA, 1993b).

Although the consumption of yam is on the increase, its production has been constrained by inadequate planting materials. Farmers are discouraged because some of them "milk" their yams immature to enable them produce seed yam as second harvest (Okonmah, 1980; Hahn *et al.*, 1987; Asadu *et al.*, 1987). Research efforts at removing the constraint culminated in developing the minisett techniques, which involves the use of setts of 25 g (Gyansa-Ameyaw *et al.*, 1999). The seed yam is preferred for its earlier and more reliable sprouts; also, it usually matures earlier than other types of seed pieces (IITA, 1993b; Hahn *et al.*, 1987). However, scant information is available on the seed yam size to produce optimum tuber yield. Onwueme (1972) and Asadu *et al.* (1987) recommended yam sett for sizeable "ware yam" production is 250 g.

This study investigated the effect of different weights of seed yam (250, 300, and 350 g) on growth and tuber yield of white yam.

Materials and methods

The experiment was set up at the Teaching and Research Farm of the Faculty of Agriculture, Delta State University, Asaba Campus, Anwai, Delta State, Nigeria. Asaba Campus is located at 06° 14^1 N and 06° 49^1E of the Equator. It lies in the tropical rainforest zone, characterized by 7 months of rainy season between April and October, punctuated by a short break in August. An annual rainfall ranges from 1500 to 1849.3 mm (Asaba Meteorological Bulletin, 2004). The study was set up during 2003 and 2004 cropping seasons. The land was cleared, ploughed, and harrowed. An experimental area of 10 m × 10 m was mapped out and plotted in to 1m × 1m with a borderline of 1m, fitted in to a randomized complete block design and replicated three times.

Composite soil (0-15 cm depth) samples were taken from the site, air-dried at room temperature, and passed through a 2-mm sieve before it was taken to IITA laboratory, Ibadan, Nigeria, for analysis. The chemical and physical characteristics of the soil at the experimental site showed that the soil is sandy loam; and it had *p*H (6.3), available P (10.4 ppm), organic carbon (0.71%), organic matter (1.24%), total nitrogen (0.08%), sand (69.41%), silt (22.25%); and clay (8.40%). Treatments of three different weights of seed yam (250 [as control], 300, and 350 g) were randomly planted on flat ground. White yam was collected from the National Root Crops Research Institute (NRCRI), Umudike. It was selected for this work because of its yielding ability in Delta State. Plants were grown rainfed under native soil fertility conditons. Fields were kept free of weeds by regular handweeding.

Data collected included vine length, number and basal diameter, and leaf number measured at

8, 10, and 12 weeks after planting (WAP). At 6 months after planting (MAP), sequel to senescing of the leaves and vines, yield parameters for fresh tuber weight, number and length were collected. Data collected were statistically analysed using procedures outlined in the general linear model (SAS, 1996), and means differences determined by LSD at 5 per cent level of significance.

Results and discussion

The results showed significant differences (P<0.05) among the different weights of seed yam (250, 300 and 350 g) in vine length, number and basal diameter, and leaf number measured at 8, 10, and 12 WAP, respectively (Table 1). There were no significant differences (P<0.05) between seed yam weight of 300 and 350 g, but they were significantly higher than seed yam weight of 250 g for all the growth parameters measured (Table 1). The numbers of vines per plant for seed yam weights 350 and 300 g were not significantly different, but higher numbers of vines were recorded in seed yams weighing 350 g. The result agreed with earlier findings of Onwueme (1972), Asadu *et al*. (1987), and Gyansa -Ameyaw *et al.* (1999) who reported that larger setts established quicker and were more vigorous in developing growth parameters such as vine length, number and basal diameter, and leaf number.

The increases in vine length, number and basal diameter, and leaf number were gradual as the weight of seed yam increased throughout the sampling period. The highest mean values of 4.5, 175 cm, 8 mm, and 69.8 were recorded for vine length, number and basal diameter, and leaf number, respectively, at 12 WAP (Fig. 1).

The results on yield parameters showed that the number, length, and fresh weight of tubers increased as the weight of seed yam increased from 250 to 350 g (Table 2). The highest mean value of 1.75 kg plant^{-1}, 2.93, and 38.86 cm for fresh tuber weight, number of tubers, and length of tubers, respectively, were recorded at 6 MAP (Table 2). The results showed that there were no

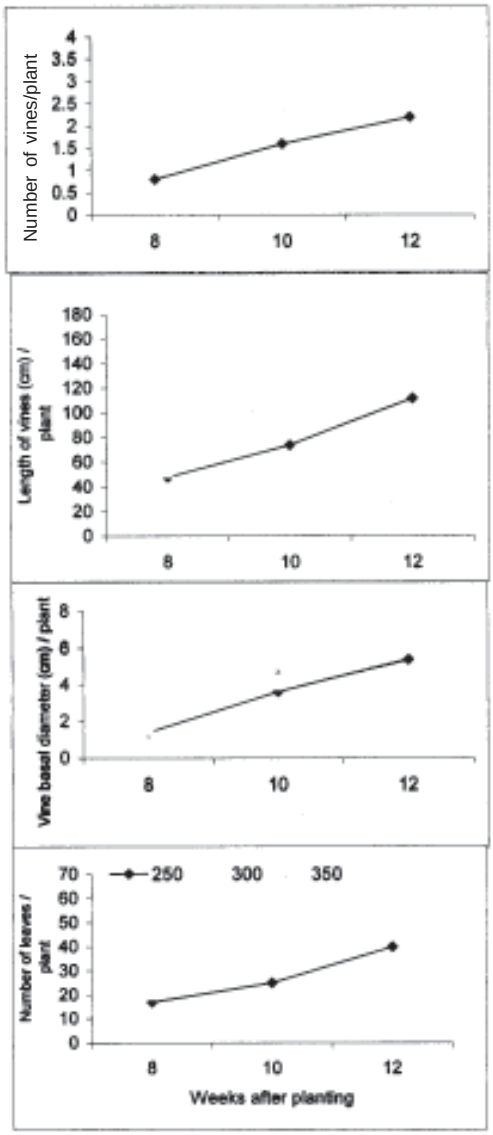

Fig. 1. Effect of different weights of seed yams (250, 300 and 350 g) on growth pattern (number of leaves, vine basal diameter, length of vines and number of vines) of white yam at 8, 10, and 12 weeks after planting.

significant differences (P<0.05) between seed yam weight of 300 and 350 g, but they were significantly higher than seed yam weight of 250 g for fresh tuber weight, number of tubers,

TABLE 1

Effect of Different Weights of Seed Yams on Number of Vines Per Plant, Length of Vines (cm), Vine Basal Diameter (mm), Number of Leaves at 12 Weeks After Planting (WAP)

Seed yam weight (g)	*Number of vines/plant*	*Length of vine (cm)*	*Vine basal diameter (cm)*	*Number of leaves*
350	3.5	165.0	7.0	59.8
300	3.0	138.6	6.3	46.7
250	2.2	112.1	5.4	23.7
LSD (0.05)	0.60	15.34	0.40	15.87

TABLE 2

Effect of Different Weights of Seed Yams on Fresh Tuber Weight, Number of Tubers, and Length of Tubers at 6 Months After Planting

Seed yam weight (g)	*Tuber yield (kg)/plant*	*Number of tubers/plant*	*Length of tubers (cm)/plant*
350	17.5	2.93	36.86
300	12.7	2.65	36.48
253	7.0	2.03	22.93
LSD (0.05)	0.23	0.31	5.57

and length of tubers. However, the highest values were recorded in seed yam weight of 350 g. This agrees with other reports that larger setts (or seed yams) produce greater yield of tubers in yam (Onwueme, 1972; Nwoke, Njoku & Okonkwo, 1974; Obigbesan, 1980; IITA, 1993b). The results showed that increase in number of tubers and length of tubers reached a maximum at seed yam weight of 300 g, after which further increase in weight of seed yam does not increase the number of tubers or length of tubers at harvest. Consequently, there were no significant differences between 300 and 350 g. Thus, this study shows that seed yam weight of 300 g is the ideal size for farmers growing white yam in acidic soils of Anwai, Delta State.

REFERENCES

Aighewi, B. A., Akoroda, M. O. & **Asiedu, R.** (2002) Seed yam (*Dioscorea rotundata* Poir) production, storage and quality in selected yam zones of Nigeria. *African Journal of Root and Tuber Crops* **5**(1), 20-23.

Asaba Meteorological Bulletin (2004) National Meteorological Report. In *Meteorological Bulletin* **2004**. Lagos, Nigerian.

Asadu, C. L. A. & **Akammigbo, F. O. R.** (1996) Performance of whole and cut setts of white yam for ware yam production in Southwestern Nigeria. *African Journal of Root and Tuber Crops* **1**(2), 18-22.

Asadu, C. L. A., Ezeumah, H. C., Nweke, F. I. & **Akammigbo, F. O. R.** (1987) The performance of size cultivars of white yam derived from three sources and evaluated across three zones in southern Nigeria. In "*Linking similar environment", cassava -based cropping system. Research* **1**, 215-223. Ibadan, Nigeria.

Brereton, L. (1986) Root and tuber crops in Barbados. Root crops production and research in the Caribbean. *Proceedings of a Regional Workshop held in Guadeloupe, Cali, Colombia.* pp. 19-29.

Coursey, U. G. (1967) *Yam on the account of the nature, origins, cultivation and utilization of the useful members of the Discoreaceae*. Longman, London, UK.

Gyansa-Ameyaw, C. E., Hahn, S. K., Alvarez, M. M. & Doku, E. V. (1999) Determination of optimal sett size for white guinea yam (*Dioscorea rotundata*, Poir) seed yam production: Trends in sprouting in presprout nursery and field performance. In *Tropical root crops in developing economy* (ed. F. Ofori and S. K. Hahn). *Proceeding of the 9th Symposium of the International Society of Tropical Root Crops*, 20-26 October 1991.

FAOSTAT (1997) *FAOSTAT 1997*. CDROM.

Hahn, S. K., Osiru, D. S., Akoroda, M. O. & **Otoo, J. A.** (1987) Yam production and its future prospects. *Outlook on Agriculture* **16**(3), 105-110.

IITA (1993b) *Yam improvement at IITA*. Ibadan, Nigeria.

Nwoke, E. I. O., Njoku, E. & **Okonkwo, S. N. C.**

(1974) *The effect of size of seed yams on yield of individual plants of* Dioscorea rotundata. Department of Botany, University of Nigeria, Nsukka (Memo). Nigeria.

Obigbesan, G. O. (1980) Growth yield and quality of Chinese yam (*Dioscorea esculenta,* Lour) as affected by seed tuber size. In *Proceedings of the 1st Triennial Root Crops Symposium* (ed. E. R. Terry, K. A. Oduro and E. Caveness). ISTRC-Africa branch, 8-12 September 1980. International Development Center. Ottawa, Canada.

Okonmah, L. U. (1980) *Rapid multiplication of yam*. IITA Manual Series No. 5. IITA, Ibadan. 22 pp.

Onwueme, I. C. (1972) Influence of the weight of the planted tuber on the growth and performance of white yam (*D. rotundata,* Poir) plants. *Nigeria Agric. Journal* **19**, 170-173.

SAS Institute (1996) *SAS user's guide*. Cary, NC, USA. 949 pp.