Tropical Root Crops

PRODUCTION AND USES IN AFRICA

Proceedings of the Special Symposium of the International Society for Root Crops —
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The International Society for Tropical Root Crops — Africa Branch was created in 1978 to stimulate research, production, and utilization of root and tuber crops in Africa and the adjacent islands. The activities include encouragement of training and extension, organization of workshops and symposia, exchange of genetic materials, and facilitation of contacts between personnel working with root and tuber crops. The Society’s headquarters are at the International Institute of Tropical Agriculture in Ibadan, Nigeria, but its executive council comprises eminent root and tuber researchers from national programs throughout the continent.

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TROPICAL ROOT CROPS: PRODUCTION AND USES IN AFRICA
ABSTRACT

A mixture of original research, updates on procedures, literature reviews, and survey reports, this document resulted from the second symposium of the International Society for Tropical Root Crops — Africa Branch, with 77 participants from 16 countries. The focus was cassava, yams, cocoyams, and sweet potatoes, from the perspectives of breeders, agronomists, soil specialists, plant pathologists, entomologists, nutritionists, food technologists, etc. Learning from past successes and failures, many of the researchers directed their efforts toward problems obstructing progress in reaching improved production and use of root crops and attempted to view, realistically, the context in which their results would be applied.

RÉSUMÉ

Résultats de recherches récentes, mises à jour sur les méthodes de recherche, revues de publications et rapports de sondages sont contenus dans ce document issu du Deuxième symposium de la Société internationale pour les plantes-racines tropicales — Direction Afrique, qui a réuni 77 participants de 16 pays. Des communications sur le manioc, le taro, le yam et la patate douce ont été présentées par des phytosélecteurs, des agronomes, des pédologues, des phytopathologistes, des entomologistes et des spécialistes de la nutrition et des aliments, entre autres. Tirant leçon de leurs succès et de leurs échecs, beaucoup de ces chercheurs ont dirigé leurs efforts vers la solution des problèmes qui entravent l’augmentation de la production et de la consommation des plantes-racines et ont tenté de considérer d’un œil réaliste le contexte qui sera celui de l’application de leurs recherches.

RESUMEN

Una mezcla de investigaciones originales, actualizaciones de procedimientos, reseñas de literatura e informes de encuestas, este documento es el resultado del segundo simposio de la Sociedad Internacional de Raíces Tropicales, Filial Africana, que contó con 77 participantes de 16 países. El simposio se centró en la yuca, el taro, el cocoyam y las batatas, desde la perspectiva de los fitomejoradores, los agrónomos, los especialistas en suelos, los patólogos vegetales, los entomólogos, los nutricionistas, los tecnólogos alimenticios, etc. A partir de los éxitos y fracasos anteriores, muchos de los investigadores encaminaron sus esfuerzos hacia los problemas que obstaculizan el avance para lograr una producción y un uso mejorados de las raíces y trataron de obtener una visión realista del contexto en que los resultados pueden ser aplicados.
TROPICAL ROOT CROPS:
PRODUCTION AND USES IN AFRICA

EDITORS: E.R. TERRY, E.V. DOKU, O.B. ARENE, AND N.M. MAHUNGU

PROCEEDINGS OF THE SECOND TRIENNIAL SYMPOSIUM OF THE INTERNATIONAL SOCIETY FOR TROPICAL ROOT CROPS — AFRICA BRANCH HELD IN DOUALA, CAMEROON, 14 – 19 AUGUST 1983
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OPTIMAL TIME FOR FERTILIZATION OF *Dioscorea rotundata*

S.C.O. Nwinyi

I compared the effects of applying fertilizer at 8. 9. 10. 11. and 12 weeks after planting (WAP) to determine the best time for fertilization of white yam (*Dioscorea rotundata* cv. Nwapoko). In 1981, the differences between treatments were not significant from each other or from the control (no fertilizer); but, in 1982, yields for all treatments were significantly higher than those for the control (ranging between \( P < 0.05 \) and \( P < 0.001 \)) but not significantly different from one another.

Sobulo (1972b) reported that the last week of April or the first week of May was ideal for fertilization of yams planted in December–February in western Nigeria. Koli (1973) reported good response from split applications at 4 and 12 weeks after planting in northern Ghana. Onwume (1978) recommended fertilization at 1 month after shoot emergence, whereas Obighesan and Agboola (1978) recommended waiting until the yam vines are established. Enwezor and I (1980) suggested that the best time was 9–12 weeks after planting (WAP), which, according to Yayock et al. (1980), is similar to the practice in Nigeria. fertilizer being applied at about 8 WAP or as soon as the soil is sufficiently moist. Recognizing that the onset of rains and their distribution influence the time for planting and fertilization. I attempted to determine the most suitable time to fertilize rain-fed white yam to boost yields in eastern Nigeria.

**MATERIALS AND METHODS**

The study was carried out at Umudike in 1981 and at Umudike, Nsukka, and Igbariam in 1982. The two experimental sites at Umudike were at the National Root Crops Research Institute, 122 m above sea level. Although the sites had been cultivated earlier, there was no record of fertilization. The site at Nsukka was at the University of Nigeria faculty of agriculture farm, 447 m above sea level. The site was sandy and had not been cropped since 1976 when it was acquired by the university. The site at the Igbariam farm settlement, 34 m above sea level, was on ground that had been planted to palm but was bulldozed in 1979 and allowed to revert to bush (mainly *Imperata cylindrica*, *Eupatorium* spp., *Andropogon tectorum*, and mixed shrubs).

In each location, the field was cleared of existing vegetation, burned, plowed, and harrowed before being divided into 0.144-ha sections for the experiment. Ridges, 1 m high, were formed with a mould-board ridger, and 30 plots (8 m \( \times \) 6 m), consisting of six 8-m-long ridges each, were planted with sets (average weight 0.25 kg) of *D. rotundata* cv. Nwapoko. 1 m \( \times \) 1 m apart. The soils were analyzed, and, after sprouting, the yams were staked singly, two stakes from each of two adjacent ridges being tied together to ensure effective support. The plots were kept weed-free by hand.

Fertilizer (100 kg N. 40 kg P. 100 kg K) was placed in a 3–4 cm deep groove on both sides of the ridges. 15 cm from the crest. The different treatments were for time of application (8, 9, 10, 11, or 12 WAP and no fertilization as the control). The experimental design was a randomized complete block, with five replications. The yams were allowed to grow till complete senescence of the aerial parts and were harvested 30 WAP.

**RESULTS AND DISCUSSION**

At the two sites in Umudike in 1981, the soils were not deficient (Table 1), and, thus, the control plots were able to support yields that did not differ significantly from those for fertilized plots. In 1982, however, the soils were nutrient poor, and yields from the control plots were
Table 1. Results of soil analyses at the experimental sites (0—23 cm deep).

<table>
<thead>
<tr>
<th>Site</th>
<th>Site</th>
<th>pH</th>
<th>Organic carbon (%)</th>
<th>N (%)</th>
<th>P (ppm)</th>
<th>Carbon exchange capacity (meq/100 g)</th>
<th>Total exchangeable base (meq/100 g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ca</td>
<td>Mg</td>
</tr>
<tr>
<td>Umudike</td>
<td>(9/4/81)</td>
<td>5.80</td>
<td>1.95</td>
<td>0.157</td>
<td>3.25</td>
<td>6.08</td>
<td>2.672</td>
</tr>
<tr>
<td></td>
<td>(22/4/81)</td>
<td>5.50</td>
<td>1.50</td>
<td>0.224</td>
<td>4.02</td>
<td>2.21</td>
<td>0.695</td>
</tr>
<tr>
<td></td>
<td>(30/3/82)</td>
<td>4.95</td>
<td>1.54</td>
<td>0.138</td>
<td>0.00</td>
<td>5.60</td>
<td>0.075</td>
</tr>
<tr>
<td>Nsukka</td>
<td>(14/4/82)</td>
<td>5.00</td>
<td>0.64</td>
<td>0.057</td>
<td>3.675</td>
<td>2.23</td>
<td>0.035</td>
</tr>
<tr>
<td>Igbariam</td>
<td>(12/5/82)</td>
<td>5.10</td>
<td>0.49</td>
<td>0.044</td>
<td>0.00</td>
<td>3.54</td>
<td>0.065</td>
</tr>
</tbody>
</table>

Table 2. Fresh tuber yield (t/ha) of D. rotundata.

<table>
<thead>
<tr>
<th>Planting date (day/month/year)</th>
<th>Umudike</th>
<th>Nsukka</th>
<th>Igbariam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>18.33</td>
<td>13.92</td>
<td>14.78</td>
</tr>
<tr>
<td>Treatment (WAP)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>—</td>
<td>18.83*</td>
<td>22.05**</td>
</tr>
<tr>
<td>9</td>
<td>22.01NS</td>
<td>13.90NS</td>
<td>19.17**</td>
</tr>
<tr>
<td>10</td>
<td>22.77NS</td>
<td>15.56NS</td>
<td>18.50*</td>
</tr>
<tr>
<td>11</td>
<td>20.30NS</td>
<td>15.06NS</td>
<td>21.67**</td>
</tr>
<tr>
<td>12</td>
<td>20.28NS</td>
<td>16.27NS</td>
<td>22.25**</td>
</tr>
</tbody>
</table>

*Significance levels: NS = not significant; * = significant at 0.05; ** = significant at 0.01; *** = significant at 0.001.

significantly lower than those from fertilized plots. Although the yields generally increased with the length of time before fertilization, the differences between treatments were not significant except on the Igbariam plots. The trend for increasing benefit with increasing time before fertilization did not hold for the Igbariam plots, probably because the rains had stopped and the last two applications were preceded by about a month of dry weather. This finding confirms Sobulo’s (1972b) observation that rainfall distribution affects the optimal time for fertilization.

The results suggest that fertilization of white yam is effective any time from 8 to 12 WAP. Hamid (1973) and Fayemi (1966) showed that fertilizer application is most effective when it corresponds to the critical time of increased nutrient requirement of the crops, and Jones (1973) observed that root growth of crops kept pace with downward wetting of the subsoil. Jones (1976) further reported that leaching efficiency varied with texture of the soil and that a low-leaching efficiency was related to slow wetting of the subsoil. These findings support the practice of applying fertilizer after the onset of rains, about 8 WAP, and support the observation (Sobulo 1972b) that annual rainfall distribution affects the best time for fertilizer application.

I wish to thank the Director, National Root Crops Research Institute, Umudike, for provision of facilities for this work, and for permission to publish it. I am particularly indebted to S.W. Agua and R.U. Onukwubiri for their assistance at various stages of this work.