Tropical Root Crops

RESEARCH STRATEGIES FOR THE 1980s

Proceedings of the First Triennial Root Crops Symposium of the International Society for Tropical Root Crops - Africa Branch
TROPICAL ROOT CROPS: RESEARCH STRATEGIES FOR THE 1980S

PROCEEDINGS OF THE FIRST TRIENNIAL ROOT CROPS SYMPOSIUM OF THE INTERNATIONAL SOCIETY FOR TROPICAL ROOT CROPS — AFRICA BRANCH, 8—12 SEPTEMBER 1980, IBADAN, NIGERIA

EDITORS: E.R. TERRY, K.A. ODURO, AND F. CAVENESS

Although the editorial chores for these proceedings were the sole responsibility of the editors, the International Society for Tropical Root Crops — Africa Branch has a full Editorial Board comprising E.R. Terry, O.B. Arene, E.V. Doku, K.A. Oduro, W.N. Ezeilo, J. Mabanza, and F. Nweke. This Board serves the Society in various editorial capacities at all times.
The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre’s activity is concentrated in five sectors: agriculture, food and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre’s headquarters are in Ottawa, Canada. Regional offices are located in Africa, Asia, Latin America, and the Middle East.

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 is 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.

©1981 International Development Research Centre
Postal Address: Box 8500, Ottawa, Canada K1G 3H9
Head Office: 60 Queen Street, Ottawa

Terry, E.R.
Oduro, K.A.
Caveness, F.

International Society for Tropical Root Crops. Africa Branch, Ibadan NG


UDC: 633.4 (213) ISBN: 0 88936 285 8

Microfiche edition available
Cooperating institutions
CONTENTS

Foreword E.R. Terry ................................................................. 7

Participants ................................................................. 9

Welcoming Addresses
Bede N. Okigho, President, International Society for Tropical Root Crops —
Africa Branch ................................................................. 15
Alhaji Ibrahim Gusau, Minister of Agriculture, Nigeria ......................... 17
S. Olajuwon Olayide, Vice-Chancellor, University of Ibadan, Nigeria ........ 19
E. Hartmans, Director-General, International Institute of Tropical Agricul-
ture, Nigeria .................................................................. 22

Cassava
Cassava Improvement Strategies for Resistance to Major Economic Diseases
Cassava Improvement in the Programme National Manioc in Zaire: Objectives
and Achievements up to 1978 H.C. Ezumah .................................. 29
Assessment of Cassava Cultivars for Extension Work C. Oyolu ............... 35
Breeding Cassava Resistant to Pests and Diseases in Zaire T.P. Singh ....... 37
Selection of Cassava for Disease and Pest Resistance in the Congo Joseph
Mabanza ........................................................................ 40
Some Characteristics of Yellow-Pigmented Cassava K.A. Oduro ............... 42
Cassava: Ecology, Diseases, and Productivity: Strategies for Future
Research E.R. Terry ............................................................ 45
Field Screening of Cassava Clones for Resistance to Cercospora henningsii
J.B.K. Kasirivu, O.F. Esuruoso, and E.R. Terry ................................. 49
Properties of a Severe Strain of Cassava Latent Virus Isolated from Field-
Grown Tobacco in Nigeria E.C.K. Igwegbe ................................ 58
Cassava Bacterial Blight Disease in Uganda G.W. Otim-Nape and T.
Sengooba ........................................................................ 61
Insect Dissemination of Xanthomonas manihotis to Cassava in the People’s
Republic of Congo J.F. Daniel, B. Boher, and N. Nkouka ...................... 66
Cassava Root Rot due to Armillariella tabescens in the People’s Republic of
Congo Casimir Makambila ...................................................... 69
Screening for Resistance Against the Green Spider Mite K. Leuschner ...... 75
Biological Control of the Cassava Mealybug Hans R. Herren ................. 79
Entomophagous Insects Associated with the Cassava Mealybug in the People’s
Republic of Congo G. Fabres .................................................. 81
Dynamics of Cassava Mealybug Populations in the People’s Republic of
Congo G. Fabres ............................................................... 84
Consumption Patterns and Their Implications for Research and Production in
Tropical Africa Felix I. Nweke ............................................. 88
Problems of Cassava Production in Malawi  
R.F. Nembozanga Sauti ............... 95

Evaluation of Some Major Soils from Southern Nigeria for Cassava Production  
J.E. Okeke and B.T. Kang ............... 99

Effects of Soil Moisture and Bulk Density on Growth and Development of Two Cassava Cultivars  
R. Lal .................................. 104

Performance of Cassava in Relation to Time of Planting and Harvesting  
F.O.C. Ezedinma, D.G. Ibe, and A.I. Onwuchuruwa ....................... 111

The Effects of Previous Cropping on Yields of Yam, Cassava, and Maize  
S.O. Oduruwke and U.I. Oji ............... 116

Intercropping of Plantains, Cocoyams, and Cassava  
S.K. Karikari ............................ 120

Weed Control in Maize—Cassava Intercrop  
I. Okezie Akobundu ...................... 124

Effect of Maize Plant Population and Nitrogen Application on Maize—Cassava Intercrop  
B.T. Kang and G.F. Wilson ............... 129

Cassava Leaf Harvesting in Zaire  
N.B. Lutaladio and H.C. Ezumah ........... 134

Effects of Leaf Harvests and Detopping on the Yield of Leaves and Roots of Cassava and Sweet Potato  
M.T. Dahniya ................................ 137

Metabolism, Synthetic Site, and Translocation of Cyanogenic Glycosides in Cassava  
M.K.B. Bediako, B.A. Tapper, and G.G. Pritchard ......................... 143

Loss of Hydrocyanic Acid and Its Derivatives During Sun Drying of Cassava  
Emmanuel N. Maduagwu and Aderemi F. Adewale ......................... 149

The Role of Palm Oil in Cassava-Based Rations  
Ruby T. Fomunyam, A.A. Adegbola, and O.L. Oke ......................... 152

Comparison of Pressed and Unpressed Cassava Pulp for Gari Making  
M.A.N. Ejiofor and N. Okafor ..................... 154

Gari Yield from Cassava: Is it a Function of Root Yield?  
D.G. Ibe and F.O.C. Ezedinma ..................... 159

Yams

Parameters for Selecting Parents for Yam Hybridization  
Obinani O. Okoli and E.U. Okpala ............................................ 163

And E.U. Okpala ........................................... 166

Strategies for Progress in Yam Research in Africa  
I.C. Onwueme .......................................... 173

Study of the Variability Created by the Characteristics of the Organ of Vegetative Multiplication in Dioscorea alata  
N. Ahoussou and B. Toure .......................... 177

Growth Pattern and Growth Analysis of the White Guinea Yam Raised from Seed  
C.E. Okezie, S.N.C. Okonkwo, and F.I. Nweke ......................... 180

Artificial Pollination, Pollen Viability, and Storage in White Yam  
M.O. Akoroda, J.E. Wilson, and H.R. Chheda ......................... 189

Improving the In-Situ Stem Support System for Yams  
G.F. Wilson and K. Akapa ................................................. 195

Yield and Shelf-Life of White Yam as Influenced by Fertilizer  
K.D. Kpeglo, G.O. Obigbesan, and J.E. Wilson ......................... 198

Weed Interference in White Yam  
R.P.A Unamma, I.O. Akobundu, and A.A.A. Fayemi ......................... 203

The Economics of Yam Cultivation in Cameroon  
S.N. Lyonga ........................................... 208

Effect of Traditional Food Processing Methods on the Nutritional Value of Yams in Cameroon  
Alice Bell and Jean-Claude Favier ......................... 214

Cocoyams

Strategies for Progress in Cocoyam Research  
E.V. Doku ........................................... 227

Root and Storage-Rot Disease of Cocoyam in Nigeria  
G.C. Okeke ........................................... 231
Fungal Rotting of Cocoyams in Storage in Nigeria J.N.C. Maduewesi and Rose C.I. Onyike .................................................. 235
A Disease of Cocoyam in Nigeria Caused by \textit{Corticium rolfsii} O.B. Arene and E.U. Okpala ........................................ 239
Cocoyam Farming Systems in Nigeria H.C. Knipscheer and J.E. Wilson ................................................................. 247
Yield and Nitrogen Uptake by Cocoyam as Affected by Nitrogen Application and Spacing M.C. Igbokwe and J.C. Ogbannaya ........................................ 255

Abstracts
Cassava Research Program in Liberia Mallik A-As-Saqui .................. 259
Effects of Cassava Mosaic on Yield of Cassava Godfrey Chapola ......... 259
Effects of Green Manure on Cassava Yield James S. Squire ............... 260
Alleviating the Labour Problem in Yam Production: Cultivation without Stakes or Manual Weeding I.C. Onwueme ........................................ 260

Discussion Summary
Strategies for the 1980s ..................................................... 263

References ................................................................. 265
YIELD AND SHELF-LIFE OF WHITE YAM AS INFLUENCED BY FERTILIZER

K.D. KPEGLO, G.O. OBIGBESAN, AND J.E. WILSON

INTERNATIONAL INSTITUTE OF TROPICAL AGRICULTURE, IBADAN, NIGERIA

Studies were undertaken to assess the influence of fertilizer nutrient elements (N, P, and K) on the yield and storability of tubers of the white yam, Dioscorea rotundata. The yam cultivar, Nwapoko, responded significantly to high rates of nitrogen (90 kg N/ha), low rates of phosphorus (30 kg P/ha) in soils low in these nutrients — an indication of the high nitrogen but low phosphorus requirements of the yam plant. Highest yields were obtained from the nutrient combinations of N45P0K30, N90P25K30, and N90P50K30, which produced tuber yields of 42.65, 42.95, and 42.22 t/ha, respectively, or marketable tubers of 38.43, 34.03, and 34.28 t/ha, respectively, representing yield increases of up to 36.9% over the control plot. Loss in tuber weight during storage was not significantly affected by N, P, or K fertilization. However, high rates of nitrogen significantly increased the percent sprouting of stored tubers, and increasing rates of phosphorus and potassium tended to suppress sprouting and, thus, enhance the storability. It is indicated that P and K fertilizers applied to yams would enhance the storage life of the tuber up to about 3–3.5 months after harvest.

Correct assessment of fertilizer input for optimum results constitutes a major problem in yam production. In subsistence farming, the yam has traditionally been the first crop in a rotation of newly cleared land or after a fallow; thus it has benefited from the natural fertility of the soil. In intensive agriculture, the same plots are cultivated more frequently so that nutrient removal from the soil through crop harvest is much greater than it was previously. Because yams make high demands on soil nutrients (Obigbesan et al. 1976; Obigbesan 1977), farmers in yam-growing areas need to supplement the natural fertility of the soil by applying mineral fertilizers. Another important aspect of yam production is postharvest storage. Many farmers still believe that fertilizers have a deleterious effect on the yam crop either by burning it or by rendering the tubers more susceptible to rot in storage. Although there have been several studies on the storage of yams, these have been scarcely related to fertilizer use (Coursey 1967a; Adesuyi 1973). The few reports available have indicated that nitrogen, phosphorus, and potassium fertilizers do not significantly affect the weight loss of tubers in storage (Umanah 1973; Lyonga 1976; Azih 1976). The aim of our study was to investigate the response of a popular cultivar of Dioscorea rotundata to N, P, and K fertilizers and the effects of these nutrient elements on weight loss and sprouting of tubers during storage, as early sprouting nullifies the shelf-life of the tubers.

MATERIALS AND METHODS

The investigations were carried out at the International Institute of Tropical Agriculture from April 1977 through May 1979. The 1977 experi-
N45 N0

Table 1. Effect of N, P, and K on fresh tuber yield (t/ha) of white yam, Nwapoko cultivar, 1978. *

<table>
<thead>
<tr>
<th></th>
<th>P₀</th>
<th>P₂₅</th>
<th>P₆₀</th>
</tr>
</thead>
<tbody>
<tr>
<td>K₀</td>
<td>K₃₀</td>
<td>K₆₀</td>
<td>K₀</td>
</tr>
<tr>
<td>N₀ 31.37</td>
<td>35.14</td>
<td>33.79</td>
<td>39.87</td>
</tr>
<tr>
<td>K₃₀ 45.37</td>
<td>42.65a</td>
<td>37.49</td>
<td>40.86</td>
</tr>
<tr>
<td>K₆₀ 40.70</td>
<td>37.78</td>
<td>36.63</td>
<td>41.08ab</td>
</tr>
</tbody>
</table>

*Values with a common letter are not significantly different at a 5% probability level as determined by Duncan's new multiple range test.

For storage, 20 marketable tubers from each treatment plot were tied on racks in a traditional barn for 6 months. The average day and night temperatures in the barn were 35.0°C and 25.3°C, and the respective average relative humidities were 40% and 94%. Sprouted tubers were counted every 2 weeks, and the sprouting percentage was determined as the ratio of the number of sprouted tubers to the number of tubers left at the time of observation multiplied by 100. Rotten tubers were discarded every 8 weeks, and the remaining tubers were weighed. Percent weight loss was also determined — initial weight minus weight at time of observation divided by initial weight times 100 at 8, 16, and 24 weeks after harvest. Sprouts were removed after each recording.

RESULTS AND DISCUSSION

YIELDS AND YIELD COMPONENTS

Table 1 shows the effect of N, P, and K on fresh yields, which ranged from 31.11 t/ha to 42.95 t/ha. Table 2 shows the effects on marketable yield. The highest marketable yields represented increases of up to 36.9% over the control, unfertilized plants. It

Table 2. Effect of N, P, and K on marketable tuber yield (t/ha) of white yam, Nwapoko cultivar, 1978. *

<table>
<thead>
<tr>
<th></th>
<th>P₀</th>
<th>P₂₅</th>
<th>P₆₀</th>
</tr>
</thead>
<tbody>
<tr>
<td>K₀</td>
<td>K₃₀</td>
<td>K₆₀</td>
<td>K₀</td>
</tr>
<tr>
<td>N₃₅ 27.74bcd</td>
<td>38.43a</td>
<td>31.21abcd</td>
<td>33.87abcd</td>
</tr>
<tr>
<td>N₆₀ 31.02abcd</td>
<td>31.88abcd</td>
<td>29.46abcd</td>
<td>33.14abcd</td>
</tr>
</tbody>
</table>

*Values with a common letter are not significantly different at a 5% probability level as determined by Duncan's new multiple range test; each value is the mean of three observations.
Table 3. Effect of NPK on average tuber weight (kg/tuber) of white yam, Nwapoko cultivar, 1978.*

<table>
<thead>
<tr>
<th></th>
<th>P₀</th>
<th>P₂₅</th>
<th>P₅₀</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>K₀</td>
<td>K₃₀</td>
<td>K₆₀</td>
</tr>
<tr>
<td>N₀</td>
<td>1.97d</td>
<td>2.08d</td>
<td>2.12cd</td>
</tr>
<tr>
<td>N₄₅</td>
<td>3.05a</td>
<td>3.05a</td>
<td>3.05a</td>
</tr>
<tr>
<td>N₉₀</td>
<td>2.69abcd</td>
<td>2.47abcd</td>
<td>2.57abcd</td>
</tr>
</tbody>
</table>

*Values with a common letter are not significantly different at a 5% probability level as determined by Duncan’s new multiple range test.

Table 4. Effect of NPK on number of tubers per 100 plants of white yam, Nwapoko cultivar, 1978.*

<table>
<thead>
<tr>
<th></th>
<th>P₀</th>
<th>P₂₅</th>
<th>P₅₀</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>K₀</td>
<td>K₃₀</td>
<td>K₆₀</td>
</tr>
<tr>
<td>N₀</td>
<td>159</td>
<td>170</td>
<td>163</td>
</tr>
<tr>
<td>N₄₅</td>
<td>144</td>
<td>141</td>
<td>157</td>
</tr>
<tr>
<td>N₉₀</td>
<td>144</td>
<td>154</td>
<td>143</td>
</tr>
</tbody>
</table>

*No significant difference at 5% probability level as determined by Duncan’s new multiple range test; each value is the mean of three observations.

was strikingly evident that the yield increases were due to increased tuber size and not due to the number of tubers (Table 3 and 4).

Doubling the nitrogen input from 45 kg/ha to 90 kg/ha doubled the yield increase (7.33 compared with the previous 3.39 t/ha); a phosphorus level of 25 kg/ha was more effective (8.5 t/ha yield increase) than the higher rate of 50 kg/ha (3.17 t/ha yield increase). This result indicates the high-nitrogen, low-phosphorus requirements of the cultivar in this soil (Table 5). Similarly, K applied at 30 kg/ha was more beneficial than were higher doses on this potassium-sufficient soil.

Nitrogen and phosphorus application resulted in significantly larger tubers (Table 6). The weight of marketable tubers was also significantly improved by phosphorus application at 25 kg/ha (Table 6). These results indicate the limits of the beneficial effects of the nutrient elements in yam production. High P and high K levels depressed both the total yield and the marketable tubers of the yam cultivar. Several workers (Rouanet 1967; Gooding and Hoad 1967; Lyonga 1976) have reported positive yield responses to fertilizer input on soils where the levels of N, P, and K were low. Obigbesan et al. (1976), Obigbesan (1977), and Young (1976) pointed out that soils with less than 0.1% N, less than 10 ppm P (Bray I-P), and exchangeable potassium less than 0.15 me/100 g could be considered deficient and that positive responses of yams

Table 5. Limit of beneficial effect of each nutrient element on D. rotundata, 1978.*

<table>
<thead>
<tr>
<th></th>
<th>Fresh tuber yield (t/ha)</th>
<th>Increase in yield (Δt/ha)</th>
<th>Average tuber weight (kg/tuber)</th>
<th>Increase in tuber weight (Δkg/tuber)</th>
<th>Marketable yield (t/ha)</th>
<th>Increase in marketable yield (Δt/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N₀</td>
<td>31.37 b</td>
<td>-</td>
<td>1.97 b</td>
<td>-</td>
<td>24.65 b</td>
<td>-</td>
</tr>
<tr>
<td>N₄₅</td>
<td>34.76 ab</td>
<td>3.39</td>
<td>2.43 ab</td>
<td>0.46</td>
<td>27.74 b</td>
<td>3.09</td>
</tr>
<tr>
<td>N₉₀</td>
<td>38.70 a</td>
<td>7.33</td>
<td>2.69 a</td>
<td>0.72</td>
<td>31.02 b</td>
<td>6.37</td>
</tr>
<tr>
<td>P₀</td>
<td>31.37 b</td>
<td>-</td>
<td>1.97 b</td>
<td>-</td>
<td>24.65 b</td>
<td>-</td>
</tr>
<tr>
<td>P₂₅</td>
<td>39.87 a</td>
<td>8.50</td>
<td>2.55 a</td>
<td>0.58</td>
<td>34.54 a</td>
<td>9.87</td>
</tr>
<tr>
<td>P₅₀</td>
<td>34.54 ab</td>
<td>3.17</td>
<td>2.51 a</td>
<td>0.54</td>
<td>27.62 b</td>
<td>2.97</td>
</tr>
<tr>
<td>K₀</td>
<td>31.37 b</td>
<td>-</td>
<td>1.97 a</td>
<td>-</td>
<td>24.65 b</td>
<td>-</td>
</tr>
<tr>
<td>K₂₅</td>
<td>35.14 b</td>
<td>3.77</td>
<td>2.08 a</td>
<td>0.11</td>
<td>27.24 b</td>
<td>2.59</td>
</tr>
<tr>
<td>K₅₀</td>
<td>33.79 b</td>
<td>2.42</td>
<td>2.12 a</td>
<td>0.15</td>
<td>26.59 b</td>
<td>1.94</td>
</tr>
</tbody>
</table>

*Values with a common letter for a nutrient and within a column and nutrient are not significantly different at a 5% probability level as determined by Duncan’s new multiple range test.
to fertilizer are likely in such soils. Our precropping soil data (pH 5.3, 0.99% organic C, 0.088% N, 6.8 ppm P, and K, 0.35 me/100 g) indicated nitrogen and phosphorus fertilizer applications could be beneficial but not potassium.

**STORAGE**

The effects of nitrogen, phosphorus, and potassium fertilizers on the percent weight loss of stored tubers are shown in Table 6. Compared with the percent from untreated plots (N₀P₀K₀), the nutrient elements (N, P, and K) applied at high rates tended to reduce the percent weight loss up to 16 weeks after harvest (Table 6), and this observation was also more or less valid for plants that received high fertilizer rates in the 1977 experiment (Table 6). However, the differences were, as determined by Duncan’s new multiple range test, not statistically significant. Earlier investigators, Umanah (1973), Azih (1976), and Lyonga (1976) observed no effect of N, P, and K on weight loss of stored tubers.

The most important result of the storage studies was that increasing rates of nitrogen significantly increased the percent sprouting (Table 7). This N effect was more consistent in the 1978 results than in the 1977 preliminary studies. Differences between untreated and N-fertilized plants were significant up to 13 weeks after harvest (WAH). In contrast, the sprouting of tubers from P-fertilized plants was significantly suppressed up to 14 WAH. Although practically no differences were observed in K-treated and untreated plants in 1977, the 1978

### Table 6. Effect of each nutrient on percent weight loss of tubers of D. roundata cv. Nwapoko, during storage in 1978 (figures in parentheses are for 1977).a

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>8</th>
<th>16</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>N₀</td>
<td>26.68 (5.40)</td>
<td>55.20 (31.64)</td>
<td>63.63 (62.27)</td>
</tr>
<tr>
<td>N₄₅(N₅₀)</td>
<td>32.48 (7.09)</td>
<td>56.89 (29.81)</td>
<td>64.24 (50.79)</td>
</tr>
<tr>
<td>N₉₀(N₅₀₀)</td>
<td>19.32 (7.28)</td>
<td>46.85 (27.41)</td>
<td>60.47 (61.92)</td>
</tr>
<tr>
<td>(N₁₅₀)</td>
<td>(6.48)</td>
<td>(28.74)</td>
<td>(56.14)</td>
</tr>
<tr>
<td>P₀</td>
<td>26.68 (5.40)</td>
<td>55.20 (31.64)</td>
<td>63.63 (62.27)</td>
</tr>
<tr>
<td>P₂₅</td>
<td>29.32</td>
<td>53.71</td>
<td>63.63</td>
</tr>
<tr>
<td>P₅₀</td>
<td>20.17 (6.65)</td>
<td>47.00 (32.47)</td>
<td>59.93 (59.38)</td>
</tr>
<tr>
<td>K₀</td>
<td>26.68 (5.40)</td>
<td>55.20 (31.64)</td>
<td>63.63 (62.27)</td>
</tr>
<tr>
<td>K₅₀</td>
<td>34.79</td>
<td>60.11</td>
<td>69.76</td>
</tr>
<tr>
<td>K₆₀</td>
<td>27.47 (3.68)</td>
<td>58.44 (27.22)</td>
<td>68.24 (60.93)</td>
</tr>
</tbody>
</table>

**a**No significant difference among values of each nutrient as determined by Duncan’s new multiple range test at a 5% probability level.

### Table 7. Effect of each nutrient on percent sprouting of tubers of white yam, Nwapoko cultivar, during storage in 1978 (figures in parentheses are for 1977).a

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>7 (8)</th>
<th>9 (10)</th>
<th>11 (12)</th>
<th>13 (14)</th>
<th>15 (16)</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>N₀</td>
<td>15.97 (6.67)</td>
<td>27.40 (45.70)</td>
<td>61.14 (81.40)</td>
<td>75.56b (91.49)</td>
<td>96.97 (98.33)</td>
<td>96.97</td>
</tr>
<tr>
<td>N₄₅(N₅₀)</td>
<td>16.55 (5.0)</td>
<td>24.98 (41.23)</td>
<td>73.04 (74.03)</td>
<td>89.28ab (87.81)</td>
<td>94.87 (100.00)</td>
<td>100.00</td>
</tr>
<tr>
<td>N₉₀(N₅₀₀)</td>
<td>19.06 (15.18)</td>
<td>49.78 (54.12)</td>
<td>79.17 (77.63)</td>
<td>100.00a (94.82)</td>
<td>100.00 (98.33)</td>
<td>100.00</td>
</tr>
<tr>
<td>(N₁₅₀)</td>
<td>(15.00)</td>
<td>(47.46)</td>
<td>(73.16)</td>
<td>(93.33)</td>
<td>(100.00)</td>
<td></td>
</tr>
<tr>
<td>P₀</td>
<td>15.97 (6.67)</td>
<td>29.40 (45.70)</td>
<td>61.14 (81.40)</td>
<td>75.56 (91.49)</td>
<td>96.97 (98.33)</td>
<td>96.97</td>
</tr>
<tr>
<td>P₂₅</td>
<td>12.67</td>
<td>-</td>
<td>65.95</td>
<td>93.05</td>
<td>-</td>
<td>95.01</td>
</tr>
<tr>
<td>P₅₀</td>
<td>14.25 (3.33)</td>
<td>30.46 (35.96)</td>
<td>70.46 (71.49)</td>
<td>89.78 (86.58)</td>
<td>92.04 (98.33)</td>
<td>100.00</td>
</tr>
<tr>
<td>K₀</td>
<td>15.97 (6.67)</td>
<td>29.40 (45.70)</td>
<td>61.14 (81.40)</td>
<td>75.56b (91.49)</td>
<td>96.97b (98.33)</td>
<td>95.01</td>
</tr>
<tr>
<td>K₅₀</td>
<td>18.50</td>
<td>-</td>
<td>66.16</td>
<td>95.00a</td>
<td>-</td>
<td>100.00a</td>
</tr>
<tr>
<td>K₆₀</td>
<td>7.41 (11.67)</td>
<td>18.75 (46.67)</td>
<td>48.64 (76.67)</td>
<td>67.91b (95.00)</td>
<td>83.33b (100.00)</td>
<td>97.44</td>
</tr>
</tbody>
</table>

**a**Values with a common letter within a column are not significantly different at a 5% probability level as determined by Duncan’s new multiple range test.
results showed that the sprouting during storage tended to be retarded in the tubers from plots fertilized with high K rates (Table 7) up to 15 WAH. It can, therefore, be inferred that P and K fertilizers applied to yams enhance the storage life of the yam tubers up to about 3–3.5 months after harvest.

**CONCLUSION**

The role of nitrogen in yam production is uniquely important. This study demonstrates that apart from increasing the total fresh tuber and marketable yields, nitrogen also promotes the sprouting of tubers in storage. Thus, farmers who apply heavy nitrogen doses for high yields have to sell their harvested tubers or process them early to avoid economic losses resulting from excessive sprouting. High rates of nitrogen application for high yields simultaneously provide means of hastening the sprouting and thus breaking the dormancy of the stored tubers. This fact may be useful for rapid multiplication of selected materials in breeding programs.

The results also indicate that optimum nutrient combinations reduce not only the percent weight loss in storage but also the percent of tubers sprouting during storage. For example, a farmer who wishes to reduce weight loss of tubers and who can either process or sell them soon after harvest would have optimum results with application of high-nitrogen fertilizer, whereas one who wishes to reduce sprouting and thus increase shelf-life of tubers would have better luck with low-nitrogen, high phosphorous, potassium fertilizers.

The tendency of the tubers of P- and K-fertilized plants to exhibit suppressed sprouting up to about 3.5 months after harvest needs further investigation and confirmation on other yam cultivars.