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Research Article

# Growth and Yield Performance of Some Selected Accessions of *Solenostemon Rotundifolius* (Poir)

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## Abstract

*Solenostemon rotundifoluis* (Poir) J.K.Morton is among the minor and underutilized tuber crops species in Africa which is experiencing a gradual genetic erosion. There is little information on the agronomic practice, production, utilization and processing of the crop. The need to intensify research on the cultivation of the crop in Nigeria in terms of growth and performance has become imperative. In this experiment, some selected accessions of *Solenostemon rotundifoluis* were grown in Jos-Plateau state, Nigeria, and evaluation of the crop for its yield and growth performance was carried out. The experiment was laid out in completely randomized design (CRD) with three replicates. Results obtained showed significant differences amongst the accessions. The leaf area index increased with time up to 135 days after planting (135 DAP) and thereafter decreased in all the accessions. Relative growth rate and net assimilation rate also increased with the crop age up to 90 days after planting, and thereafter decreased in all the accessions. Also, the harvest index increased with time up to 180 days after planting. The yield for fresh harvested tubers was low in all the accessions of *Solenostemon rotundifoluis* used in this study. This experiment shows that further study should be carried out for yield improvement in the *Solenostemon rotundifoluis*.

**Keywords:** *Solenostemon Rotundifolius*; Accessions; Growth; Yield

## Introduction

*Solenostemon rotundifoliius* (Poir) J.K. Morton is among the minor tuber crops consumed in most African countries and Southeast Asia. It is a crop with the potential of reducing poverty, hunger and starvation in low-income families and contributing to food security in Nigeria [1]. It is a small herbaceous annual crop.... [2-4] with prostrate or ascending succulent stems and branches and has volatile oil in the glands or sac in its leaves [3,5]. The flowers are small and may appear in different colours such as white, pale-violet, blue and pink. In height, the plant attains a height of 15-30 cm and in some species, the height could be as high as 40 cm. Tubers can be found in different shapes, sizes and colour. Its local names vary from one geographic location to another, and it is vegetatively propagated with a somatic chromosome number of 2n = 2x = 64.

The edible portion of *Solenostemon rotundifoliius* contains carbohydrate (21%), protein (1.4%), fat (0.2%), water (76%), fibre (1.1%), besides minerals and vitamins like vitamin A [4], making it a highly valued carbohydrate. Besides its nutritional quality, the crop is important in the treatment of disorders such as dysentery, and eye disorder including glaucoma [6,7]. According to Muazu., *et al*. [8], the starch of the *Solenostemon rotundifolius* combines well with maize starch in the formulation of paracetamol tablet both in disintegration and dissolution time. Besides its nutritional attributes, the crop holds a strong economic potential. In the international market, *Solenostemon rotundifolius* is believed to be more economically important in Asia countries such as in India, Sri Lanka, Southern Thailand, and Indonesia where it is grown as a major crop [4]. Its growth and yield development is believed to contribute to the improvement of the production technologies as well as reduction of food crisis at the household level [9].

The objective of this experiment was to study the growth and yield performance of some selected accessions of *Solenostemon rotundifolius* grown in the Jos-Plateau environment.

## Materials and Methods

The study was carried out during the 2021 rainy season from the month of January-August, 2021 at the farm site of the Federal College of Forestry, Bauchi road, Jos-Plateau State (Latitude 09$^0$57N, Longitude 08$^0$53E). The selected accessions of the *Solenostemon rotundifolius* were gotten from the National Root Crops Research Institute (NRCRI), Kuru and some from local farmers in Kaduna, Plateau, Taraba and Adamawa States in Nigeria. The sources and agronomic characterization of the accessions used in the study are shown in table 1 and table 2, respectively.

| Pop. No | Accession | Source |
|---|---|---|
| | Manchok | Manchok, KadunaState, Nigeria |
| | NRCRI (1) | National Root Crops Research Institute, Potato Substation, Kuru, Jos |
| | NRCRI (2) | National Root Crops Research Institute, Potato Substation, Kuru, Jos |
| | Hong (1) | Hong, Adamawa State, Nigeria |
| | Hong (2) | Hong, Adamawa State, Nigeria |
| | Pankshin | Pankshin, Plateau State, Nigeria |
| | Gembu | Gembu, Taraba State, Nigeria |
| | Langtang | Langtang, Plateau State, Nigeria |
| | Bokkos (1) | Bokkos, Plateau State, Nigeria |
| | Bokkos (2) | Bokkos, Plateau State, Nigeria |

**Table 1:** Sources of the selected accessions of the *Solenostemon rotundifolius* used in the study.

Topsoil for this experiment was collected from a fallow field and the organic manure in the form of cow dung was collected from an animal farm at Mista Ali along Zaria Road, Plateau state.

The topsoil and sharp sand were mixed with the organic manure in a potting ratio of 3:2:1, respectively, according to the method of Bugbee and Frink [11] as reported by [10]. The soil mixture was placed in already perforated polyethylene bags, which measured 23cm in diameter, 25cm in length and 14 cm in height. The already perforated polyethylene bags at the bottom were to ensure proper drainage and air flow. The polyethylene bags were arranged in four replications using a Completely Randomized Design. One of the replicates was used for the observation and growth analysis study.

Growth observation and data collection was collected 15 days after planting (DAP) and continued in an interval of two weeks for emergence rate, number of branches, leaf area index, relative growth rate, net assimilation rate, and number of days to flowering. Observation and data collection on mean numbers of tubers, mean tuber length, tuber girth, mean tuber weight, dry matter percentage and total tuber yield were collected after harvest.

| Accession | Agronomic Characteristics |
|---|---|
| Manchok | A local farmer's accession with yellowish round tubers |
| NRCRI (1) | An improved variety with tubers which have white skin |
| NRCRI (2) | An improved variety with tubers which have black skin |
| Hong (1) | A local accession sourced from Hong in Adamawa State. It is tolerant to rot and dryness when kept for several months. It is also characterized by large and round tubers |
| Hong (2) | It is tolerant to rot and dryness when kept for several months. It is characterized by large and longer tubers than Hong 1 |
| Pankshin | It is characterized by large tubers, yellow skin, tolerance to rot and dryness when kept for several months |
| Gembu | It is characterized by yellow skin, early sprouting and large tubers and can also be cultivated under irrigation |
| Langtang | It is characterized by distinct traits, which include long tubers and dark spots around the sprouting region |
| Bokkos (1) | It is characterized by dark, roundish tubers and early sprouting |
| Bokkos (2) | It is characterized by dark, oblong tubers and early sprouting |

**Table 2:** Agronomic characteristics of the selected *Solenostemon rotundifolius* accessions used in the study.

**Source:** Egbaji [10].

## Results and Discussion

### Emergence rate

Table 3 shows the emergence rate of some selected *Solenostemon rotundifolius* accessions grown in Jos in 2021. The accessions Manchok, Bokkos 1, Bokkos 2, Gembu and Pankshin had the highest emergence rate of 90.00%. The accession NRCRI (1) had the lowest emergence rate (48.33%). The variations observed in the emergence rate may have been due to differences in the genetic make-up of the different accessions of the *Solenostemon rotundifo-*

*lius* used in the study. The accessions Manchock, Pankshin, Gembu, Bokkos (1) and Bokkos (2) which recorded the highest emergence rate had bigger seed tubers than the other accessions. Rykbost., *et al.* [12] observed that small seed tubers resulted in delayed emergence in varieties of *Solenostemon rotundifolius*.

### Number of branches per plant

The accession Gembu (39.00) had the highest mean number of branches per plant, followed by the accessions NRCRI 1 (27.00), NRCRI 2 (25.00), Bokkos 2 (24.33), Bokkos 1 (23.64), Hong 1 (22.00), Manchok (19.33), Hong 2 (19.00) and Langtang (18.67). While Pankshin (15.00) has the lowest number of branches per plant (15.00) (Table 3). Variation in the number of branches is primarily a genetic character which may be influenced by growth hormones like the indole acetic acid (IAA) as well as the prevailing environmental condition [13]. The number of branches in a plant contributes to the total dry matter produced by the plant, which normally result in high tuber yield. However, the continuous production of new branches during tuber bulking may result in competition for assimilates between the new branches and the tubers, which may result in low tuber yield as was observed by [14].

| Accession | *Emergence rate (%) | Number of branches Per plant |
|---|---|---|
| Manchok | $90.00^{a}$ | $19.33^{b}$ |
| NRCRI (1) | $48.33^{b}$ | $27.00^{b}$ |
| NRCRI (2) | $66.67^{ab}$ | $25.67^{b}$ |
| Hong (1) | $73.33^{ab}$ | $22.00^{b}$ |
| Hong (2) | $78.33^{ab}$ | $19.00^{b}$ |
| Pankshin | $90.00^{a}$ | $15.00^{b}$ |
| Gembu | $90.00^{a}$ | $39.00^{a}$ |
| Langtang | $71.67^{ab}$ | $18.67^{b}$ |
| Bokkos (1) | $90.00^{a}$ | $23.67^{b}$ |
| Bokkos (2) | $90.00^{a}$ | $24.33^{b}$ |
| LSD (0.05)<br>CV (%) | 35.28<br>26.12 | 10.6<br>26.68 |

**Table 3:** Emergence rate and number of branches per plant of some selected *Solenostemon rotundifolius* accessions grown in Jos in 2021.

Means followed by the same letter(s) are not significantly different at 5% level of probability (Duncan's new Multiple-Range Test).

*Values were subjected to arcsine transformation before the analysis and thereafter de-transformed.

### Leaf area index

Table 4 shows the leaf area index (LAI) of some selected accessions of *Solenostemon rotundifolius* at different stages of growth in Jos in 2021. The LAI increased with time at 135 days after planting and thereafter decrease in all the accessions except accessions Hong (1) and Bokkos (2) of *Solenostemon rotundifolius* used in this study. The highest LAI value of 0.62 at 90 days after planting was observed in the accession Gembu. While the lowest LAI value of 0.07 at 90 days after planting was observed in the accession Manchok. The highest LAI value of 0.90 at 135 days after planting was observed in the accessions Pankshin and Langtang. While the lowest LAI value of 0.06 at 135 days after planting was recorded in the accessions Hong (1) and Hong (2). At 180 days after planting, the highest LAI value of 0.66 was recorded in the accession Hong (1) while the lowest value of 0.07 at 180 days after planting was recorded in the accession Manchok. According to reports by [13] and Deshi., *et al.* [15] Leaf area index in both potato and sweet potato increased in all varieties with time and then declined due to senescence of leaves and decrease in dry matter production and distribution to the various parts of the plant.

| | Growth stage (Days after planting) | | |
|---|---|---|---|
| Accession | 90 | 135 | 180 |
| Manchok | 0.07 | 0.79 | 0.07 |
| NRCRI (1) | 0.37 | 0.53 | 0.37 |
| NRCRI (2) | 0.36 | 0.53 | 0.14 |
| Hong (1) | 0.26 | 0.06 | 0.66 |
| Hong (2) | 0.29 | 0.06 | 0.29 |
| Pankshin | 0.20 | 0.90 | 0.10 |
| Gembu | 0.62 | 0.64 | 0.62 |
| Langtang | 0.44 | 0.90 | 0.44 |
| Bokkos (1) | 0.19 | 0.87 | 0.19 |
| Bokkos (2) | 0.41 | 0.35 | 0.41 |
| SE ± | 0.016 | 0.031 | 0.030 |

**Table 4:** Leaf area index of some selected *Solenostemon rotundifolius* accessions at 90, 135 and 180 days after planting in Jos in 2021.

S. E = Standard error.

### Days to flowering

Bokkos (2) (98.00 DAP) had the highest number of days to flowering, followed by the accession Manchok (90.00 DAP). While NRCRI (1) (70.00) had the lowest number of days to flowering (Table 5). The variations in the number of days to flowering suggest that flowering traist are genotypically controlled.

### Number of flowers per plant

The highest mean number of flowers was observed in the accessions Manchok, (20.00), NRCRI (1) (20.00) and Hong (2) (20.00). While the lowest value for mean number of flowers was observed in the accession Bokkos (2) (10.00) (Table 5). The number of flowers per plant in the *Solenostemon rotundifolius* accessions used in the study did not differ significantly (p = 0.05) amongst the accessions. Mwanja., *et al.* [16] reported that the number of flowers per plant in the living stone potato differed significantly with variety.

| Accession | Days to flowering | Flower number per plant |
|---|---|---|
| Manchok | 90.00[ab] | 20.00[a] |
| NRCRI (1) | 70.00[d] | 10.00[b] |
| NRCRI (2) | 88.00[abc] | 20.00[a] |
| Hong (1) | 84.00[bc] | 12.00[b] |
| Hong (2) | 84.00[bc] | 20.00[a] |
| Pankshin | 81.00[bc] | 10.00[b] |
| Gembu | 88.00[abc] | 11.00[b] |
| Langtang | 78.00[cd] | 12.00[b] |
| Bokkos (1) | 81.00[bc] | 12.00[b] |
| Bokkos (2) | 98.00[a] | 10.00[b] |
| LSD (0.05) | 28.0 | 5.80 |
| CV (%) | 6.52 | 11.6 |

**Table 5:** Days to flowering and number of flowers per plant of some selected *Solenostemon rotundifolius* accessions grown in Jos in 2021.

Means followed by the same letter(s) are not significantly different at 5% level of probability (Duncan's new Multiple-Range Test).

### Relative growth rate

Table 6 shows the relative growth rate (RGR) of some selected *Solenostemon rotundifolius* accessions grown in Jos in 2021. The relative growth rate increased with time up to 90 DAP and thereafter decreased in all the accessions of *Solenostemon rotundifolius* used in the study. The highest RGR value at 90 DAP was observed in the accession NRCRI (1) (0.39gg-$^{1}$ day$^{-1}$), but this was not different from those of accessions Hong (1) (0.38gg$^{-1}$day$^{-1}$), Langtang (0.38 gg$^{-1}$ day$^{-1}$), Pankshin (0.36 gg$^{-1}$day$^{-1}$), Bokkos (2) (0.36 gg$^{-1}$day$^{-1}$) and Manchok (0.36 gg$^{-1}$ day$^{-1}$). The highest RGR value at 135 DAP was observed in the accession Gembu (0.25 gg$^{-1}$ day$^{-1}$), Hong (2) (0.25 gg day$^{-1}$) and Bokkos (2) (0.25gg$^{-1}$ day$^{-1}$). The lowest value of RGR at 135 DAP was observed in the accession Hong (1) (0.06gg$^{-1}$ day$^{-1}$). The highest RGR value at 180 DAP of 0.21 gg$^{-1}$ day$^{-1}$ was observed in the accession Bokkos (1) while the lowest RGR value at 180 DAP was observed in the accession Gembu (0.03 gg$^{-1}$ day$^{-1}$), Pankshin (0.03 gg$^{-1}$ day$^{-1}$) and Hong (2) (0.02 gg$^{-1}$day$^{-1}$). The decrease in RGR over time in the study showed, that there was a decrease in total dry matter accumulation and partitioned to various parts of the plants, due, perhaps to senescence.

| | Growth stage (days after planting) | | |
|---|---|---|---|
| Accessions | 90 | 135 | 180 |
| Manchok | 0.36 | 0.13 | 0.10 |
| NRCRI (1) | 0.39 | 0.09 | 0.11 |
| NRCRI (2) | 0.34 | 0.09 | 0.08 |
| Hong (1) | 0.38 | 0.06 | 0.18 |
| Hong (2) | 0.32 | 0.25 | 0.02 |
| Pankshin | 0.36 | 0.12 | 0.03 |
| Gembu | 0.30 | 0.25 | 0.03 |
| Langtang | 0.38 | 0.15 | 0.08 |
| Bokkos (1) | 0.36 | 0.14 | 0.21 |
| Bokkos (2) | 0.27 | 0.25 | 0.13 |
| SE± | 0.12 | 0.10 | 0.09 |

**Table 6:** Relative growth rate (gg$^{-1}$ day $^{-}$1) (x10 $^{-1}$) in some selected *Solenostemon rotundifolius* accessions at 90, 135 and 180 days after planting in Jos in 2021.

S. E = Standard error of mean.

### Net assimilation rate

At 90 DAP, the net assimilation rate (NAR) increased with time and thereafter decreased in all the accessions of *Solenostemon rotundifolius* used in the study (Table 7). The highest NAR value of 9.80 gm$^{-1}$ week$^{-1}$ at 90 DAP was recorded in the accession Pankshin followed by accession Hong (2) (9.29 gm$^{-1}$ week$^{-1}$) and NRCRI (2) (9.17 gm$^{-1}$ week$^{-1}$). While the lowest NAR value of 1.19 gm$^{-1}$ week$^{-1}$ at 90 DAP was observed in the accession NRCRI (1). The highest NAR value at 135 DAP (5.58 gm$^{-1}$ week$^{-1}$) was recorded in accessions Gembu and Hong (1). While the lowest NAR value of 0.87 gm$^{-1}$ week$^{-1}$ at 135 DAP was observed in the accession Pankshin. At 180 DAP, the highest NAR was observed in the accession Langtang (0.91 gm$^{-1}$week$^{-1}$). The lowest NAR value of 0.10 gm$^{-1}$ week$^{-1}$) was observed in the accession Bokkos (1). The NAR values observed for all the accessions of *Solenostemon rotundifolius* used in the study did not differ significantly.

| | Growth stage (Days after planting) | | |
|---|---|---|---|
| Accession | 90 | 135 | 180 |
| Manchok | 8.72 | 1.47 | 0.21 |
| NRCRI (1) | 1.19 | 1.16 | 0.25 |
| NRCRI (2) | 9.17 | 1.53 | 0.61 |
| Hong (1) | 5.65 | 5.58 | 0.20 |
| Hong (2) | 9.29 | 0.95 | 0.78 |
| Pankshin | 9.80 | 0.87 | 0.35 |
| Gembu | 6.25 | 5.58 | 0.17 |
| Langtang | 6.25 | 1.37 | 0.91 |
| Bokkos (1) | 5.68 | 2.75 | 0.10 |
| Bokkos (2) | 7.42 | 1.16 | 0.86 |
| SE± | 0.26 | 0.18 | 0.04 |

**Table 7:** Net assimilation rate ($gg^{-1}$ week $^{-1}$) (x10 $^{4}$) of some selected *Solenostemon rotundifolius* accessions at 90, 135 and 180 days after planting in Jos in 2021.

S. E = Standard error of mean.

The differences observed in the net assimilation rate, and the stages of growth varied in the *Solenostemon rotundifolius* accessions used in the study. In some accessions, NAR was higher at the early stages, while in some at the late stage of growth. As the cropping season progresses, light interception improves and the rate of dry matter production goes up. But due to mutual shading, photosynthesis no longer exceeds respiration in older leaves, which then cease to be net producers of dry matter [13]. However in accessions where NAR was higher at the latter stages of growth, there might have been less mutual shading of leaves, due to leaf orientation, which resulted in a continuous production of dry matter.

## Tuber length and tuber girth

The highest value of 7.43 cm for tuber length was observed in the accession Hong (1) and this was followed by accession Gembu (7.40), Pankshin (7.13) and Hong (2) (7.03 cm)**.** The lowest tuber length of 5.37 cm in the accession Bokkos (2). The accessions differed significantly (p= 0.05) in tuber length (Table 8). The highest tuber girth was in the accession Hong (2) (9.80 cm) followed by the accessions Manchok (9.17) and Bokkos (2) (9.13). The lowest tuber girth of 5.50 cm was observed in the accession Langtang. Namo [13] suggested that for sweet potato yield improvement, tuber selection should be made base on length of tubers. This could also be true for *Solenostemon rotundifoliius*. Ogedengbe., *et al*. [17] also observed variations in tuber length and tuber girth and suggested that it was influenced by the genotype.

| Accession | Days to flowering | Flower number per plant |
|---|---|---|
| Manchok | 90.00[ab] | 20.00[a] |
| NRCRI (1) | 70.00[d] | 10.00[b] |
| NRCRI (2) | 88.00[abc] | 20.00[a] |
| Hong (1) | 84.00[bc] | 12.00[b] |
| Hong (2) | 84.00[bc] | 20.00[a] |
| Pankshin | 81.00[bc] | 10.00[b] |
| Gembu | 88.00[abc] | 11.00[b] |
| Langtang | 78.00[cd] | 12.00[b] |
| Bokkos (1) | 81.00[bc] | 12.00[b] |
| Bokkos (2) | 98.00[a] | 10.00[b] |
| LSD (0.05) | 28.0 | 5.80 |
| CV (%) | 6.52 | 11.6 |

**Table 8:** Days to flowering and number of flowers per plant of some selected *Solenostemon rotundifoliius* accessions grown in Jos in 2021.

Means followed by the same letter(s) are not significantly different at 5% level of probability (Duncan's new Multiple-Range Test).

## Mean tuber weight

The highest mean tuber weight of 3.6 g was observed in the accession NRCRI (1), which significantly did not differ from the accessions Langtang (3.5 g), Bokkos (2) (3.5g), Manchok (3.4 g), Hong (2) (2.9 g) and Gembu (2.9 g).The lowest mean tuber weight of 2.3 g was observed in the accessions NRCRI (2) and Hong (1) (Table 9).The mean tuber weight and total tuber yield were generally low in this study as was also reported by [14]. These results suggest that fresh tuber yield in the Hausa potato is dependent not only on the number of tubers per plant but also on the tuber size and mean tuber weight. To improve tuber yield in the Hausa potato, therefore, efforts should be directed at selecting simultaneously for tuber size and tuber weight.

## Dry matter content

The highest dry matter content of 20.43% was observed in the accession Hong (1) of the selected accessions of *Solenostemon rotundifoliius* grown in Jos in 2021. It was similar to all but accessions Hong (2), Gembu and Bokkos (1) (Table 9). Namo [13] reported a dry matter content of 22.2 - 35.6% in reciprocal grafts of sweet potato clones grown in the Jos-Plateau environment in Nigeria. Farmers cultivating sweet potato prefer varieties with dry matter content above 25% of the fresh tuber weight while processing industries prefer varieties with dry matter content above 35% [18]. The present result shows that the dry matter observed was generally below the acceptable range of 25 – 30%. This may explain why not many farmers are interested in cultivating the crop in spite of its nutritional and medicinal values.

| Accession | Mean tuber weight (g) | Dry matter content (%) |
|---|---|---|
| Manchok | $3.4^{ab}$ | $18.84^{abc}$ |
| NRCRI (1) | $3.6^{a}$ | $19.87^{ab}$ |
| NRCRI (2) | $2.3^{c}$ | $19.23^{ab}$ |
| Hong (1) | $2.3^{c}$ | $20.43^{a}$ |
| Hong (2) | $2.9^{abc}$ | $17.67^{bcd}$ |
| Pankshin | $2.6^{bc}$ | $19.27^{ab}$ |
| Gembu | $2.9^{abc}$ | $16.53^{cd}$ |
| Langtang | $3.5^{ab}$ | $18.78^{abc}$ |
| Bokkos (1) | $2.6^{bc}$ | $16.28^{d}$ |
| Bokkos (2) | $3.5^{ab}$ | $20.26^{a}$ |
| LSD (0.05) | 0.87 | 2.16 |
| CV (%) | 17.46 | 6.78 |

**Table 9:** Mean tuber weight and dry matter content (%) of some selected accessions of *Solenostemon rotundifoliius* grown in Jos in 2021.

Means followed by the same letter(s) are not significantly different at 5% level of probability (Duncan's new Multiple-Range Test).

## Harvest index

Table 10 shows the harvest index at different stages of growth of some selected *Solenostemon rotundifoliius* accessions grown in Jos in 2021. The harvest index increased with time up to 180 DAP in all accessions except Manchok, Hong (1) and Pankshin. Accessions NRCRI (1) and Pankshin had the highest harvest index value of 0.22 at 90 DAP. Accession Gembu had the lowest harvest index value of (0.04). At 135 DAP, Accession NRCRI (1) had the highest harvest index value (0.55). The lowest harvest index of 0.02 was observed in the accession Pankshin. At 180 DAP, the highest index of 0.83 was observed in the accession NRCRI (2) and this was followed by the accession Manchok (0.80). The accessions Langtang and Bokkos (1) had the lowest harvest index of 0.52.Generally, the harvest index increased with time up to 180 days after planting (180 DAP) in all but accessions Manchok, Hong (1) and Pankshin. Donald [19] suggested that harvest index is used to measure the yield potentials of a crop variety. The generally high harvest index observed in the selected accessions of *Solenostemon rotundifoliius* used in the study did not translate into high tuber yield at the end of the cropping season as expected. There may be other factors that influence tuber yield in the *Solenostemon rotundifoliius* that are yet to be identified.

| | Growth stage (days after planting) | | |
|---|---|---|---|
| Accession | 90 | 135 | 180 |
| Manchok | 0.18 | 0.12 | 0.80 |
| NRCRI (1) | 0.22 | 0.55 | 0.76 |
| NRCRI (2) | 0.09 | 0.47 | 0.83 |
| Hong (1) | 0.07 | 0.06 | 0.76 |
| Hong (2) | 0.15 | 0.20 | 0.74 |
| Pankshin | 0.22 | 0.02 | 0.74 |
| Gembu | 0.04 | 0.18 | 0.69 |
| Langtang | 0.08 | 0.22 | 0.52 |
| Bokkos (1) | 0.09 | 0.13 | 0.52 |
| Bokkos (2) | 0.07 | 0.12 | 0.56 |
| SE± | 0.02 | 0.03 | 0.68 |

**Table 10:** Harvest index in some selected *Solenostemon rotundifoliius* accessions at 90, 135 and 180 days after planting in Jos in 2021.

S. E = Standard error of mean.

## Total tuber yield

Table 11 shows the total yield of some selected *Solenostemon rotundifoliius* accessions grown in Jos in 2021. The highest total tuber yield value of 0.71 t $ha^{-1}$ was observed in the accession Bokkos (1). The lowest total tuber yield of 0.54 t $ha^{-1}$ was observed in the accessions Manchok and NRCRI (2). The total tuber yield of the accessions of the *Solenostemon rotundifoliius* used in the study did not differ significantly. Enyiukwu., *et al.* [1,20] reported an average total tuber yields of between 5 and 15 t/$ha^{-1}$, contrary to the findings in this study were the total tuber yield was low in all the accessions used. This may be due to the fact that more dry matter could have been left in the leaves and stems than in the roots as observed and reported by [14] suggesting lack of balance between the source potential and sink capacity. Except NRCRI (1) and NRCRI (2), the low tuber yield observed in the study could also suggest that all the accessions of *Solenostemon rotundifoliius* used in the experiment, where newly introduced into the Jos-Plateau environment.

| Accession | Total tuber yield (t $ha^{-1}$) |
|---|---|
| Manchok | 0.54[a] |
| NRCRI (1) | 0.57a |
| NRCRI (2) | 0.54[a] |
| Hong (1) | 0.62[a] |
| Hong (2) | 0.58[a] |
| Pankshin | 0.57[a] |
| Gembu | 0.58[a] |
| Langtang | 0.60[a] |
| Bokkos (1) | 0.71[a] |
| Bokkos (2) | 0.58[a] |
| LSD (0.05) | 0.35 |
| CV (%) | 34.7 |

**Table 11:** Total tuber yield of some selected *Solenostemon rotundifoliius* accessions grown in Jos in 2021.

Means followed by the same letter(s) are not significantly different at 5% level of probability (Duncan's new Multiple-Range Test).

## Conclusion

The results of this study show that the emergence rate, number of branches per plant, leaf area index, days to flowering, number of flowers per plant, relative growth rate, net assimilation rate, tuber length, tuber girth, mean tuber weight, dry matter content and total tuber yield varied with the accessions. The total tuber yield was generally low in all the accessions. These variations could be use for the improvement and breeding of the *Solenostemon rotundifoliius* cultivated in Nigeria.

## Bibliography


1. Enyiukwu DN., *et al.* "Potential of Hausa Potato (*Solemostemon rotundolius* (Poir) J.K. Morton) and Management of its tuber rot in Nigeria". *Greener Journal of Agronomy, Forestry and Horticulture* 2.2 (2014): 027-037.

2. Duprez H and Deleener P. "African fables and orchards: Growing vegetables and fruits". Macmillan Press, London, United Kingdom (1989): 333.

3. Alleman J. "Evaluation of *Plectranthus esculentus* N.B.Br. as a potential vegetable crop". Ph.D. Thesis, University of Pretoria, South Africa (2002): 40-44.

4. PROTA (Plant Resources of Tropical Africa). "Solenostemon rotundifolius Poir (Synonyms: Germania rotundifolius (Poir), Plectranthus rotundifolius Sims) database PROTA" (2013).

5. Phungpanya C., *et al.* "Chemical composition and antibacterial activity of *Plectranthus rotundifolius* extracts". In: Pure and Applied Chemistry International Conference (PACCON) (2012): 1670-1672.

6. Irvine FR. "Indegenmous, food plant of west Africa". *Economy Botany* 3 (1990): 441

7. Schippers RR "African Indigenous Vegetables: An Overview of the Cultivated Species. Natural Resources. EU Institute Technical Centre for Agriculture Rural Cooperation Chatham, United kingdom (2000): 214.

8. Muazu J., *et al.* "Preliminary studies on Hausa potato starch 1: The Disintegrant Properties". *Journal of Pharmaceutical Science Technology* 4.3 (2012): 883-891.

9. National Research Council (NRC). Lost Crops of Africa: Volume 11: *Vegetable.* Washington, DC: The National Academic Press (2006).

10. Egbaji CI. "Cytomorphological study of the Hausa potato (*Solemostemon rotundolius* (Poir) J.K. Morton) in Jos, Plateau State. M.Sc. Dissertation. University of Jos, Plateau State, Nigeria (2019): 114.

11. Bugbee GJ and Frink CR. "Aeration of potting media and plant growth". *Journal of Soil Science* 141.6 (1986): 438-441.

12. Rykbost KA., *et al.* "Effect of Seed Piece on Performance of three Potato Varieties". *American Journal of Potato Research* (1995).

13. Namo OAT. "Screening for Source-Sink Potential in some Sweet potato (*Ipomoea batatas*) (L.) Lam.) Lines in Jos-Plateau, Nigeria". Published Ph.D. Thesis. University of Jos, Nigeria. Published by Lambert Academic Publishing, Omniscriptum GmbH Co. KG, Deutschland, Germany (2005): 240.

14. Namo OAT and Opaleye SA. "Assessment of Different Accessions of the Hausa Potato (*Solenostemon rotundifolius* (Poir) J.K. Morton) for Productivity in Jos-Plateau Environment". *Journal of Agriculture and Ecology Research International* 14.3 (2018): 1-9.

15. Deshi KE., *et al*. "Leaf Area Index Values of Potato (*Solanum tuberosum)* stored for different periods in different kinds of stores". *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS*) 8.1 (2015): 09-19.

16. Mwanja YP., *et al*. "Flowering and Seed Setting Studies in Livingstone Potato (*Plectranthus esculenthus* N.E. BR.) in Jos-Plateau, Nigeria". *International Journal of Plant Breeding and Genetics* 9 (2015): 275.279.

17. Ogedengbe SA., *et al.* "Effect of Seed Tuber Size and N.P.K Fertilizer on some Yield Components of *Coleus* Potato (*Solenostemon rotundifolius* (Poir) J.K. Morton)". *International Journal of Agriculture and Rural Development* 18.2 (2015): 2240-2245.

18. Grüneberg WJ., *et al.* "Heritability estimates for an accelerated breeding scheme for clonally propagated crops using sweet potato as a model". Proceedings of the 15th International ISTRC Symposium. Tropical Root and Tubers in a Changing Climate: A critical Opportunity for the World. CIP, Lima, Peru (2019): 2-6.

19. Donald JL. "Growth regulator effects in above-ground dry matter partitioning during grain fill of spring barley". *Journal of Crop Science* 5.4 (1992): 10-13.

20. Reddy PP. "Plant protection in tropical root and tuber crops". Springer International Publishers, New Delhi, India (2015): 336.