

## Full Length Research Paper

# Studies of Dormancy Break of some Accessions of Hausa Potato (*Solenostemon rotundifolius* (Poir) J.K.Morton) in Jos, Plateau State, Nigeria

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**ABSTRACT:** An experiment was carried out at Ritdun Integrated farm, Kangang road, off Miango Road, situated at altitude 44 09Ft on latitude 09° 88<sup>1</sup>N and longitude 08° 85<sup>1</sup>E, Jos, Plateau State, Nigeria between the months of February and May 2018 to study the breaking of dormancy of some accessions of Hausa potato (*Solenostemon rotundifolius*). The experiment was laid out in a completely randomized design consisting of six accessions which were replicated three times and stored at room temperature. The data collected were subjected to analysis of variance and the means were separated using the least significant difference (LSD<sub>0.05</sub>). The parameters assessed include: days to the breaking of dormancy, number of sprouted tubers, length of sprouts tuber and weight of whole tubers left after storage. The results showed that Langtang 2 took the longest number of days (161.00) to break dormancy while Gembu 2 was the earliest to break dormancy (76.67), but

the difference was not significant. All the accessions resulted in a significantly higher mean number of sprouted tubers, length of sprouts except at week 14 and mean weight of whole tubers left after storage except at week 4 and 14 which were similar. Generally, there was increased in sprout number and sprout length overtime for all the accessions studied. The weight of the whole tubers left decreases with time throughout the storage period. It can be concluded from this study that Hausa potato accessions varied in days to break of dormancy, number of sprouts, sprout length and weight of whole tubers left after storage. It's therefore recommended that further study should be carried out to evaluate the break of dormancy in Hausa potato using plant growth regulators.

**Keywords:** Hausa potato, accession, dormancy and sprout

## INTRODUCTION

The Hausa potato (*Solenostemon rotundifolius* (Poir) J.K. Morton) is a minor tuber crop in most parts of Africa. On world scale, the crop is the most widespread of the cultivated lamiaceae and is believed to be of more economic importance (Nkansah, 2004). Hausa potato is a small herb that has prostrate or ascending succulent stems and branches. It attains a height of 15-30 cm and presents a distinctive fragrance due to the presence of volatile oils in the glands or sacs of leaves (Allemann, 2002; Phungpanya *et al.*, 2012). The flowers are small and may be white, blue, pinkish or pale-violet in colour.

They are borne on distal inflorescences with slender false spikes measuring up to 15 cm in length. It has small dark-brown edible tubers produced at the base. It grows well in regions receiving annual rainfall between 700 and 1,000 mm (Quedraogo *et al.*, 2007). Yield under favorable condition may reach 30 t/ha (Tarpaga, 2001) or 45 t/ha (Nkansah, 2004).

In ethnobotany, preparation of boiled leaves of Hausa potato is used to treat disorders such as dysentery, blood in urine and eye disorders including glaucoma (Schippers, 2000). Tubers of the crop provide essential

dietary and energy requirements to the populace during lean periods. The tubers taste similar to Irish potato and trifoliate yam and can be eaten as the main starchy staple or part of it in combination with legumes, rice and vegetables. Considerable importance of Hausa potato as a staple foodstuff in the tropics has been largely replaced by other starchy foodstuffs such as sweet potatoes, and production has declined to such an extent that it has almost disappeared in many areas (Dittoh *et al.*, 1998; Bennett-Lartey and Oteng-Yeboah, 2008). Generally, Hausa potato is a relatively under-exploited food crop in Nigeria.

After reaching physiological maturity, potato seed tubers may enter a state of deep dormancy, during which tuber seeds do not germinate after planting. Dormancy is the physiological state of the tuber in which tubers do not sprout even when placed in ideal germination conditions (Reust, 2002; Sonnewald and Sonnewald, 2014). The dormancy period varies from 2 to 3 months, depending on genotype and conditions of pre-and postharvest. Dormancy is regarded as a period in the tuber life cycle from initiation to the time when sprouting starts. However, since this period is difficult to determine, post-harvest dormancy is used for practical purposes, and is defined as the period from dehauling to the time when 80% of tubers show sprouts at least 2 mm long (Pande *et al.*, 2007). Lack of good quality seed among the growers is a major problem adversely affects the expansion of potato production in many developing countries (Crissman *et al.*, 1993). One major problems of production of quality potato seed is poor sprouting, due to dormancy, which leads to delayed planting and poor crop emergence and vigor (Wiersema, 1985).

A dormancy value or duration gives an insight on how long the potato will store before it initiates sprout development. Knowledge of dormancy duration provides information for selecting varieties for short to long-term storage, planning for proper timing of sprout inhibition products, and marketing of the potatoes (Mani *et al.*, 2014). For fresh market potatoes, detrimental quality concerns develop once sprouting begins; such as changes in carbohydrate status, increase in respiration rate, additional weight loss, and storage management issues like impeded airflow. Seed producers may need to accelerate or retard sprout development depending upon the time of year and intended seed market (Johansen *et al.*, 2008; Salimi *et al.*, 2010).

Understanding dormancy regulation of potato tubers has been reported to help in handling genetic materials for different end-uses (ware or seed) and in planning for the next planting season (Muthoni *et al.*, 2014). Hence, it should be evaluated before releasing any accession so that farmers are able to store their produce for a desired period of time. For quality of a particular potato clone, its dormancy period and sprouting behavior are major criteria that should be documented before any promising clone is released (Viratanen *et al.*, 2013). This study was

aimed to evaluate dormancy break in some accessions of the Hausa potato under room temperature in Jos, Plateau Environment.

## MATERIALS AND METHODS

The details of the sources and dates of harvest of the Hausa potato Accessions used in this study are given in (Table 1).

### Experimental site

An experiment was carried out between the months of February and May 2018 to study the dormancy breaking of some accessions of the Hausa potato at Ritdun Integrated farm, Kangang road, off miango Road, Jos South Local Government Area of Plateau State, Nigeria which is situated at altitude 44 09 Ft on latitude 09° 88<sup>1</sup>N and longitude 08° 85<sup>1</sup>E .

### Experimental design

A completely randomized design consisting of six (6) accessions, with each accession having thirty tubers which was replicated three times, put in plastic baskets and stored at room temperature. The storage conditions included temperature, relative humidity and light. The store received some light through the windows. Room temperature storage represents local farmer's potato storage practice.

### Data collection

Data was collected at two weeks interval on; days to break of dormancy, number of sprouted tubers, length of sprout and weight of whole tubers left after storage.

### Data analysis

Data collected was subjected to analysis of variance and the means were separated using the Least Significant Difference (LSD).

## RESULTS

### Break of dormancy

Table 2 shows the number of days from harvest to break of dormancy. Although, accession Gembu 2 was the earliest to break dormancy at 76.67 days after harvest, accession Langtang 2 took the longest number of days

**Table 1:** Hausa potato accessions used in this study, their sources and dates of harvest.

| Accession  | Date of Harvest | Source      | Mean tuber weight (g) |
|------------|-----------------|-------------|-----------------------|
| Gembu 1    | 07/12/2017      | Gembu*      | 200.33                |
| Gembu 2    | 07/12/2017      | Gembu*      | 169.00                |
| Bokkos 1   | 03/11/2017      | Bokkos**    | 324.33                |
| Bokkos 2   | 03/11/2017      | Bokkos**    | 247.67                |
| Langtang 1 | 28/11/2017      | Langtang*** | 98.33                 |
| Langtang 2 | 28/11/2017      | Langtang*** | 187.33                |

\*Gembu, Taraba State, Nigeria, \*\* Bokkos, Plateau State, \*\*\*Langtang, Plateau State, Nigeria.

**Table 2:** Number of days from harvest to break of dormancy.

| Accessions | Days to break of dormancy |
|------------|---------------------------|
| Gembu 1    | 81.33                     |
| Gembu 2    | 76.67                     |
| Bokkos 1   | 129.33                    |
| Bokkos 2   | 120.00                    |
| Langtang 1 | 140.00                    |
| Langtang 2 | 161.00                    |
| LSD0.05    | NS                        |
| LSD        | 88.83                     |

Means followed by the same letter(s) are not significantly different at 5% level of probability.

(161.00) to break dormancy and the differences were not significant.

### Number of sprouted tubers

The number of sprouted tubers increased over time in storage from 4 to 14 WAS. Number of sprouted tubers varied with accession at all sampling dates. At 4 WAS accessions from Gembu resulted in significantly ( $p < 0.05$ ) higher sprouted tubers, this was followed by accessions from Bokkos while accessions from Langtang were least and the difference was significant ( $p < 0.05$ ). From 8 to 14 WAS, accessions from Gembu and Bokkos resulted in similar mean number of sprouted tubers and was significantly higher than accession from Langtang (Table 3).

### Length of sprouts

Generally, sprout length increased with time in storage from 8 to 14 WAS. Except at 14 WAS, sprout length varied significantly with accession at all the sampling dates. At 8 and 10 WAS, accessions from Langtang had significantly lower sprout length than accessions from Gembu and Bokkos. However, at 12 WAS, accessions Gembu 2, Bokkos 1 and Bokkos 2 had the highest sprout length. This was followed by accessions Gembu 1 and Langtang 1 while accession Langtang 2 had the least sprout length (1.93 cm) (Table 4).

### Mean weight of whole tubers left after storage (g)

Table 5 shows the mean weight of whole tubers left after storage. Generally, mean weight of whole tubers decreased with time in storage from 4 to 14 WAS. The Mean weight of whole tubers left after storage varied with accession at all sampling dates except at 4 and 14 WAS. At 6 and 8 weeks after storage, accession Langtang 1 resulted in significantly lower mean weight of whole tubers (92.00 and 85.22 g, respectively) than the other accessions which had similar weight of whole tubers. Same pattern was repeated at 12 weeks of storage.

### DISCUSSION

The result of this study indicated that the number of days from harvest to breaking of Dormancy did not differ significantly with accession, although Gembu 2 took 76.67 days to break dormancy while Langtang 2 took about 161.00 days. This could be stated due to different physiological characteristics of different accessions. Dormancy in potato has been reported to be a complex process that depends on genetic background, stage of tuber development, environmental and management conditions during tuber growth and storage (Aksenova *et al.*, 2013). Mani *et al.* (2013) reported that dormancy period depends on genotype and conditions of pre- and

**Table 3:** Number of sprouted tubers.

| Treatments        | Weeks after storage |        |        |        |        |        |
|-------------------|---------------------|--------|--------|--------|--------|--------|
|                   | 4                   | 6      | 8      | 10     | 12     | 14     |
| <b>Accessions</b> |                     |        |        |        |        |        |
| Gembu 1           | 21.33a              | 28.00a | 28.67a | 28.67a | 28.67a | 30.00a |
| Gembu 2           | 22.30a              | 26.67a | 28.67a | 29.00a | 29.00a | 29.67a |
| Bokkos 1          | 13.33b              | 21.67b | 27.00a | 28.00a | 28.00a | 29.67a |
| Bokkos 2          | 10.00b              | 28.33a | 29.67a | 29.67a | 29.67a | 29.67a |
| Langtang 1        | 0.00c               | 9.00c  | 21.67b | 21.67b | 23.00b | 23.00b |
| Langtang 2        | 0.03c               | 6.00c  | 18.67b | 21.00b | 22.33b | 25.00b |
| LSD0.05           | *                   | *      | *      | *      | *      | *      |
| LSD               | 4.74                | 4.57   | 4.24   | 4.59   | 4.53   | 4.28   |

Means followed by the same letter(s) are not significantly different at 5% level of probability.

**Table 4:** Length of sprouts (cm).

| Treatments        | Weeks after Storage |       |       |      |
|-------------------|---------------------|-------|-------|------|
|                   | 8                   | 10    | 12    | 14   |
| <b>Accessions</b> |                     |       |       |      |
| Gembu 1           | 2.84a               | 3.45a | 3.58b | 3.80 |
| Gembu 2           | 3.15a               | 3.56a | 4.09a | 4.19 |
| Bokkos 1          | 3.15a               | 3.65a | 4.05a | 4.12 |
| Bokkos 2          | 3.07a               | 3.65a | 4.21a | 4.70 |
| Langtang 1        | 0.43b               | 0.91b | 1.26d | 1.77 |
| Langtang 2        | 0.57b               | 1.24b | 1.93c | 2.28 |
| LSD0.05           | *                   | *     | *     | NS   |
| LSD               | 0.91                | 0.81  | 0.41  | 2.99 |

Means followed by the same letter(s) are not significantly different at 5% level of probability.

**Table 5:** Mean weight of whole tubers left after storage (g).

| Treatments        | Weeks after Storage |         |         |          |        |
|-------------------|---------------------|---------|---------|----------|--------|
|                   | 4                   | 6       | 8       | 12       | 14     |
| <b>Accessions</b> |                     |         |         |          |        |
| Gembu 1           | 200.33              | 166.33a | 159.33a | 153.00a  | 115.67 |
| Gembu 2           | 169.00              | 162.67a | 156.33a | 139.33ab | 133.00 |
| Bokkos 1          | 324.33              | 237.33a | 219.67a | 146.00a  | 141.00 |
| Bokkos 2          | 247.67              | 229.00a | 213.00a | 166.33a  | 144.33 |
| Langtang 1        | 98.33               | 92.00b  | 85.33b  | 69.00c   | 60.67  |
| Langtang 2        | 187.33              | 178.33a | 168.67a | 145.33a  | 123.67 |
| LSD0.05           | NS                  | *       | *       | *        | NS     |
| LSD               | 249.25              | 108.22  | 72.43   | 26.39    | 52.01  |

Means followed by the same letter(s) are not significantly different at 5% level of probability.

post-harvest. Salimi *et al.*, 2010 also noticed that two varieties of potato (Burren and Agria) achieved longest and shortest dormancy period respectively.

The highest mean number of sprouted tubers was observed in accessions Gembu and Bokkos while accessions Langtang had the least (Table 3). Difference in seed size causes a difference in number sprouts. Hence, the bigger the seed tuber size the higher the number of sprouts. This indicates the importance of

nutrients available in the seed tubers (Farshid *et al.*, 2014).

The length of sprouts showed that all the accessions resulted in longest sprouts length except for accessions Langtang which had the shortest sprouts length (Table 4). The differences observed may be due to various physiological habits. This is consistent with the results of Rehman *et al.* (2001). There was significant difference attributed to accessions with respect to whole weight of

tubers left after storage. Accession Langtang 1 had the lowest mean weight of whole tubers left after storage while accession Gembu 1 had the highest mean weight of tubers left. The differences observed may be attributed to their genetic makeup. Weight loss determines the longevity of tubers' storability and, hence, their keeping quality. Variations in weight loss among cultivars are attributed to either their periderm characteristics or their sprouting behaviour. Hence, varieties with a thick periderm (a large number of cell layers in the periderm) and less lenticels on the tuber surface lose less weight than their counterparts (Struik and Wiersema, 1999; Ezekiel *et al.*, 2004 and Pande *et al.*, 2007).

## Conclusion

The study showed that all the parameters studied differ with accession. Accession Langtang 1 took the longest number of days to break dormancy. The lowest number of sprout, sprout length and mean weight of whole tubers left after storage was observed in accessions langtang. This indicates that accessions Langtang will have poor emergence rate when planted with other accessions. Further study should be carried out to induce the break of dormancy in Hausa potato using phytohormones.

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