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# Agronomic Performance and Sensory Evaluation of Lablab (*Lablab purpureus* L. Sweet) Accessions for Human Consumption in Uganda

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## Abstract

Lablab (*Lablab purpureus*) germplasm was evaluated to identify high grain yielding and palatable accessions that were suitable for human consumption in Uganda. A preference analysis was done to identify accessions that had a high probability of being accepted by farmers. Accessions 29399, 29400, 29803, 30701, 31364, CQ3620, Q5427, Q6988, 52518B, Q6880B, 31364, CQ3621 and Lablab Uganda had high yields, which partly resulted from their high tolerance of the prevailing stresses (diseases, pests and low soil moisture). Accessions 29400, Lablab Uganda, Njahi. 29399, 36019, Q5427, Q6988, 30701 and 31364 scored highly based on the sensory attributes. Accessions Lablab Uganda, Njahi, 29400 and Q69887 were the most accepted for adoption by farmers based on their high agronomic performance. Lablab Uganda, Njahi, 29400 and Q69887 had the most preferred palatability characteristics for human consumption.

## Subject Areas

Agricultural Science, Food Science & Technology, Plant Science

## Keywords

*Lablab purpureus*, Agronomic Performance, Palatability, Preference Ranking, Human Consumption

## 1. Introduction

The dual-purpose legume species are finding greater importance in the farming

systems of sub-Saharan Africa where technology adoption of single purpose species for improved agricultural production has been very low [1]. These multipurpose legume cover crops (LCCs) are increasingly becoming important alternative innovations for soil fertility improvement and soil conservation, livestock feed and sources of household food/nutrition among smallholder farmers in Uganda. This is partly because of the high costs and low availability of mineral fertilisers to the majority rural smallholder farmers in the country [2]. The importance of integrating the multiple purpose LCCs in agricultural production under smallholder farming systems has been recommended due to their dual use in meeting multiple needs of farmers [1] [3] [4].

Previous studies in Eastern Uganda and elsewhere showed that use of LCCs and biomass transfer species to improve soil fertility are promising options for increased crop productivity [3]. Under smallholder farming systems, LCCs such as mucuna provided high biomass for green manure and cover crop, yet it was not highly adopted. This was mainly because of its unsuitability for human and livestock consumption, and limited marketability [2]. However, in more recent years, the ability of lablab (*Lablab purpureus*) to enhance soil fertility for crop production has increased its acceptance by farmers. Lablab is a multipurpose plant with high growth vigour that quickly provide adequate biomass for green manure and protect the soil from devastating effects of erosion and high temperatures [5] [6]. Lablab has been used to control weeds, as a high quality animal feed/forage, medicine and human food [7] [8]. The high protein content (22.4% - 31.3%) in lablab has been found to stimulate high milk production in breast feeding mothers [9].

Lablab has been found suitable to most tropical environments because of its adaptability to a wide range of rainfall, temperatures and altitudes. It is highly adapted to a diverse range of agro-ecosystems and stays green into the dry season [6] [10]. However, it grows best under warm, humid conditions at temperatures ranging from 18˚C to 30˚C [11] [12]. Lablab grows in a wide range of soils without stagnant water, including the deep sands and heavy black clays with a pH range 5 to 7.5 [13].

Although lablab is a multipurpose LCC, its low seed production limits its utilization. A farmer participatory evaluation conducted in 1998 under the Integrated Soil Productivity Initiative through Research and Education (INSPIRE) project, revealed that the common lablab species (*Lablab Uganda*) in Uganda was low yielding [4]. Efforts to solve this problem were devoted to conducting more research to improve lablab so that its full potential as a multipurpose legume is achieved. Thirty three *lablab purpureus* accessions were introduced in Uganda from Australia to characterise the performance of new germplasm for seed production and palatability under the East African conditions. These accessions were evaluated at National Agricultural Research Laboratories (NARL) and District Agricultural Training and Information Centre (DATIC) in Tororo for two years to identify the accessions that had potential of producing sufficient seed. Sensory tests were also carried out to assess the potential of lablab to be

used for human consumption in Uganda.

## 2. Materials and Methods

Field experiments were conducted at NARL at 1179 - 1188 meters above sea level (masl) located at 0.68˚N, 32.9˚E, while the fields at the DATIC were located at 1142 masl and 0.61˚N and 34.1˚E. The lablab experiments were conducted under generally warm and dry environmental conditions at NARL (Table 1). In absence of a weather station at DATIC-Tororo, there were no rainfall and temperature data collected. Rainfall during the research period was generally low with more than 6 months receiving less than 100 mm per months, but the average minimum and maximum temperatures did not exceed 30˚C, implying that these conditions were tolerated by lablab at NARL.

Soil samples were collected from experimental fields at depths of 0 - 20 cm and 20 - 40 cm. The soils were analysed in the Soil and Plant Analytical Laboratories at NARL for physical and chemical properties (Table 2) following methods described by Okalebo *et al.* (2002).

Field sowing of the 33 accessions at NARL and DATIC-Tororo started just after the beginning of the long rains in April 2011. Twenty five seeds of each accession were planted at a spacing of 1 m × 1 m in single row plots at a seed rate of 10 Kg/ha. One month after planting (MAP), all plants were staked with 2 m long sticks. One of the two blocks planted per experiment in each site received

Table 1. Weather data collected at the lablab experiment in NARL during 2011-2014.

| Month | 2011 | | | | 2012 | | | | 2013 | | | | 2014 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Air T ˚C | | | Rain | Air T ˚C | | | Rain | Air T ˚C | | | Rain | Air T ˚C | | | Rain |
| | mean | *min | **max | mm | mean | min | max | mm | mean | min | max | mm | mean | min | max | mm |
| January | 19.1 | 12.4 | 26.7 | 61.5 | 19.2 | 11.6 | 28.1 | 72.5 | 17.2 | 4.4 | 27.9 | 108.3 | 21 | 13.5 | 29.1 | 36.9 |
| February | 20.8 | 13.4 | 29.1 | 73.7 | 21.6 | 14.0 | 29.9 | 35.0 | 19.8 | 10.2 | 28.8 | 70.7 | 22.7 | 14.0 | 30.4 | 39.9 |
| March | 19.5 | 13.4 | 27.0 | 110.8 | 21.2 | 14.1 | 29.3 | 61.6 | 20.2 | 9.3 | 28.6 | 64.3 | 21.1 | 15.1 | 28.3 | 75.7 |
| April | 19.8 | 14.2 | 26.9 | 153.9 | 19.8 | 12.6 | 27.1 | 105.3 | 16.8 | 4.0 | 26.7 | 82.9 | 21.6 | 16.7 | 27.7 | 156.4 |
| May | 19.8 | 13.8 | 27.0 | 94.5 | 19.2 | 11.5 | 26.8 | 126.3 | 16.8 | 1.2 | 27.6 | 21.6 | 20.7 | 16.8 | 26.3 | 174.8 |
| June | 18.2 | 11.8 | 26.2 | 86.0 | 16.1 | 7.7 | 25.4 | 97.4 | 20.6 | 14.8 | 28.6 | 42.9 | 20.4 | 15.1 | 26.7 | 36.4 |
| July | 18.4 | 11.1 | 26.9 | 27.9 | 16.8 | 8.9 | 25.2 | 70.7 | 20.4 | 15.3 | 27.0 | 41.4 | 19.8 | 13.8 | 26.4 | 59.5 |
| August | 18.3 | 11.4 | 26.5 | 85.5 | 17.7 | 9.4 | 26.5 | 96.7 | 20.6 | 16.2 | 27.1 | 44.0 | | | | |
| September | 18.3 | 11.8 | 27.2 | 114.4 | 19.9 | 13.8 | 27.1 | 83.2 | 20.7 | 16.1 | 27.2 | 171.6 | | | | |
| October | 18.3 | 11.7 | 26.9 | 76.0 | 20.0 | 12.9 | 27.7 | 271.1 | 20.9 | 16.6 | 27.0 | 144.4 | | | | |
| November | 17.6 | 10.0 | 26.4 | 312.2 | 17.8 | 8.2 | 27.2 | 190.7 | 19.5 | 11.4 | 27.1 | 238.2 | | | | |
| December | 19.3 | 12.7 | 26.9 | 82.6 | 17.1 | 5.5 | 27.3 | 167.1 | 19.4 | 8.5 | 27.4 | 101.5 | | | | |
| **Total** | | | | **1279** | | | | **1378** | | | | **1132** | | | | |

T ˚C: Temperature degrees Celsius, *min-minimum, **max-maximum.

Table 2. Laboratory soil analysis results for the DATIC-Tororo and NARL-Kawanda.

| Location | Sites | Depth | pH | OM | N | P | K | SAND | CLAY | SILT | Textural class |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | % | | ppm | | | % | | |
| DATIC-Tororo | Field 1 | 0 - 15 | 6.3 | 2.5 | 0.1 | 2.3 | 21.7 | 76.3 | 15.3 | 5.4 | Sandy loam |
| DATIC-Tororo | Field 1 | 15 - 30 | 6.1 | 2.3 | 0.1 | 3.3 | 29.2 | 76.7 | 14.8 | 8.5 | Sandy loam |
| DATIC-Tororo | Field 2 | 0 - 15 | 5.4 | 1.2 | 0.1 | 0.5 | 15.7 | 73.2 | 19.5 | 7.3 | Sandy loam |
| DATIC-Tororo | Field 2 | 15 - 30 | 5.1 | 1.0 | 0.1 | 0.9 | 7.6 | 77.2 | 16.2 | 6.6 | Sandy loam |
| NARL | Block 1 | 0 - 20 | 5.4 | 3.3 | 0.1 | 7.5 | 133.6 | 55.0 | 37.0 | 8.0 | Sandy clay loam |
| NARL | Block 1 | 20 - 40 | 5.4 | 2.6 | 0.1 | 2.5 | 68.0 | 55.0 | 39.0 | 6.0 | Sandy clay |
| NARL | Block 5 | 0 - 20 | 5.8 | 3.8 | 0.1 | 3.8 | 95.7 | 53.6 | 35.8 | 10.6 | Sandy clay |
| NARL | Block 5 | 20 - 40 | 5.9 | 2.3 | 0.1 | 1.7 | 37.2 | 48.8 | 44.6 | 6.6 | Sandy clay |
| **Critical values** | | | **5.2** | **3.0** | **0.20** | **5.0** | **150.0** | | | | |

[OM]Organic matter, [N]Nitrogen, [P]Phosphorus, [P]Potassium, [PPM]Parts per million.

pesticide application (Dursban) at the rate of 1 - 2 L/ha (25 - 50 ml/10 L water) once to twice per week depending on the pest incidence, while the other block was not sprayed. The experiments were repeated in 2013 at NARL and DATIC-Tororo, using 21 accessions that were high yielding and tolerant to pests and diseases. Besides pesticide application, other agronomic techniques such as weeding were carried by regular hand hoeing.

Two cycles of lablab grain palatability tests were carried out after the 2011A and 2013A seasons by a panel of 20 farmers representing six farmer groups. The first sensory evaluation activity was carried out using 12 high yielding and pest and/or disease tolerant accessions (29399, 29400, 30701, 36019, 52518B, CQ3620, Q5427, Q6988, Lablab Uganda, 31364, Q6880B and Njahi) before and after cooking. The second evaluation was carried out with seven accessions (29400, 30701, 52518B, Q6988, Lablab Uganda, 31364 and Njahi). Dry grains (0.5 Kg) of each selected accession were measured, washed and boiled in uniform amounts of water in similar saucepans on locally made charcoal stoves, until they were fully cooked. The cooking time of each accession was recorded. Like any other pulses, the boiled grains of each lablab accession were prepared into a sauce using the same amounts of locally available ingredients including onions, tomatoes, curry powder and vegetable oil. The different sauces were served (Figure 1), and well labelled for the panel to test and take note as indicated below. Supplementary dishes of posho, bananas, sweet potatoes and cassava were used to eat lablab.

Twenty one morphological and agronomic attributes were assessed from 25 plants per accession (Table 3). Following the genetic resource characterisation guidelines, accessions were not replicated and the individual plants represented experimental units [7] [14]. All agronomic data were entered and subjected to analysis of variance (ANOVA) using the Genstat 4th Edition. The Least

**Figure 1.** Farmers carrying out palatability tests of 10 lablab accessions in DATIC-Tororo.

**Table 3.** Morphological and parameters used to assess the agronomic performance of lablab accessions.

| Attribute | Unit of measurement | Timing of measurement |
|---|---|---|
| Germination | percent (%) | 1 month after planting (MAP) |
| Time to flowering | days | At 50% of flowering |
| Seedling vigour | rating 1 = low, 5 = high | 1 month after planting (MAP) |
| Plant vigour | rating 1 = low, 5 = high | Once per month |
| Leafiness | rating 1 = low, 5 = high | |
| Plant habit | rating 1 = erect, 2 = decumbent, 3 = prostrate | |
| Flower colour | 1=white, 2=purple | At 50% of flowering |
| Plant height | cm | At 50% of flowering |
| Plant height | cm | At 100% of flowering |
| Time to podding | days | At 50% of podding |
| Time to mature pods | days | At 50% of plants with mature pods |
| Harvest date | days | Date of first harvest) |
| Harvest period | days | Length of time harvest was conducted |
| Pod colour | rating 1 = green, 2 = purple | |
| Seeds per pod | number | Seeds counted at harvest of mature pods |
| Seed weight | g $1000^{-1}$ seeds | After harvest completed |
| Seed colour | colour | After harvest completed |
| Seed mottling | rating 1 = no, 2 = yes | After harvest completed |
| Pods harvested | number | After harvest completed |
| Pods $plant^{-1}$ | number | After harvest completed |
| Seed yield | g $plant^{-1}$ | After harvest completed |

Significant Difference test (LSD) at 5% probability level was used to separate significant means. Matrix scores ranging from 1 (very bad) to 5 (very good) were used to assess grain colour, grain size, taste, texture and flavour, whereas preference ranking were used for palatability evaluation of the different accessions before and after cooking. The matrix scores (1 - 5) were analysed using Genstat, and the means were separated using the LSD ($P \leq 0.05$). The logistic preference ranking was used to analyse the accession based on palatability data [colour (before and after cooking), size, taste, texture and flavour].

## 3. Results

### 3.1. Agronomic Performance of 33 *L. purpureus* Accessions

NARL and DATIC-Tororo had highly sandy soils with very low clay and silt proportions (Table 2), but Nitrogen (N), Organic matter (OM), Phosphorus (P) and Potassium (K) contents in Tororo soils were lower than in the Kawanda soils. Although the overall nutrient level was below the critical levels, the pH levels were above the critical values but still tolerable by lablab according to Kay, 1979.

Percent germination, days to 50% flowering, plant vigour, leafiness, plant height at 100% flowering, days to podding, days to pod maturity, harvest period, pods per plant and yield (g) per plant of all accessions were significantly different ($P \leq 0.05$) in NARL and DATIC-Tororo. Although the germinability of most accessions (60.6%) was higher than the mean (71.6%), the overall range was 59% - 82%, with 52506B and 52504A having the highest rate of germination. The rate of germination was higher in DATIC-Tororo (82.2%) than at NARL (61.0%) probably because rainfall started earlier in DATIC-Tororo. The trends of germination were inconsistent between the two sites, showing that accessions that had higher % germination in DATIC-Tororo were different from those that performed well in NARL (Table 4(a)).

Days to 50% flowering differed significantly during the two seasons (Table 4(a), Table 5(a)), and all accessions reached 50% flowering within 52 - 69 days after planting (DAP) in the first season (2011A), while in the second season, the range was 56 - 108 DAP. There was no significant difference among DAP taken by 75.8% of the accessions to reach 50% flowering during the first season. Although 82% of the accessions in NARL took fewer (55.5) days to reach 50% flowering; only 54% took 49 - 57 days to reach 50% flowering in DATIC-Tororo (Table 4(a)).

Seedling vigour was generally low especially in NARL (Table 4(a)), but accession 29399 had higher seedling vigour, plant vigour and leafiness. In the second season, seedling vigour was significantly different, but below the average (2.5) for most of the accessions (Table 5(a)). Plant vigour was positively correlated with leafiness in NARL and DATIC-Tororo where accessions (29399, 27400, 31364, 34777, 35894, 52506B, 52552, CQ3620 and CQ3621) that had higher plant vigour, also had higher leafiness.

The height of most accessions (63.6%) was below the average height (189.7 cm) at 100% flowering, which was partly attributed to the unfavourable weather

**Table 4.** (a) Vegetative growth performance of 33 different lablab accessions during 2011-2012 at NARL and DATICS DATIC-Tororo; (b) Podding and yield performance of lablab accessions during 2011-2012 at NARL and DATIC-Tororo.

(a)

| Accessions | Days to Podding | | Days to Harvesting | | Harvest Period (days) | | Total pod per Plot | | Pods per Plant | | Plant Seed Weight (g) | | 1000 seed weight (g) | | Seed per Pod | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NARL | DATIC-Tororo | NARL | DATIC-Tororo | NARL | DATIC-Tororo | NARL | DATIC-Tororo | NARL | DATIC-Tororo | NARL | DATIC-Tororo | NARL | DATIC-Tororo | NARL | DATIC-Tororo |
| 29399 | 73.0 | 66.0 | 94.0 | 98.0 | 313.5 | 71.0 | 15885.0 | 4775.5 | 956.5 | 404.0 | 655.6 | 172.5 | 267.9 | 108.2 | 5 | 4 |
| 29400 | 73.0 | 65.0 | 94.0 | 98.0 | 313.5 | 71.0 | 10108.0 | 2614.5 | 701.5 | 300.5 | 322.0 | 106.4 | 248.6 | 115.8 | 5 | 4 |
| 29803 | 87.5 | 79.5 | 107.0 | 98.0 | 313.5 | 64.0 | 6681.0 | 3150.5 | 478.5 | 232.0 | 353.0 | 172.6 | 286.4 | 112.8 | 5 | 4 |
| 30701 | 87.5 | 78.0 | 107.0 | 102.5 | 273.0 | 89.0 | 8676.0 | 4955.5 | 1017.0 | 371.0 | 725.8 | 287.3 | 340.3 | 124.0 | 5 | 4 |
| 31364 | 73.0 | 64.5 | 97.5 | 98.0 | 313.5 | 63.0 | 12503.0 | 5674.0 | 671.0 | 371.0 | 415.2 | 135.6 | 194.7 | 109.5 | 4 | 4 |
| 34777 | 73.0 | 71.0 | 94.0 | 98.0 | 171.5 | 38.0 | 7698.0 | 854.0 | 255.0 | 107.0 | 154.3 | 21.3 | 208.8 | 112.2 | 4 | 4 |
| 34780 | 73.0 | 71.0 | 94.0 | 98.0 | 245.5 | 38.0 | 3105.0 | 1311.5 | 179.0 | 120.5 | 149.9 | 48.9 | 239.4 | 113.4 | 5 | 5 |
| 35771 | 73.0 | 71.0 | 94.0 | 98.0 | 227.7 | 38.0 | 3983.0 | 1359.5 | 207.0 | 120.5 | 125.9 | 32.1 | 165.7 | 105.8 | 4 | 4 |
| 35893 | 79.5 | 71.0 | 94.0 | 98.0 | 245.5 | 45.0 | 1048.0 | 576.0 | 68.0 | 69.5 | 59.2 | 43.3 | 262.0 | 112.3 | 5 | 4 |
| 35894 | 79.5 | 57.5 | 94.0 | 91.0 | 171.5 | 41.5 | 2142.5 | 1478.5 | 140.0 | 113.5 | 126.7 | 59.1 | 250.9 | 112.3 | 5 | 4 |
| 36019 | 79.5 | 57.5 | 94.0 | 91.0 | 313.5 | 76.5 | 3778.5 | 2157.0 | 217.5 | 145.0 | 137.5 | 65.7 | 164.8 | 108.5 | 5 | 4 |
| 36903 | 73.0 | 63.0 | 94.0 | 98.0 | 171.5 | 38.0 | 5760.5 | 1665.0 | 300.0 | 132.5 | 176.1 | 31.3 | 181.8 | 99.1 | 4 | 3 |
| 52504A | 79.5 | 78.0 | 94.0 | 98.0 | 250.5 | 38.0 | 3629.5 | 1825.0 | 164.0 | 111.5 | 95.9 | 43.5 | 163.9 | 106.0 | 4 | 4 |
| 52504B | 73.0 | 72.0 | 94.0 | 98.0 | 159.5 | 38.0 | 3454.5 | 1806.0 | 165.5 | 141.0 | 92.4 | 39.2 | 152.2 | 109.1 | 4 | 3 |
| 52506B | 73.0 | 72.0 | 94.0 | 98.0 | 159.5 | 38.0 | 4735.5 | 1053.0 | 212.5 | 112.0 | 113.2 | 16.6 | 155.5 | 96.2 | 4 | 4 |
| 52508 | 79.5 | 66.0 | 94.0 | 98.0 | 164.5 | 38.0 | 2659.0 | 1622.0 | 142.0 | 126.5 | 90.8 | 49.6 | 181.4 | 105.0 | 4 | 4 |
| 52513 | 73.0 | 66.0 | 100.0 | 98.0 | 187.0 | 38.0 | 3371.0 | 2003.0 | 223.0 | 197.5 | 133.0 | 48.2 | 167.8 | 103.8 | 5 | 4 |
| 52514 | 73.0 | 72.0 | 94.0 | 98.0 | 164.0 | 38.0 | 3340.5 | 1637.0 | 187.5 | 172.0 | 111.9 | 59.1 | 162.3 | 105.9 | 4 | 4 |
| 52518B | 100.0 | 71.5 | 117.0 | 106.0 | 313.5 | 85.5 | 1234.5 | 1838.5 | 91.5 | 178.0 | 52.7 | 101.2 | 234.4 | 109.8 | 4 | 3 |
| 52530 | 79.5 | 67.5 | 100.5 | 51.5 | 164.5 | 55.0 | 2879.0 | 1072.5 | 195.5 | 495.0 | 148.4 | 161.6 | 205.0 | 104.7 | 4 | 2 |
| 52533 | 79.5 | 69.0 | 94.0 | 98.0 | 146.5 | 38.0 | 3568.3 | 2025.5 | 221.5 | 205.5 | 120.0 | 96.5 | 174.4 | 96.5 | 4 | 4 |
| 52535 | 73.0 | 75.0 | 94.0 | 98.0 | 186.0 | 38.0 | 4127.0 | 233.0 | 240.0 | 44.0 | 144.5 | 50.9 | 238.8 | 113.5 | 4 | 4 |
| 52551 | 79.5 | 75.0 | 94.0 | 98.0 | 171.5 | 38.0 | 4157.5 | 1301.0 | 248.0 | 149.5 | 176.4 | 75.6 | 242.6 | 112.8 | 4 | 4 |
| 52552 | 73.0 | 75.0 | 94.0 | 98.0 | 219.0 | 38.0 | 5629.5 | 2275.5 | 283.0 | 196.0 | 150.0 | 65.4 | 203.4 | 108.6 | 4 | 4 |
| 52554 | 79.5 | 75.0 | 94.0 | 98.0 | 171.5 | 38.0 | 5258.0 | 1405.0 | 272.5 | 140.0 | 146.9 | 25.5 | 98.4 | 106.4 | 4 | 4 |
| 57314 | 79.5 | 75.0 | 94.0 | 98.0 | 171.5 | 38.0 | 5104.0 | 2381.0 | 161.5 | 189.0 | 88.9 | 63.5 | 191.2 | 103.9 | 4 | 3 |
| 57315 | 73.0 | 73.0 | 94.0 | 102.5 | 170.5 | 38.0 | 6684.0 | 2034.0 | 305.0 | 222.0 | 169.1 | 48.5 | 152.5 | 105.7 | 4 | 4 |
| 60795 | 73.0 | 64.5 | 94.0 | 98.0 | 170.5 | 63.0 | 3732.5 | 2235.5 | 184.5 | 171.0 | 109.2 | 44.0 | 154.3 | 107.9 | 4 | 4 |
| CQ3620 | 73.0 | 75.5 | 94.0 | 98.0 | 285.5 | 38.0 | 8000.5 | 2365.0 | 510.0 | 182.5 | 357.2 | 94.0 | 216.5 | 116.0 | 4 | 4 |
| CQ3621 | 73.0 | 59.0 | 100.0 | 98.0 | 313.5 | 39.5 | 3407.0 | 3140.0 | 252.0 | 184.5 | 145.9 | 129.0 | 236.8 | 111.1 | 4 | 4 |
| Q5427 | 82.0 | 78.5 | 101.0 | 116.0 | 313.5 | 30.0 | 11214.5 | 4734.5 | 622.0 | 306.0 | 336.2 | 260.3 | 256.5 | 118.9 | 5 | 4 |
| Q6880B | 73.0 | 57.5 | 94.0 | 91.0 | 313.5 | 106.0 | 4025.5 | 2399.5 | 236.5 | 153.0 | 135.7 | 60.5 | 212.2 | 112.0 | 5 | 4 |
| Q6988 | 76.0 | 72.0 | 101.0 | 98.0 | 313.5 | 98.0 | 11314.0 | 5443.0 | 888.0 | 315.0 | 489.5 | 147.8 | 205.0 | 104.2 | 5 | 4 |
| **Mean average** | | **73.5** | | **96.8** | | **140.4** | | **3914** | | **264** | | **146.4** | | **158.4** | | **4** |
| **LSD (P < 0.05)** | | **10** | | **NS** | | **65.1** | | **3117.5** | | **232.9** | | **131.2** | | **NS** | | **0.7** |
| **CV%** | | **9.6** | | **10.4** | | **32.8** | | **56.4** | | **62.5** | | **63.5** | | **46.7** | | **12.9** |

(b)

| Accessions | Days to Podding | | Days to Harvesting | | Harvest Period (days) | | Total pod per Plot | | Pods per Plant | | Plant Seed Weight (g) | | 1000 seed weight (g) | | Seed per Pod | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NARL | DATIC-Tororo | NARL | DATIC-Tororo | NARL | DATIC-Tororo | NARL | DATIC-Tororo | NARL | DATIC-Tororo | NARL | DATIC-Tororo | NARL | DATIC-Tororo | NARL | DATIC-Tororo |
| 29399 | 73.0 | 66.0 | 94.0 | 98.0 | 313.5 | 71.0 | 15885.0 | 4775.5 | 956.5 | 404.0 | 655.6 | 172.5 | 267.9 | 108.2 | 5 | 4 |
| 29400 | 73.0 | 65.0 | 94.0 | 98.0 | 313.5 | 71.0 | 10108.0 | 2614.5 | 701.5 | 300.5 | 322.0 | 106.4 | 248.6 | 115.8 | 5 | 4 |
| 29803 | 87.5 | 79.5 | 107.0 | 98.0 | 313.5 | 64.0 | 6681.0 | 3150.5 | 478.5 | 232.0 | 353.0 | 172.6 | 286.4 | 112.8 | 5 | 4 |
| 30701 | 87.5 | 78.0 | 107.0 | 102.5 | 273.0 | 89.0 | 8676.0 | 4955.5 | 1017.0 | 371.0 | 725.8 | 287.3 | 340.3 | 124.0 | 5 | 4 |
| 31364 | 73.0 | 64.5 | 97.5 | 98.0 | 313.5 | 63.0 | 12503.0 | 5674.0 | 671.0 | 371.0 | 415.2 | 135.6 | 194.7 | 109.5 | 4 | 4 |
| 34777 | 73.0 | 71.0 | 94.0 | 98.0 | 171.5 | 38.0 | 7698.0 | 854.0 | 255.0 | 107.0 | 154.3 | 21.3 | 208.8 | 112.2 | 4 | 4 |
| 34780 | 73.0 | 71.0 | 94.0 | 98.0 | 245.5 | 38.0 | 3105.0 | 1311.5 | 179.0 | 120.5 | 149.9 | 48.9 | 239.4 | 113.4 | 5 | 5 |
| 35771 | 73.0 | 71.0 | 94.0 | 98.0 | 227.7 | 38.0 | 3983.0 | 1359.5 | 207.0 | 120.5 | 125.9 | 32.1 | 165.7 | 105.8 | 4 | 4 |
| 35893 | 79.5 | 71.0 | 94.0 | 98.0 | 245.5 | 45.0 | 1048.0 | 576.0 | 68.0 | 69.5 | 59.2 | 43.3 | 262.0 | 112.3 | 5 | 4 |
| 35894 | 79.5 | 57.5 | 94.0 | 91.0 | 171.5 | 41.5 | 2142.5 | 1478.5 | 140.0 | 113.5 | 126.7 | 59.1 | 250.9 | 112.3 | 5 | 4 |
| 36019 | 79.5 | 57.5 | 94.0 | 91.0 | 313.5 | 76.5 | 3778.5 | 2157.0 | 217.5 | 145.0 | 137.5 | 65.7 | 164.8 | 108.5 | 5 | 4 |
| 36903 | 73.0 | 63.0 | 94.0 | 98.0 | 171.5 | 38.0 | 5760.5 | 1665.0 | 300.0 | 132.5 | 176.1 | 31.3 | 181.8 | 99.1 | 4 | 3 |
| 52504A | 79.5 | 78.0 | 94.0 | 98.0 | 250.5 | 38.0 | 3629.5 | 1825.0 | 164.0 | 111.5 | 95.9 | 43.5 | 163.9 | 106.0 | 4 | 4 |
| 52504B | 73.0 | 72.0 | 94.0 | 98.0 | 159.5 | 38.0 | 3454.5 | 1806.0 | 165.5 | 141.0 | 92.4 | 39.2 | 152.2 | 109.1 | 4 | 3 |
| 52506B | 73.0 | 72.0 | 94.0 | 98.0 | 159.5 | 38.0 | 4735.5 | 1053.0 | 212.5 | 112.0 | 113.2 | 16.6 | 155.5 | 96.2 | 4 | 4 |
| 52508 | 79.5 | 66.0 | 94.0 | 98.0 | 164.5 | 38.0 | 2659.0 | 1622.0 | 142.0 | 126.5 | 90.8 | 49.6 | 181.4 | 105.0 | 4 | 4 |
| 52513 | 73.0 | 66.0 | 100.0 | 98.0 | 187.0 | 38.0 | 3371.0 | 2003.0 | 223.0 | 197.5 | 133.0 | 48.2 | 167.8 | 103.8 | 5 | 4 |
| 52514 | 73.0 | 72.0 | 94.0 | 98.0 | 164.0 | 38.0 | 3340.5 | 1637.0 | 187.5 | 172.0 | 111.9 | 59.1 | 162.3 | 105.9 | 4 | 4 |
| 52518B | 100.0 | 71.5 | 117.0 | 106.0 | 313.5 | 85.5 | 1234.5 | 1838.5 | 91.5 | 178.0 | 52.7 | 101.2 | 234.4 | 109.8 | 4 | 3 |
| 52530 | 79.5 | 67.5 | 100.5 | 51.5 | 164.5 | 55.0 | 2879.0 | 1072.5 | 195.5 | 495.0 | 148.4 | 161.6 | 205.0 | 104.7 | 4 | 2 |
| 52533 | 79.5 | 69.0 | 94.0 | 98.0 | 146.5 | 38.0 | 3568.3 | 2025.5 | 221.5 | 205.5 | 120.0 | 96.5 | 174.4 | 96.5 | 4 | 4 |
| 52535 | 73.0 | 75.0 | 94.0 | 98.0 | 186.0 | 38.0 | 4127.0 | 233.0 | 240.0 | 44.0 | 144.5 | 50.9 | 238.8 | 113.5 | 4 | 4 |
| 52551 | 79.5 | 75.0 | 94.0 | 98.0 | 171.5 | 38.0 | 4157.5 | 1301.0 | 248.0 | 149.5 | 176.4 | 75.6 | 242.6 | 112.8 | 4 | 4 |
| 52552 | 73.0 | 75.0 | 94.0 | 98.0 | 219.0 | 38.0 | 5629.5 | 2275.5 | 283.0 | 196.0 | 150.0 | 65.4 | 203.4 | 108.6 | 4 | 4 |
| 52554 | 79.5 | 75.0 | 94.0 | 98.0 | 171.5 | 38.0 | 5258.0 | 1405.0 | 272.5 | 140.0 | 146.9 | 25.5 | 98.4 | 106.4 | 4 | 4 |
| 57314 | 79.5 | 75.0 | 94.0 | 98.0 | 171.5 | 38.0 | 5104.0 | 2381.0 | 161.5 | 189.0 | 88.9 | 63.5 | 191.2 | 103.9 | 4 | 3 |
| 57315 | 73.0 | 73.0 | 94.0 | 102.5 | 170.5 | 38.0 | 6684.0 | 2034.0 | 305.0 | 222.0 | 169.1 | 48.5 | 152.5 | 105.7 | 4 | 4 |
| 60795 | 73.0 | 64.5 | 94.0 | 98.0 | 170.5 | 63.0 | 3732.5 | 2235.5 | 184.5 | 171.0 | 109.2 | 44.0 | 154.3 | 107.9 | 4 | 4 |
| CQ3620 | 73.0 | 75.5 | 94.0 | 98.0 | 285.5 | 38.0 | 8000.5 | 2365.0 | 510.0 | 182.5 | 357.2 | 94.0 | 216.5 | 116.0 | 4 | 4 |
| CQ3621 | 73.0 | 59.0 | 100.0 | 98.0 | 313.5 | 39.5 | 3407.0 | 3140.0 | 252.0 | 184.5 | 145.9 | 129.0 | 236.8 | 111.1 | 4 | 4 |
| Q5427 | 82.0 | 78.5 | 101.0 | 116.0 | 313.5 | 30.0 | 11214.5 | 4734.5 | 622.0 | 306.0 | 336.2 | 260.3 | 256.5 | 118.9 | 5 | 4 |
| Q6880B | 73.0 | 57.5 | 94.0 | 91.0 | 313.5 | 106.0 | 4025.5 | 2399.5 | 236.5 | 153.0 | 135.7 | 60.5 | 212.2 | 112.0 | 5 | 4 |
| Q6988 | 76.0 | 72.0 | 101.0 | 98.0 | 313.5 | 98.0 | 11314.0 | 5443.0 | 888.0 | 315.0 | 489.5 | 147.8 | 205.0 | 104.2 | 5 | 4 |
| **Mean average** | | **73.5** | | **96.8** | | **140.4** | | **3914** | | **264** | | **146.4** | | **158.4** | | **4** |
| **LSD (P < 0.05)** | | **10** | | **NS** | | **65.1** | | **3117.5** | | **232.9** | | **131.2** | | **NS** | | **0.7** |
| **CV%** | | **9.6** | | **10.4** | | **32.8** | | **56.4** | | **62.5** | | **63.5** | | **46.7** | | **12.9** |

conditions during the first season. Accessions 52518B and 30701 were significantly taller than the other accessions, while 52508 was the shortest during the first season. Accessions 52518B, Lablab Uganda, Q5427, 29803, 30701 and 34780

**Table 5.** (a) Vegetative growth performance of 22 different lablab accessions during 2013-2014 at NARL and DATICS DATIC-Tororo; (b) Podding and yield performance of lablab accessions during 2013-2014 at NARL and DATIC-Tororo.

(a)

| Accessions | % Germination | Days to 50% Flowering | Seedling Vigour (1 - 5) | Plant Vigour (1 - 5) | Leafiness (1 - 5) | Plant height at 50% flowering | Plant height at 100% flowering |
|---|---|---|---|---|---|---|---|
| 29803 | 72 | 89.5 | 2.5 | 1.8 | 3.0 | 235.9 | 259.7 |
| 30701 | 66 | 93.5 | 2.3 | 2.3 | 3.5 | 228.6 | 259.5 |
| 34777 | 70 | 64.0 | 2.8 | 2.5 | 2.0 | 123.2 | 67.0 |
| 34780 | 84 | 60.5 | 1.8 | 1.8 | 3.3 | 175.0 | 223.1 |
| 35894 | 76 | 58.5 | 2.0 | 2.3 | 2.0 | 106.3 | 154.4 |
| 36019 | 72 | 54.5 | 2.5 | 1.8 | 1.8 | 51.0 | 89.5 |
| 36903 | 84 | 57.5 | 2.8 | 1.8 | 2.8 | 110.5 | 125.5 |
| 52504A | 70 | 56.5 | 2.3 | 2.0 | 2.8 | 113.9 | 122.4 |
| 52506B | 84 | 55.5 | 2.0 | 1.8 | 2.8 | 119.5 | 132.0 |
| 52513 | 80 | 59.5 | 2.5 | 2.5 | 2.3 | 105.3 | 127.8 |
| 52514 | 70 | 56.5 | 2.0 | 2.3 | 2.3 | 67.4 | 78.9 |
| 52518B | 68 | 107.0 | 1.5 | 1.3 | 2.3 | 258.5 | 326.5 |
| 52535 | 54 | 56.5 | 2.3 | 2.0 | 2.8 | 121.6 | 139.6 |
| 52552 | 56 | 64.0 | 2.5 | 2.8 | 2.8 | 111.9 | 138.9 |
| Q6880B | 82 | 57.0 | 2.3 | 2.0 | 2.3 | 23.0 | 53.5 |
| 81364 | 78 | 57.0 | 2.3 | 2.3 | 2.8 | 53.0 | 107.5 |
| CQ3620 | 68 | 64.0 | 2.8 | 2.5 | 2.8 | 114.0 | 143.0 |
| CQ3621 | 68 | 57.0 | 2.0 | 2.5 | 2.0 | 17.9 | 62.6 |
| Q5427 | 66 | 93.0 | 1.5 | 2.8 | 3.3 | 246.5 | 280.0 |
| Q6988 | 76 | 64.0 | 2.3 | 2.5 | 3.0 | 137.0 | 192.5 |
| Lablab Uganda | 60 | 108.0 | 2.3 | 2.5 | 4.0 | 310.3 | 258.9 |
| **Average** | **71.6** | **68.3** | **2.2** | **2.2** | **2.6** | **134.8** | **159.2** |
| **LSD (P < 0.05)** | **15.5** | **13.5** | **1.0** | **1.5** | **1.0** | **86.0** | **90.1** |
| **CV%** | **2.3** | **9.5** | **8.3** | **7.8** | **15.2** | **31.8** | **28.1** |

(b)

| Accessions | Days to podding | Days to pod maturity | Days to harvesting | Harvest period (days) | Total pods per plot | Pods per plant | Total plant seed weight (g) | 1000 seed weight (g) | Number of Seed per pod |
|---|---|---|---|---|---|---|---|---|---|
| 29803 | 96.5 | 105.0 | 80.0 | 239.5 | 10610 | 810 | 913 | 241.2 | 5 |
| 30701 | 106.0 | 112.0 | 80.0 | 236.0 | 11144 | 931 | 1225 | 340.3 | 5 |
| 34777 | 69.0 | 84.0 | 80.0 | 73.0 | 1391 | 149 | 151 | 220.7 | 4 |
| 34780 | 65.5 | 87.5 | 80.0 | 61.0 | 1117 | 123 | 272 | 257.2 | 5 |
| 35894 | 66.5 | 84.0 | 80.0 | 65.5 | 732 | 85 | 123 | 260.8 | 5 |
| 36019 | 60.0 | 83.5 | 80.0 | 93.5 | 1904 | 186 | 294 | 191.8 | 4 |
| 36903 | 62.0 | 86.0 | 80.0 | 135.0 | 2100 | 180 | 132 | 168.8 | 4 |
| 52504A | 62.0 | 85.0 | 80.0 | 82.0 | 1437 | 141 | 124 | 170.0 | 4 |
| 52506B | 63.0 | 80.0 | 80.0 | 66.5 | 2226 | 215 | 190 | 161.5 | 4 |
| 52513 | 65.5 | 80.0 | 80.0 | 69.5 | 1688 | 146 | 119 | 166.1 | 4 |
| 52514 | 63.0 | 80.0 | 80.0 | 72.5 | 776 | 82 | 66 | 161.1 | 4 |
| 52518B | 99.0 | 104.2 | 80.0 | 239.5 | 8984 | 698 | 890 | 224.8 | 4 |
| 52535 | 62.0 | 86.5 | 80.0 | 55.0 | 832 | 105 | 142 | 259.1 | 4 |

**Continued**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 52552 | 69.0 | 80.0 | 80.0 | 90.0 | 1011 | 108 | 107 | 224.8 | 4 |
| Q6880B | 62.5 | 76.0 | 80.0 | 239.5 | 5131 | 500 | 787 | 213.6 | 5 |
| 81364 | 62.5 | 80.0 | 80.0 | 172.5 | 14827 | 1227 | 1749 | 173.2 | 5 |
| CQ3620 | 70.0 | 80.0 | 80.0 | 80.5 | 1059 | 127 | 170 | 222.9 | 4 |
| CQ3621 | 63.0 | 80.0 | 80.0 | 155.5 | 4535 | 602 | 971 | 233.2 | 4 |
| Q5427 | 98.5 | 110.0 | 80.0 | 243.0 | 10509 | 750 | 1336 | 244.7 | 5 |
| Q6988 | 69.0 | 78.0 | 80.0 | 243.0 | 8941 | 814 | 1083 | 196.3 | 4 |
| Lablab Uganda | 112.5 | 124.0 | 80.0 | 243.0 | 7528 | 592 | 1247 | 258.7 | 4 |
| **Averages** | **73.9** | **88.6** | **80.0** | **140.7** | **4689** | **408** | **576** | **218.6** | **4.0** |
| **LSD (P < 0.05)** | **11.8** | **18.1** | **NS** | **90.9** | **9917** | **777** | **1426** | **24.7** | **1.0** |
| **CV%** | **10.0** | **8.2** | **0.0** | **17.5** | **93.7** | **82.1** | **118.4** | **3.4** | **3.2** |

were taller at 50% and 100% flowering stages during the second season (Table 5(a)). The average plant height (206.6 cm) in NARL was higher than in DATIC-Tororo (172.7 cm) whereby the tallest accessions were 29803, 30701, Q5427 and 52518B. The tallest accessions in DATIC-Tororo were 29803, 31364, 52518B, CQ3620, CQ3621, 60795, Q5427 and Q6988 (Table 4(a)). However, there was no positive correlation between plant vigour and height.

Podding started at 65.3 - 85.8 average DAP with most early flowering accessions (54.5%) starting to pod before the average 74 DAP in the first season. The harvest periods ranged from 92.2 to 209.8 DAP in the first season, and 15 accessions had a significantly longer harvest period (Table 4(b)). The harvest period in NARL was longer (229.8 days) than in DATIC-Tororo (51 days), and accessions with the longest harvest periods were 29399, 29400, 29803, 31364, 36019, 52518B, CQ3621, Q5427, Q6880B, Q6988, CQ3620 and 30701 (Table 4(b)). This showed that under favourable conditions (sufficient moisture), lablab has the ability to produce more pods for a long period. In the second season, the days to podding (62 - 113) and pod maturity (76 - 124) were significantly different (Table 5(b)).

The accessions that had the longest harvest period, eventually produced the highest number of pods and yields (Table 4(b) and Table 5(b)), and the number of pods were significantly different with a range of 69 - 694 pods per plant. More pods were harvested in NARL (average 332) than in DATIC-Tororo (196), which resulted in higher average yields per plant in NARL (206.3 g) than in DATIC-Tororo (86.5 g). Accessions 30701, 29399, Q6988, 29400, 31364 and Q5427 produced the highest number of pods. However, the 1000 seeds weight with the range of 102.4 - 232.1 g showed no significantly difference across accessions, while 85% of the accessions had 4 seeds per pod (Table 4(b)).

Plant vigour, leafiness, plant height, harvest period, pods per plant and yields, showed significant differences between the sprayed and non-sprayed plants (Table 6 and Table 7). Poor yields from the non-sprayed plants resulted from the high incidences of different insect pests (*Anaplocnemis curvipes*, *Acanthomia tomentosicollis*, *Zonabris dicincta*, *Coryna apicicornis*, *Nematocerus*

**Table 6.** Vegetative growth performance of 33 different lablab accessions with or without pesticide sprays during 2011-2012.

(a)

| Accessions | % Germination | | Day to 50% Flowering | | Seedling Vigour | | Plant Vigour | | Leafiness | | Plant height at 50% Flowering | | Plant height at 100% Flowering | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control |
| 29399 | 82 | 68 | 57.0 | 55.0 | 2.3 | 2.0 | 3.5 | 3.5 | 4.8 | 4.5 | 108 | 82 | 245.0 | 170.5 |
| 29400 | 56 | 72 | 57.0 | 55.0 | 1.5 | 1.5 | 3.0 | 3.0 | 3.3 | 4.0 | 60 | 72 | 196.0 | 127.0 |
| 29803 | 68 | 80 | 70.0 | 68.0 | 1.5 | 1.0 | 2.5 | 2.5 | 3.3 | 3.0 | 116 | 60 | 339.0 | 314.0 |
| 30701 | 56 | 62 | 70.0 | 68.0 | 1.5 | 1.5 | 3.0 | 2.5 | 3.3 | 4.0 | 74 | 98 | 356.0 | 335.5 |
| 31364 | 84 | 72 | 57.0 | 55.0 | 1.5 | 1.5 | 3.0 | 3.0 | 3.8 | 4.3 | 52 | 80 | 246.0 | 166.0 |
| 34777 | 72 | 76 | 60.0 | 58.0 | 1.5 | 1.5 | 3.0 | 3.0 | 2.0 | 3.0 | 60 | 70 | 222.0 | 150.0 |
| 34780 | 76 | 70 | 53.5 | 51.0 | 1.0 | 1.5 | 3.0 | 2.0 | 2.0 | 1.3 | 144 | 50 | 255.0 | 162.0 |
| 35771 | 76 | 70 | 53.5 | 51.0 | 1.5 | 1.5 | 2.5 | 1.5 | 2.5 | 1.3 | 54 | 38 | 180.0 | 124.0 |
| 35893 | 82 | 68 | 53.5 | 51.0 | 1.0 | 1.0 | 2.5 | 2.0 | 1.8 | 1.5 | 132 | 58 | 235.0 | 156.0 |
| 35894 | 64 | 74 | 53.5 | 51.0 | 1.5 | 1.5 | 3.0 | 2.5 | 2.3 | 2.5 | 120 | 80 | 246.5 | 154.0 |
| 36019 | 78 | 62 | 53.5 | 51.0 | 1.0 | 1.5 | 3.0 | 2.0 | 2.0 | 1.3 | 86 | 26 | 209.0 | 93.0 |
| 36903 | 86 | 70 | 60.5 | 61.0 | 1.5 | 1.5 | 3.0 | 2.0 | 2.8 | 2.0 | 52 | 28 | 190.0 | 120.0 |
| 52504A | 94 | 70 | 63.5 | 61.0 | 1.5 | 1.5 | 2.5 | 2.0 | 2.5 | 2.8 | 34 | 34 | 161.5 | 130.0 |
| 52504B | 78 | 74 | 60.5 | 58.0 | 1.5 | 1.5 | 2.5 | 2.0 | 2.5 | 2.5 | 30 | 34 | 184.0 | 119.0 |
| 52506B | 86 | 84 | 60.5 | 58.0 | 1.5 | 1.5 | 3.0 | 2.5 | 3.3 | 3.0 | 48 | 26 | 182.0 | 156.0 |
| 52508 | 72 | 76 | 57.5 | 55.5 | 1.5 | 1.5 | 2.5 | 2.5 | 2.8 | 2.8 | 24 | 16 | 129.0 | 122.0 |
| 52513 | 60 | 62 | 63.0 | 55.5 | 1.5 | 1.0 | 2.5 | 2.0 | 2.3 | 2.5 | 64 | 56 | 225.0 | 152.0 |
| 52514 | 66 | 70 | 57.5 | 55.5 | 1.5 | 1.0 | 2.5 | 2.5 | 2.3 | 3.3 | 44 | 56 | 149.0 | 121.0 |
| 52518B | 62 | 70 | 53.5 | 61.0 | 1.5 | 1.0 | 2.5 | 1.5 | 2.0 | 1.0 | 66 | 90 | 346.5 | 355.0 |
| 52530 | 68 | 56 | 60.5 | 58.0 | 1.5 | 1.0 | 3.0 | 1.0 | 2.5 | 1.0 | 90 | 30 | 166.5 | 94.0 |
| 52533 | 70 | 70 | 62.0 | 59.5 | 1.5 | 1.0 | 3.0 | 1.0 | 3.0 | 1.0 | 92 | 34 | 207.5 | 144.0 |
| 52535 | 80 | 68 | 60.5 | 58.0 | 1.5 | 1.5 | 2.5 | 2.0 | 1.5 | 1.5 | 70 | 44 | 157.5 | 140.0 |
| 52551 | 68 | 64 | 60.5 | 58.0 | 1.5 | 1.0 | 3.0 | 1.5 | 2.5 | 2.3 | 94 | 84 | 200.0 | 144.0 |
| 52552 | 74 | 72 | 57.5 | 55.5 | 1.0 | 1.0 | 3.0 | 3.0 | 2.5 | 3.0 | 98 | 88 | 219.0 | 160.0 |
| 52554 | 62 | 58 | 61.5 | 59.0 | 1.0 | 1.0 | 2.5 | 2.5 | 2.8 | 2.5 | 62 | 44 | 166.5 | 93.0 |
| 57314 | 76 | 70 | 61.5 | 59.0 | 1.5 | 1.0 | 3.0 | 2.0 | 2.5 | 2.3 | 50 | 42 | 187.5 | 115.0 |
| 57315 | 78 | 72 | 63.0 | 60.5 | 1.5 | 1.0 | 3.0 | 2.0 | 3.0 | 2.8 | 58 | 44 | 206.5 | 126.0 |
| 60795 | 80 | 76 | 57.5 | 55.5 | 1.5 | 1.0 | 2.5 | 2.0 | 3.0 | 2.8 | 44 | 42 | 224.0 | 151.0 |
| CQ3620 | 76 | 74 | 60.5 | 58.0 | 1.5 | 1.5 | 3.0 | 3.0 | 2.8 | 3.3 | 62 | 78 | 187.5 | 197.0 |
| CQ3621 | 72 | 68 | 63.0 | 55.5 | 1.5 | 1.5 | 2.5 | 3.0 | 3.0 | 3.3 | 42 | 38 | 232.5 | 149.0 |
| Q5427 | 78 | 78 | 53.5 | 56.5 | 1.0 | 1.0 | 2.0 | 1.5 | 2.5 | 1.3 | 26 | 16 | 334.0 | 265.0 |
| Q6880B | 70 | 74 | 55.5 | 55.5 | 1.0 | 1.5 | 2.0 | 2.0 | 1.5 | 1.3 | 72 | 88 | 151.5 | 133.5 |
| Q6988 | 66 | 62 | 58.5 | 56.0 | 1.0 | 1.8 | 2.5 | 2.5 | 2.3 | 2.5 | 96 | 104 | 265.0 | 177.0 |
| **Means** | **73.2** | **70.1** | **59.1** | **57.1** | **1.4** | **1.3** | **2.7** | **2.2** | **2.6** | **2.4** | **70.4** | **55.5** | **218.2** | **161.1** |

(b)

| Accessions | Days to Podding | | Days to Harvesting | | Harvest Period (days) | | Total pod per Plot | | Pods per Plant | | Plant Seed Weight (g) | | 1000 seed weight (g) | | Seed per Pod | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control |
| 29399 | 70.5 | 68.5 | 100.0 | 92.0 | 193.5 | 191.0 | 12961.0 | 7700.0 | 763.0 | 598.0 | 537.9 | 290.1 | 230.5 | 145.6 | 4.5 | 3.5 |
| 29400 | 70.0 | 68.0 | 100.0 | 92.0 | 193.5 | 191.0 | 6486.0 | 6238.0 | 591.0 | 412.0 | 303.4 | 125.0 | 228.6 | 135.8 | 4.5 | 3.5 |
| 29803 | 92.5 | 74.5 | 106.0 | 99.0 | 220.5 | 157.0 | 5977.0 | 3855.0 | 445.0 | 266.0 | 369.2 | 156.4 | 239.9 | 159.3 | 4.5 | 4.5 |
| 30701 | 92.5 | 74.0 | 110.0 | 99.0 | 216.0 | 146.0 | 10139.0 | 3493.0 | 954.0 | 435.0 | 799.6 | 213.5 | 269.3 | 195.0 | 5.0 | 4.0 |
| 31364 | 70.0 | 67.5 | 100.0 | 95.5 | 190.0 | 186.5 | 12912.0 | 5265.0 | 695.0 | 293.0 | 411.7 | 139.0 | 196.0 | 108.2 | 4.0 | 3.5 |
| 34777 | 73.0 | 71.0 | 100.0 | 92.0 | 104.0 | 105.5 | 2573.0 | 5979.0 | 190.0 | 173.0 | 92.0 | 83.6 | 201.0 | 166.0 | 4.0 | 4.0 |
| 34780 | 73.0 | 71.0 | 100.0 | 92.0 | 190.0 | 93.5 | 3492.0 | 925.0 | 221.0 | 79.0 | 157.0 | 41.8 | 216.1 | 136.7 | 5.5 | 4.0 |
| 35771 | 73.0 | 71.0 | 100.0 | 92.0 | 104.0 | 161.5 | 2952.0 | 2391.0 | 207.0 | 121.0 | 86.2 | 71.8 | 167.4 | 104.1 | 4.0 | 4.0 |
| 35893 | 79.5 | 71.0 | 100.0 | 92.0 | 197.0 | 93.5 | 1124.0 | 501.0 | 91.0 | 47.0 | 71.9 | 30.6 | 240.9 | 133.6 | 4.5 | 4.0 |
| 35894 | 72.5 | 64.5 | 96.5 | 88.5 | 107.5 | 105.5 | 2423.0 | 1199.0 | 184.0 | 70.0 | 151.3 | 34.4 | 227.9 | 135.3 | 4.5 | 4.0 |
| 36019 | 72.5 | 64.5 | 96.5 | 88.5 | 224.0 | 166.0 | 4507.0 | 1429.0 | 253.0 | 110.0 | 132.8 | 70.3 | 196.5 | 76.8 | 4.5 | 4.0 |
| 36903 | 72.0 | 64.0 | 100.0 | 92.0 | 104.0 | 105.5 | 5670.0 | 1756.0 | 311.0 | 122.0 | 148.9 | 58.5 | 169.0 | 111.9 | 3.5 | 3.5 |
| 52504A | 83.0 | 74.5 | 100.0 | 92.0 | 190.0 | 98.5 | 3705.0 | 1750.0 | 192.0 | 84.0 | 95.6 | 43.8 | 174.7 | 95.2 | 4.0 | 3.5 |
| 52504B | 73.5 | 71.5 | 100.0 | 92.0 | 104.0 | 93.5 | 3782.0 | 1479.0 | 221.0 | 86.0 | 99.8 | 31.8 | 175.5 | 85.8 | 3.5 | 3.5 |
| 52506B | 73.5 | 71.5 | 100.0 | 92.0 | 104.0 | 93.5 | 3929.0 | 1860.0 | 239.0 | 86.0 | 104.9 | 24.8 | 166.2 | 85.4 | 3.5 | 4.0 |
| 52508 | 77.0 | 68.5 | 100.0 | 92.0 | 104.0 | 98.5 | 2698.0 | 1584.0 | 195.0 | 74.0 | 96.1 | 44.3 | 189.2 | 97.2 | 4.0 | 3.5 |
| 52513 | 70.5 | 68.5 | 106.0 | 92.0 | 104.0 | 121.0 | 3316.0 | 2058.0 | 295.0 | 126.0 | 134.8 | 46.3 | 182.6 | 89.0 | 4.5 | 3.5 |
| 52514 | 73.5 | 71.5 | 100.0 | 92.0 | 104.0 | 98.5 | 2361.0 | 2617.0 | 186.0 | 174.0 | 110.6 | 60.4 | 180.4 | 87.7 | 4.0 | 4.0 |
| 52518B | 95.0 | 76.5 | 124.5 | 98.5 | 212.5 | 186.5 | 2513.0 | 560.0 | 229.0 | 41.0 | 129.3 | 24.6 | 212.6 | 131.6 | 4.0 | 3.0 |
| 52530 | 76.5 | 70.5 | 100.0 | 52.0 | 134.5 | 85.0 | 2642.0 | 1310.0 | 607.0 | 84.0 | 254.4 | 55.6 | 211.1 | 98.6 | 4.0 | 2.0 |
| 52533 | 78.0 | 70.5 | 100.0 | 92.0 | 103.0 | 81.5 | 4516.0 | 1079.0 | 365.0 | 63.0 | 196.2 | 20.3 | 184.4 | 86.4 | 4.0 | 4.0 |
| 52535 | 75.0 | 73.0 | 100.0 | 92.0 | 103.0 | 121.0 | 2814.0 | 1546.0 | 184.0 | 101.0 | 136.1 | 59.2 | 220.7 | 131.6 | 4.0 | 4.0 |
| 52551 | 81.5 | 73.0 | 100.0 | 92.0 | 104.0 | 105.5 | 3721.0 | 1738.0 | 282.0 | 116.0 | 188.8 | 63.2 | 217.0 | 138.4 | 4.0 | 3.5 |
| 52552 | 75.0 | 73.0 | 100.0 | 92.0 | 151.5 | 105.5 | 4710.0 | 3195.0 | 297.0 | 183.0 | 133.0 | 82.4 | 196.9 | 115.1 | 4.0 | 4.0 |
| 52554 | 81.5 | 73.0 | 100.0 | 92.0 | 104.0 | 105.5 | 3726.0 | 2937.0 | 275.0 | 138.0 | 95.9 | 76.5 | 105.2 | 99.6 | 4.0 | 4.0 |
| 57314 | 81.5 | 73.0 | 100.0 | 92.0 | 104.0 | 105.5 | 4307.0 | 3178.0 | 292.0 | 59.0 | 118.5 | 34.0 | 189.9 | 105.3 | 3.5 | 3.5 |
| 57315 | 74.0 | 72.0 | 100.0 | 96.5 | 103.0 | 105.5 | 4713.0 | 4005.0 | 345.0 | 183.0 | 128.8 | 88.7 | 171.4 | 86.8 | 4.0 | 3.5 |
| 60795 | 70.0 | 67.5 | 100.0 | 92.0 | 103.0 | 130.5 | 3943.0 | 2026.0 | 206.0 | 150.0 | 103.3 | 49.9 | 176.5 | 85.7 | 4.0 | 4.0 |
| CQ3620 | 77.0 | 71.0 | 100.0 | 92.0 | 162.0 | 161.5 | 5464.0 | 4902.0 | 376.0 | 317.0 | 240.0 | 211.7 | 209.7 | 122.9 | 4.0 | 4.0 |
| CQ3621 | 67.0 | 65.0 | 106.0 | 92.0 | 190.0 | 163.0 | 4539.0 | 2008.0 | 285.0 | 152.0 | 227.4 | 47.5 | 210.9 | 137.0 | 4.0 | 3.5 |
| Q5427 | 87.0 | 73.5 | 104.5 | 112.5 | 180.5 | 163.0 | 13681.0 | 2269.0 | 793.0 | 135.0 | 542.5 | 54.0 | 233.2 | 142.1 | 5.0 | 4.0 |
| Q6880B | 66.0 | 64.5 | 96.5 | 88.5 | 224.0 | 195.5 | 3937.0 | 2489.0 | 268.0 | 122.0 | 133.6 | 62.7 | 205.1 | 119.1 | 4.5 | 4.0 |
| Q6988 | 76.5 | 71.5 | 100.0 | 99.0 | 220.5 | 191.0 | 12258.0 | 4499.0 | 826.0 | 378.0 | 449.7 | 187.6 | 196.3 | 112.9 | 4.5 | 4.5 |
| **Means** | **76.5** | **70.4** | **101.4** | **92.2** | **150.1** | **130.7** | **5105.8** | **2721.8** | **359.5** | **169.0** | **211.6** | **81.3** | **199.8** | **117.0** | **4.2** | **3.8** |

**Table 7.** (a) Vegetative growth performance of 33 different lablab accessions with or without pesticide sprays during 2013-2014. (b) Podding and yield performance of 33 different lablab accessions with or without pesticide sprays during 2013-2014.

(a)

| Accessions | % Germination | | Day to 50% Flowering | | Seedling Vigour | | Plant Vigour | | Leafiness | | Plant height at 50% Flowering | | Plant height at 100% Flowering | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control | Sprayed | Control |
| 29803 | 72.0 | 72.0 | 87.0 | 92.0 | 2.0 | 3.0 | 1.5 | 5.0 | 3.0 | 3.0 | 279.0 | 192.9 | 308.0 | 211.4 |
| 30701 | 68.0 | 64.0 | 89.0 | 98.0 | 1.5 | 3.0 | 1.5 | 3.0 | 3.5 | 3.5 | 290.0 | 167.1 | 343.3 | 175.7 |
| 34777 | 76.0 | 64.0 | 64.0 | 64.0 | 3.0 | 2.5 | 2.0 | 3.0 | 2.0 | 2.0 | 142.0 | 104.4 | 81.4 | 115.6 |
| 34780 | 84.0 | 84.0 | 53.0 | 68.0 | 2.0 | 1.5 | 2.0 | 1.5 | 4.0 | 2.5 | 265.0 | 85.0 | 316.3 | 130.0 |
| 35894 | 76.0 | 76.0 | 64.0 | 53.0 | 2.0 | 2.0 | 2.5 | 2.0 | 2.5 | 1.5 | 142.5 | 70.0 | 218.8 | 90.0 |
| 36019 | 72.0 | 72.0 | 57.0 | 52.0 | 2.5 | 2.5 | 1.5 | 2.0 | 2.0 | 1.5 | 52.0 | 50.0 | 121.0 | 58..0 |
| 36903 | 80.0 | 88.0 | 63.0 | 52.0 | 2.5 | 3.0 | 2.0 | 1.5 | 3.0 | 2.5 | 144.0 | 77.0 | 172.0 | 79.0 |
| 52504A | 64.0 | 76.0 | 60.0 | 53.0 | 2.0 | 2.5 | 2.5 | 1.5 | 3.0 | 2.5 | 125.0 | 102.9 | 142.0 | 102.9 |
| 52506B | 76.0 | 92.0 | 54.0 | 57.0 | 2.0 | 2.0 | 2.5 | 1.0 | 3.0 | 2.5 | 145.0 | 94.0 | 165.0 | 99.0 |
| 52513 | 92.0 | 68.0 | 64.0 | 55.0 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.0 | 115.0 | 95.6 | 149.0 | 106.7 |
| 52514 | 64.0 | 76.0 | 65.0 | 48.0 | 2.0 | 2.0 | 2.5 | 2.0 | 2.5 | 2.0 | 77.0 | 57.8 | 90.0 | 67.8 |
| 52518B | 68.0 | 68.0 | 97.0 | 117.0 | 1.5 | 1.5 | 1.5 | 1.0 | 3.5 | 1.0 | 333.0 | 184.0 | 373.0 | 280.0 |
| 52535 | 56.0 | 52.0 | 55.0 | 58.0 | 2.0 | 2.5 | 2.5 | 1.5 | 3.0 | 2.5 | 131.3 | 112.0 | 161.3 | 118.0 |
| 52552 | 48.0 | 64.0 | 64.0 | 64.0 | 2.0 | 3.0 | 2.5 | 3.0 | 3.0 | 2.5 | 112.9 | 111.0 | 145.7 | 132.0 |
| Q6880B | 84.0 | 80.0 | 57.0 | 57.0 | 2.0 | 2.5 | 1.0 | 3.0 | 2.5 | 2.0 | 28.0 | 18.0 | 69.0 | 38.0 |
| 81364 | 80.0 | 76.0 | 57.0 | 57.0 | 2.0 | 2.5 | 1.5 | 3.0 | 3.0 | 2.5 | 55.0 | 51.0 | 119.0 | 96.0 |
| CQ3620 | 56.0 | 80.0 | 64.0 | 64.0 | 2.5 | 3.0 | 2.5 | 2.5 | 3.0 | 2.5 | 146.0 | 82.0 | 192.0 | 94.0 |
| CQ3621 | 64.0 | 72.0 | 57.0 | 57.0 | 2.0 | 2.0 | 2.5 | 2.5 | 2.5 | 1.5 | 23.0 | 12.9 | 78.0 | 47.1 |
| Q5427 | 64.0 | 68.0 | 89.0 | 97.0 | 2.0 | 1.0 | 2.5 | 3.0 | 3.5 | 3.0 | 303.0 | 190.0 | 338.0 | 222.0 |
| Q6988 | 76.0 | 76.0 | 64.0 | 64.0 | 2.0 | 2.5 | 2.0 | 3.0 | 3.0 | 3.0 | 155.0 | 119.0 | 222.0 | 163.0 |
| Lablab Uganda | 60.0 | 60.0 | 101.0 | 115.0 | 2.0 | 2.5 | 1.5 | 3.5 | 4.0 | 4.0 | 402.5 | 218.0 | 265.7 | 252.0 |
| **Mean average** | **70.5** | **72.8** | **67.9** | **68.7** | **2.1** | **2.4** | **2.1** | **2.3** | **3.0** | **2.4** | **165.1** | **104.5** | **10.8** | **127.5** |

(b)

| Accessions | Days to Podding | | Days to Maturity | | Days to Harvesting | | Harvest Period (days) | | Total pod per Plot | | Pods per Plant | | Plant Seed Weight (g) | | 1000 seed weight (g) | | Seed per Pod | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | sprayed | control | sprayed | control | sprayed | control | sprayed | control | sprayed | control | sprayed | control | sprayed | control | sprayed | control | sprayed | control |
| 29803 | 96.0 | 97.0 | 104.0 | 106.0 | 80.0 | 80.0 | 241.0 | 238.0 | 13606 | 7614 | 840 | 781 | 1703.7 | 123.1 | 241.5 | 241.0 | 5 | 5 |
| 30701 | 97.0 | 115.0 | 102.0 | 122.0 | 80.0 | 80.0 | 234.0 | 238.0 | 17723 | 4565 | 1437 | 425 | 2189.2 | 260.5 | 341.1 | 339.5 | 5 | 5 |
| 34777 | 69.0 | 69.0 | 84.0 | 84.0 | 80.0 | 80.0 | 76.0 | 70.0 | 2256 | 525 | 226 | 72 | 260.0 | 41.1 | 226.2 | 215.3 | 4 | 4 |
| 34780 | 59.0 | 72.0 | 87.0 | 88.0 | 80.0 | 80.0 | 94.0 | 28.0 | 2115 | 119 | 222 | 25 | 503.2 | 41.7 | 254.8 | 259.6 | 5 | 5 |
| 35894 | 70.0 | 63.0 | 84.0 | 84.0 | 80.0 | 80.0 | 68.0 | 63.0 | 1354 | 110 | 129 | 41 | 171.4 | 75.0 | 275.7 | 245.9 | 5 | 4 |
| 36019 | 62.0 | 58.0 | 83.0 | 84.0 | 80.0 | 80.0 | 110.0 | 77.0 | 3205 | 602 | 286 | 85 | 517.9 | 70.5 | 197.8 | 185.8 | 4 | 4 |
| 36903 | 67.0 | 57.0 | 86.0 | 86.0 | 80.0 | 80.0 | 234.0 | 36.0 | 3266 | 933 | 278 | 82 | 238.3 | 26.5 | 167.3 | 170.3 | 4 | 4 |

**Continued**

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 52504A | 65.0 | 59.0 | 85.0 | 85.0 | 80.0 | 80.0 | 94.0 | 70.0 | 2167 | 707 | 196 | 87 | 198.6 | 49.4 | 170.1 | 169.9 | 4 | 4 |
| 52506B | 64.0 | 62.0 | 80.0 | 80.0 | 80.0 | 80.0 | 84.0 | 49.0 | 3790 | 661 | 339 | 90 | 340.3 | 40.7 | 166.3 | 156.6 | 4 | 4 |
| 52513 | 69.0 | 62.0 | 80.0 | 80.0 | 80.0 | 80.0 | 76.0 | 63.0 | 2408 | 967 | 201 | 92 | 200.0 | 37.9 | 169.6 | 162.6 | 4 | 4 |
| 52514 | 70.0 | 56.0 | 80.0 | 80.0 | 80.0 | 80.0 | 68.0 | 77.0 | 1013 | 539 | 92 | 72 | 90.9 | 40.2 | 164.3 | 158.0 | 4 | 4 |
| 52518B | 104.0 | 104.3 | 118.0 | 80.0 | 80.0 | 80.0 | 241.0 | 238.0 | 17163 | 804 | 1271 | 124 | 1733.3 | 46.2 | 261.7 | 188.0 | 4 | 4 |
| 52535 | 60.0 | 64.0 | 86.0 | 87.0 | 80.0 | 80.0 | 68.0 | 42.0 | 1316 | 347 | 159 | 51 | 241 | 43.8 | 271.6 | 246.7 | 4 | 4 |
| 52552 | 69.0 | 69.0 | 80.0 | 80.0 | 80.0 | 80.0 | 76.0 | 104.0 | 890 | 1131 | 93 | 72 | 104.8 | 109.1 | 229.3 | 220.4 | 4 | 4 |
| Q6880B | 62.0 | 63.0 | 76.0 | 76.0 | 80.0 | 80.0 | 241.0 | 238.0 | 8637 | 1624 | 751 | 250 | 1373.9 | 200.0 | 214.8 | 212.4 | 5 | 4 |
| 81364 | 63.0 | 62.0 | 80.0 | 80.0 | 80.0 | 80.0 | 241.0 | 104.0 | 26557 | 3097 | 2146 | 307 | 3280.8 | 218.2 | 178.7 | 167.8 | 5 | 4 |
| CQ3620 | 70.0 | 70.0 | 80.0 | 80.0 | 80.0 | 80.0 | 84.0 | 77.0 | 1353 | 764 | 155 | 100 | 274.3 | 65.5 | 224.1 | 221.8 | 4 | 4 |
| CQ3621 | 63.0 | 63.0 | 80.0 | 80.0 | 80.0 | 80.0 | 248.0 | 63.0 | 8532 | 538 | 1138 | 66 | 1893.3 | 49.3 | 237.5 | 229.0 | 4 | 4 |
| Q5427 | 97.0 | 100.0 | 104.0 | 116.0 | 80.0 | 80.0 | 248.0 | 238.0 | 19400 | 1617 | 1354 | 147 | 2609.3 | 63.6 | 245.5 | 243.9 | 5 | 4 |
| Q6988 | 68.0 | 70.0 | 77.0 | 79.0 | 80.0 | 80.0 | 248.0 | 238.0 | 14714 | 3167 | 1308 | 320 | 1973.3 | 191.7 | 197.4 | 195.3 | 4 | 4 |
| Lablab Uganda | 105.0 | 120. | 119.0 | 129.0 | 80.0 | 80.0 | 248.0 | 238.0 | 12227 | 2828 | 928 | 257 | 2321.4 | 172.7 | 265.9 | 251.5 | 4 | 4 |
| **Mean average** | **73.8** | **74.1** | **88.3** | **88.9** | **80.0** | **80.0** | **158.2** | **123.3** | **7795** | **1584** | **645** | **171** | **1058.0** | **93.7** | **223.9** | **213.4** | **4** | **4** |

*castaneipennis, Alcides, Chilomenes lunata, Phloeobius humilis, Nazara viridula, Aspavia armigera and Catantops melanostictus*) that severely damaged leaves, flowers, stems and pods in both sites. Some accessions were also severely damaged by Anthracnose disease caused by *Choletotricum lindemuthianum*.

Apart from 29803, the pod colour of 32 accessions was green of varying intensities, and most accessions had black seeds of which majority were mottled (Table 8). The common seed colours observed were black, brown, dark red and cream whereas the common flower colours were white, dark purple and light purple.

Overall, accessions that had the best vegetative growth characteristics (highest plant vigour, leafiness and height at 50% and 100% flowering) were 29399, 29400, 29803, 31364, 57315, 52554, 52552, 52514, 52508, 52506B, CQ3620 and CQ3621 in the first season, and 29803, 30701, 52552, CQ3620, Q5427, Q6988 and Lablab Uganda in the second season. Based on harvest period, pods per plant and yield per plant, the best performing accessions were 29399, 29400, 29803, 30701, 31364, 52530, CQ3620, Q5427 and Q6988 in the 1st season, while 29803, 30701, 52518B, Q6880B, 31364, CQ3621, Q5427, Q6988 and Lablab Uganda performed best in the 2nd season.

### 3.2. Sensory and Palatability Evaluation of Lablab Using Matrix Scores

All parameters (grains size, colour, taste, texture and flavour) used to assess the 12 accessions selected in the first season showed significant differences. Accessions CQ3620, 29400 and 31364 selected based on high plant vigour, leafiness,

Table 8. Flower, pod and grain visual characteristics of the 33 lablab accessions.

| Accessions | Plant habit | Flower colour | Pod colour | Seed colour | Mottling |
|---|---|---|---|---|---|
| 29399 | Prostrate | Purplish white | Green | Dark red | No |
| 29400 | Erect | Purplish white | Green | Dark red | No |
| 29803 | Prostrate | Purple | Green | Black | No |
| 30701 | Erect | White | Green | Dark red | No |
| 34777 | Erect | White | Green | Cream | Yes |
| 34780 | Erect | Pale Purple | Green | Back | Yes |
| 35771 | Erect | Pale Purple | Green | Black | No |
| 35893 | Erect | Pale Purple | Purple | Black | No |
| 35894 | Erect | White | Green | Brown | Yes |
| 36019 | Erect | Pale Purple | Green | Black | Yes |
| 36903 | Erect | Pale Purple | Green | Black (pale) | No |
| 52504A | Erect | Pale Purple | Green | Black (pale) | No |
| 52504B | Erect | Pale Purple | Green | Black (pale) | No |
| 52506B | Erect | Pale Purple | Green | Black (pale) | No |
| 52508 | Erect | White | Green | Dark red | Yes |
| 52513 | Erect | Pale Purple | Green | Brown | Yes |
| 52514 | Erect | White | Green | Brown | Yes |
| 52518B | Prostrate | Pale Purple | Green | Brown | No |
| 52530 | Erect | White | Green | Cream | Yes |
| 52533 | Erect | White | Green | Cream | Yes |
| 52535 | Erect | White | Green | Brown | Yes |
| 52551 | Erect | White | Green | Brown | Yes |
| 52552 | Erect | White | Green | Cream | Yes |
| 52554 | Erect | White | Green | Brown | Yes |
| 57314 | Erect | Pale Purple | Green | Black | No |
| 57315 | Prostrate | Pale Purple | Green | Black | No |
| 60795 | Erect | Pale Purple | Green | Black | No |
| 31364 | Erect | White | Green | Brown | Yes |
| CQ3620 | Erect | White | Green | Cream | Yes |
| CQ3621 | Erect | White | Green | Dark red | Yes |
| Q5427 | Prostrate | Pale Purple | Green | Black | No |
| Q6880B | Erect | Pale Purple | Green | Black | Yes |
| Q6988 | Prostrate | White | Green | Dark red | Yes |

height, podding ability and yield, scored significantly higher average grain colour (before cooking) (Table 9) than 36019, 52518B, Q5427 and Q6880B. Njahi and 29399 had higher grain size scores before cooking than 29400, 30701,

**Table 9.** Sensory evaluation of the 12 different *L. purpureus* accessions based on 1 - 5 matrix scores during 2011-2012.

| Accessions | Scores before cooking (1 - 5) | | Scores after cooking (1 - 5) | | | | | Cooking time (hrs: mins) |
|---|---|---|---|---|---|---|---|---|
| | Grain colour | Grain size | Grain colour | Taste | Texture | Flavour | Mean averages | |
| 29399 | 3.2 | 3.7 | 3.1 | 2.9 | 2.4 | 2.6 | 3.0 | 2:59 |
| 29400 | 3.7 | 3.3 | 4.2 | 3.9 | 3.1 | 3.8 | 3.7 | 3:17 |
| 30701 | 3.2 | 3.4 | - | - | - | - | 3.3 | - |
| 36019 | 2.3 | 2.8 | 2.5 | 2.6 | 3.0 | 3.1 | 2.7 | 4:13 |
| 52518B | 2.4 | 2.6 | - | - | - | - | 2.5 | - |
| CQ3620 | 4.3 | 3.1 | 4.6 | 1.3 | 2.4 | 1.6 | 2.9 | 3:23 |
| Q5427 | 2.5 | 2.3 | 2.6 | 3.4 | 2.9 | 3.1 | 2.8 | 3:14 |
| Q6988 | 3.3 | 2.4 | 3.4 | 3.2 | 3.3 | 3.0 | 3.1 | 3:01 |
| Lablab Uganda | 3.4 | 3.3 | 3.4 | 4.0 | 3.9 | 4.1 | 3.7 | 4:10 |
| 31364 | 3.9 | 3.2 | 2.9 | 3.5 | 3.4 | 3.6 | 3.4 | 3:43 |
| Q6880B | 2.4 | 2.9 | 2.6 | 2.2 | 2.5 | 2.6 | 2.5 | 3:13 |
| Njahi | 3.2 | 4.1 | 3.5 | 4.6 | 4.1 | 4.4 | 4.0 | 3:57 |
| **Mean** | **3.1** | **3.1** | **3.3** | **3.2** | **3.09** | **3.2** | **-** | **3:26** |
| **$LSD_{(P \leq 0.05)}$** | **0.75** | **0.77** | **0.71** | **0.69** | **0.82** | **0.79** | **-** | **-** |

CQ3620, Lablab Uganda, 31364 and Q6880B. The overall grain size and colour before cooking assessments showed that 58% - 67% had above average scores. After cooking, 80% scored ≥3, while in the second assessment, 71% accessions scored above average (Table 10). The best accessions identified in the first assessment were 29400, Lablab Uganda and Njahi, while in the second evaluation, Q6988, Lablab Uganda and Njahi that scored 4 - 5. Based on all attributes, Njahi, Lablab Uganda, 29400, 31364 and Q6988 were the best in first season, while the final assessment determined that Lablab Uganda, Njahi, Q6988, 30701 and 29400 were the most suitable accessions for human palatability.

### 3.3. Graphic Comparison of Lablab Acceptance Based on Preference Ranking with Logistic Regression

Preference ranking of lablab accessions based on grain colour, taste, texture and flavour after cooking showed that the most preferred or acceptable accessions were 29400, Njahi, Lablab Uganda, 31364 and 29399. Although CQ3620 had a good colour, it was not ranked among the best five in the subsequent evaluations partly because of its bad taste, texture and flavour. The second evaluation before and after cooking indicated that there was no correlation in acceptance of accessions based on size and colour because the accessions that were best in one attributes such as colour (before cooking) were not automatically the best in the other (size). However, the most accepted accession before cooking for both

**Table 10.** Sensory evaluation of the seven different *L. purpureus* accessions based on 1 - 5 matrix scores during 2013-2014.

| Accessions | Scores before cooking (1 - 5) | | Scores after cooking (1 - 5) | | | | Cooking time (hrs:mins) |
|---|---|---|---|---|---|---|---|
| | Grain colour | Grain size | Grain colour | Taste | Texture | Flavour | Mean average | |
| 29400 | 3.6 | 3.3 | 3.5 | 3.2 | 2.5 | 2.8 | 3.2 | 4:55 |
| 30701 | 2.9 | 3.6 | 3.4 | 2.8 | 3.3 | 3.7 | 3.3 | 3:41 |
| 52518B | 1.4 | 2.7 | 1.8 | 1.7 | 1.6 | 1.5 | 1.8 | 5:01 |
| Q6988 | 3.4 | 2.6 | 4.1 | 3.9 | 3.8 | 3.4 | 3.5 | 3:41 |
| Lablab Uganda | 4.6 | 4.2 | 5.0 | 4.5 | 4.8 | 4.6 | 4.6 | 3:41 |
| 31364 | 3.4 | 2.6 | 2.5 | 2.3 | 2.5 | 2.3 | 2.6 | 4:59 |
| Njahi | 3.4 | 3.8 | 3.4 | 3.9 | 3.5 | 3.7 | 3.6 | 4:05 |
| **Mean** | **3.2** | **3.3** | **3.4** | **3.2** | **3.1** | **3.1** | - | **4:35** |
| **$LSD_{(P = 0.05)}$** | **0.82** | **0.95** | **0.61** | **0.93** | **0.9** | **0.82** | - | - |

colour and size was Lablab Uganda while the least accepted was 52518B. After cooking, Njahi was the most preferred followed by 29400, Lablab Uganda, 31364 and 29399, but Lablab Uganda was consistently the best both before and after cooking in the second evaluation. The second set of preferred accessions before cooking were 31364, 29400, 30701 and Njahi whereas the best after cooking were Q6988, 30701, Njahi, 29400 and 31364. Overall, the best selected accessions in the first evaluation (Figure 2) were Njahi, 29400, Lablab Uganda, 31364 and 29399, while in the second season they were Lablab Uganda, Q6988, 30701, 31364 and Njahi (Figure 3).

The analysis of cumulative probability against ranking of the accessions evaluated in the first tests showed that three accessions (29400, Njahi and Lablab Uganda) consistently had positive intercepts based on colour, taste, texture and flavour after cooking (Table 11). Although accessions CQ3620, 31364 and 29399 had variable intercepts with different attributes, Q6988, Q6880B, Q5427 and 36019 had negative intercepts and were probably likely to be rejected by the farmers. Therefore, the three accessions, which had positive intercepts on y-axis had high probability of being accepted by the farmers because they had palatability characteristics that were highly preferred by the panel. Similarly, the second evaluation indicated that lablab Uganda had positive intercepts throughout all the tests (Table 12). Surprisingly, the three accessions that had be selected from the first evaluation had negative intercepts in the second evaluation implying that they had high probability of being rejected by the farmers. Based on colour before cooking, it was determined that 29400 and Lablab Uganda had positive intercepts, whereas in the case of grain size, Njahi and Lablab Uganda had positive intercepts. The after cooking results showed that Lablab Uganda

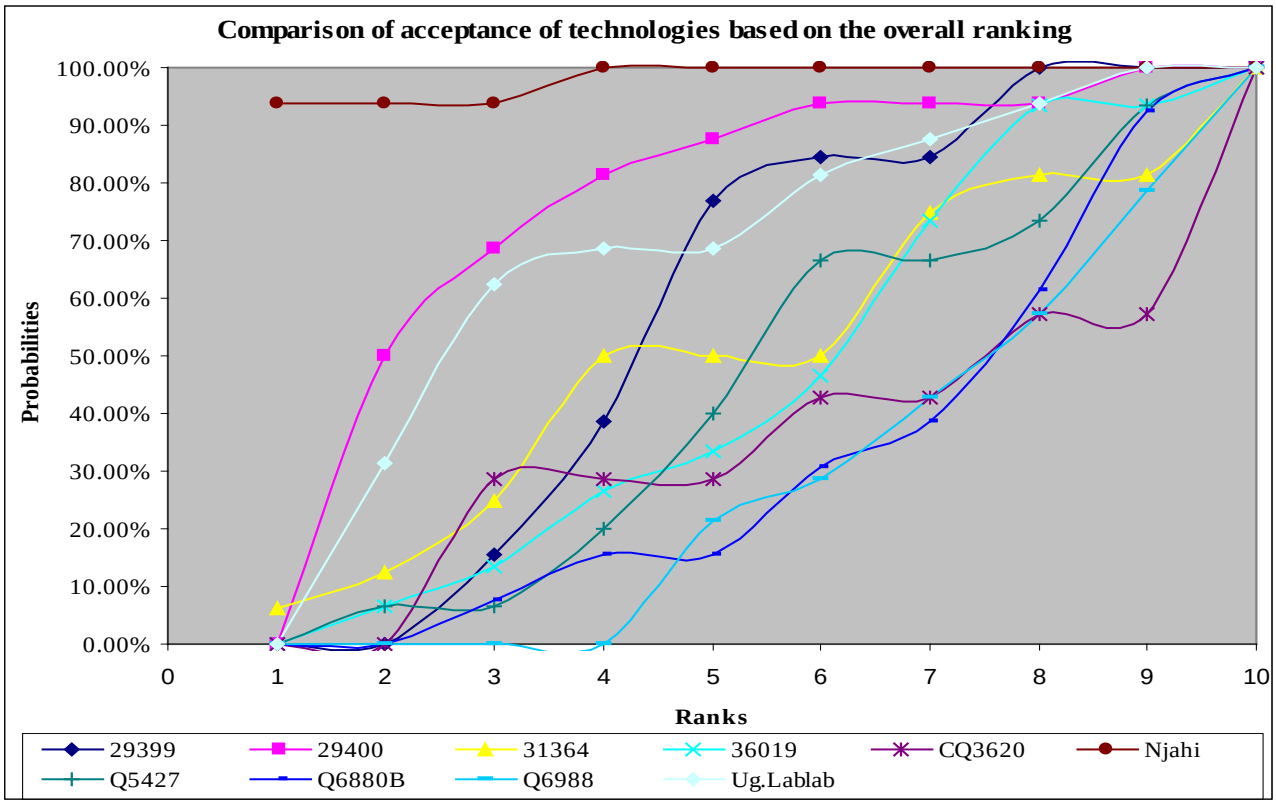


**Figure 2.** Overall preference ranking of the 12 accessions based on their sensory evaluation before and after cooking in the first season.

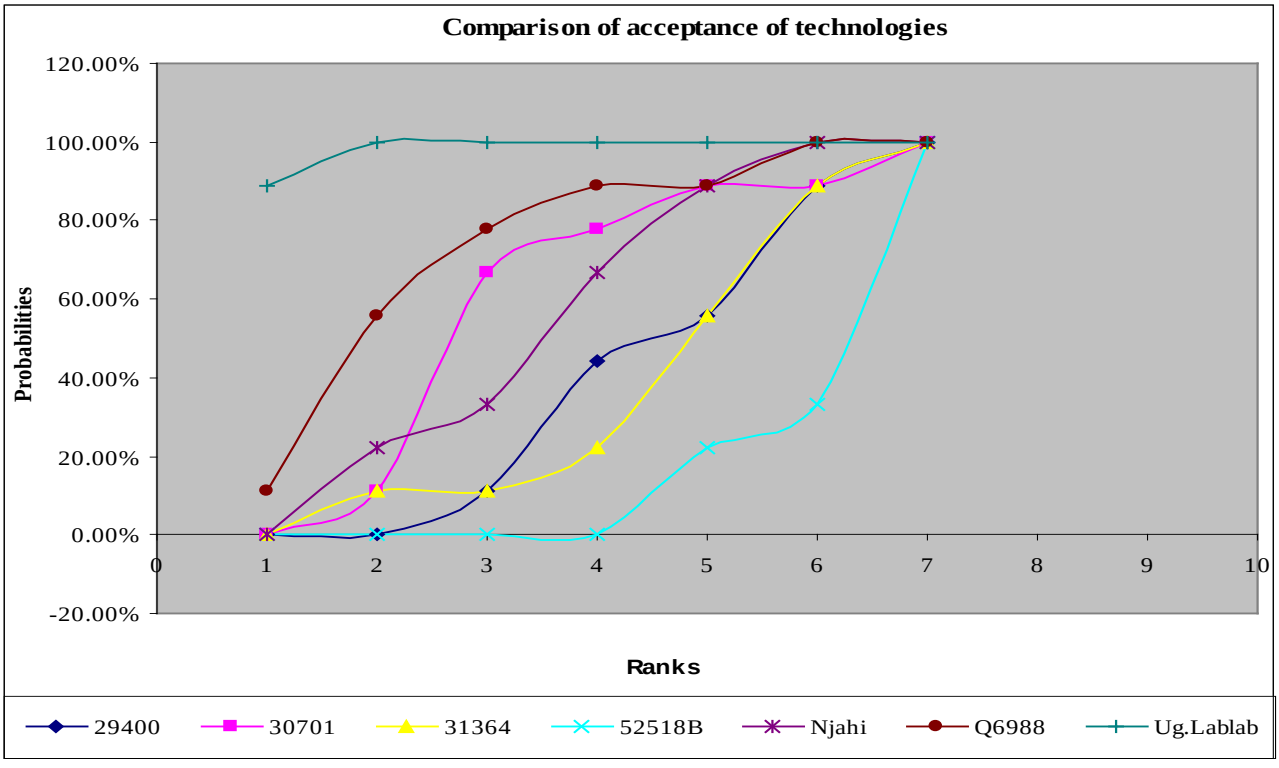


**Figure 3.** Overall preference ranking of the seven accessions based on their sensory evaluation by farmers before and after cooking in the second season.

**Table 11.** Statistical analysis of overall parameters of 10 lablab accessions using the logistic regression.

| Technology | Estimated parameter b (intercept) | Estimated parameter m (slope) | Standard Error (SE) for b intercept | Chi Square | b Intercept | Significance of statistical differences based on a level of 15% |
|---|---|---|---|---|---|---|
| 29399 | −0.123 | 0.131 | 0.099 | 0.266 | −ve intercept | No difference |
| 29400 | 0.296 | 0.086 | 0.124 | 0.123 | +ve intercept | **Statistically different |
| 31364 | −0.029 | 0.102 | 0.046 | 0.425 | −ve intercept | No difference |
| 36019 | −0.120 | 0.125 | 0.053 | 0.052 | −ve intercept | **Statistically different |
| CQ3620 | −0.114 | 0.091 | 0.075 | 0.216 | −ve intercept | No difference |
| Njahi | 0.938 | 0.008 | 0.013 | 3.447 | +ve intercept | **Statistically different |
| Q5427 | −0.196 | 0.122 | 0.052 | 0.052 | −ve intercept | **Statistically different |
| Q6880B | −0.272 | 0.115 | 0.086 | 0.075 | −ve intercept | **Statistically different |
| Q6988 | −0.295 | 0.113 | 0.082 | 0.057 | −ve intercept | **Statistically different |
| Lablab Uganda | 0.158 | 0.097 | 0.092 | 0.188 | +ve intercept | No difference |

**Table 12.** Statistical analysis of overall attributes of the seven accessions using the logistic regression.

| Technology | Estimated parameter b (intercept) | Estimated \|parameter m (slope) | Standard Error (SE) for b intercept | Chi Square | b Intercept | Significance of statistical differences based on a level of 15% |
|---|---|---|---|---|---|---|
| 29400 | −0.317 | 0.187 | 0.084 | 0.051 | −ve intercept | **Statistically different |
| 30701 | −0.063 | 0.171 | 0.144 | 0.051 | −ve intercept | No difference |
| 31364 | −0.302 | 0.179 | 0.112 | 0.101 | −ve intercept | **Statistically different |
| 52518B | −0.333 | 0.139 | 0.198 | 0.195 | −ve intercept | No difference |
| Njahi | −0.143 | 0.183 | 0.082 | 0.188 | −ve intercept | No difference |
| Q6988 | 0.222 | 0.131 | 0.136 | 0.202 | +ve intercept | **Statistically different |
| Lablab Uganda | 0.937 | 0.012 | 0.031 | 3.395 | +ve intercept | **Statistically different |

and Q6988 were the only ones likely to be accepted by the farmers because of the positive intercepts.

## 4. Discussion and Conclusion

Although preference ranking and logistic regression analyses of the probabilities of acceptance of six different legume cover crops (mucuna, canavalia, lablab, crotalaria, tithonia, tephrosia) graded lablab species with low probability of being accepted or adopted due to its inability to produce sufficient seed [4], and slow initial field establishment [15], its multi-purpose nature made it one of the legume cover crops that can be highly preferred and probably widely adopted by farmers because of its ability to provide multiple farmers' requirements including human food [1], animal feed [6] [16], medicine [9], mulch [17], weed control [18] and soil fertility improvement [19] [20].

The 33 lablab accessions differed significantly in the agronomic characteristics

at the NARL and DATIC-Tororo sites. Pedigree information about these accessions was not publically available, and therefore the genetic associations were not discussed. Beside germination, which was generally good (≥50%) in both sites, plant growth and yield varied greatly with weather, agreeing that under wet and cool weather conditions, the plants normally gain high vegetative vigour producing more leaves, pods and accumulate higher dry matter for yield [21]. As a growth habit of lablab, all accessions reached 50% flowering within a shorter period (55 - 69 DAP), however, besides the genetic variation effect, the slow initial establishment of the different accessions, was partly attributed to lack of sufficient soil moisture [21]. Plant vigour and leafiness were positively correlated, meaning that the higher the growth vigour, the higher was the level of leaf production. Although most of the accessions that had higher plant vigour and leafiness were taller, the negative correlation between plant height and leafiness of several accessions could not be explained. The agronomic performances of the different accessions were also affected by the soil fertility status, because the performance of lablab at NARL was better than in DATIC-Tororo due the higher organic matter and water holding capacity in the NARL soils.

Previously, lablab was known to be virtually free of pests and diseases [22], but in the current study, many accessions were severely infested by various insect pest species in both sites. Thus integration of pesticide sprays in the agronomic management of lablab resulted in significantly higher vegetative growth, podding, longer harvesting periods, and higher yields than in the non-sprayed plots. Generally, most accession had low yields partly because of severe anthracnose infection, nevertheless, accessions 29399, 29400, 29803, 30701, 31364, CQ3620, Q5427, Q6988, 52518B, Q6880B, 31364, CQ3621 and Lablab Uganda displayed higher disease resistance levels.

Accessions 29400, Lablab Uganda, Njahi, 29399, 36019, Q5427, Q6988, 30701 and 31364 had the highest probability of being accepted due to their palatability and high yielding capacity regardless of the prevailing unfavourable environmental conditions.

The logistic regression determined that although 29400, Njahi and Lablab Uganda had positive intercepts, an implication that they had high probability of being accepted by farmers, 29400 and Njahi showed significant differences, but Lablab Uganda showed no difference. Therefore, of the 10 accessions evaluated for palatability, 29400 and Njahi had high probability of being accepted with positive intercepts and also differed statistically at $P < 0.15$. Nonetheless, the second analysis determined that Lablab Uganda and Q6988 had positive intercepts and differed significantly ($P < 0.15$) for most of the parameters.

Lablab has many benefits when included in tropical agricultural systems. The natural action of converting atmospheric N into forms available for the plant-animal-soil systems improves productivity in an inexpensive and environmentally friendly manner. This study found out that accessions 29399, 29400, 29803, 30701, 31364, CQ3620, Q5427, Q6988, 52518B, Q6880B, 31364, CQ3621

and Lablab Uganda had high yields which partly resulted from their high tolerance of the prevailing stresses (diseases, pests and low soil moisture). Accessions 29400, Lablab Uganda, Njahi 29399, 36019, Q5427, Q6988, 30701 and 31364 scored highly based on the sensory evaluation parameters. Although Njahi was the most preferred accession during the first test, in the second test, Lablab Uganda was highly scored followed by Njahi. In the second evaluation, the most preferred accessions (scored above 2.5) were Lablab Uganda, Njahi, Q6988, 30701, 29400 and 31364. Statistical analysis of the logistic regression determined that 29400, Njahi, Lablab Uganda and Q6988 showed significant differences.

Finally, the accessions that had the potential for being accepted based on the logistic preference ranking analysis were Lablab Uganda, Njahi, 29400 and Q6988. These results agreed with the graphic comparison and matrix score analyses. As earlier mentioned, the best accessions identified during the first exercise were 29400, Lablab Uganda and Njahi whereas in the second evaluation Q6988, Lablab Uganda and Njahi scored highly. Accessions 29399, 36019, Q5427, Q6988, 31364, 29400 and 30701 formed the second set of preferred options. Therefore, any of the above 10 accessions can be adopted by farmers for different purposes. For further research, a study comparing the quantity of biomass produced by the different accessions would give evidence and recommendation on which accessions are most suited for biomass.

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## Conflicts of Interest

The authors declare that they have no conflict.

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