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# Performance of potato (*Solanum tuberosum* L.) clones for growth, yield and quality

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**Abstract**
This experiment was aimed to evaluate the performance of potato varieties for growth, yield and quality attributes. A field experiment was carried out at AICRP on Potato, Horticulture Research and Extension Centre (HREC), Somanahallikaval, Hassan district, Karnataka during the *Kharif* season 2025 under rainfed conditions with 15 potato genotypes (P-1, RH-2, P-14, P-45, P-46, C-15, C-17, P-16, P-53, P-76, P-82, P-93, P-99, P-7 and Kufri Himalini as the check) in a Randomized Complete Block Design (RCBD) with three replications. The results showed statistically significant variations in almost all of the parameters. The highest germination percentage at 20 DAP (93.00%), plant height at 75 DAP (67.57 cm), plant spread at 75 DAP (56.16 cm), total fresh weight of the plant at 75 DAP (287.21 g), total dry weight at 75 DAP of the plant (19.75 g) and leaf area per plant at 75 DAP (396.91 cm$^2$), tuber length (8.70 cm), tuber weight (118.83 g), number of tubers per plant (9.23), total tuber yield per plot (13.67 kg), tuber yield per hectare (18.99 t/ha) and marketable yield per hectare (17.10 t/ha) was in P-1. The highest chlorophyll content (4.00 mg/g), tuber dry matter (24.40%) and starch (24.00%) content was observed in P-7 whereas, the highest reducing sugar (1.52%), non-reducing sugar (1.41%) and total sugar content (2.78%) was observed in C-17. In conclusion, results of the experiment revealed that P-1 variety resulted as best genotypes in terms of growth, yield and quality characters at HREC, Hassan during *Kharif* season.

**Keywords:** Gemination percentage, tuber yield, chlorophyll, dry matter, starch

## Introduction
The potato (*Solanum tuberosum* L.), a member of the Solanaceae family, is one of the most important food crops globally and is often called the "King of Vegetables." Originating in the Peruvian-Bolivian Andes, it was domesticated over 8,000 years ago (Martins, 1976) [17] and later introduced into Europe in the 16$^{th}$ century and India in the 17$^{th}$ century (Singh *et al*., 2001) [25]. Among seven cultivated *Solanum* species, *S. tuberosum* subsp. *tuberosum* is the most widely grown, showing adaptability from sea level to >4,000 m (Brown, 1973) [6]. Cultivated varieties are mainly tetraploid (2n = 4x = 48) and propagated through tubers, though true potato seed is also used. Potatoes are nutritionally rich, containing 75-80% water, 20-25% dry matter, 2.8 g protein, 22.6 g carbohydrates and 25 mg vitamin C per 100 g fresh weight (Bhuwneshwari *et al*., 2013). They also supply vitamins, minerals and antioxidants (Yadav *et al*., 2015; Singh *et al*., 2005), making them vital for food and nutritional security. Globally, potato ranks fifth among food crops after sugarcane, maize, rice and wheat (FAOSTAT, 2023) [9]. India is the second-largest producer with 51.3 million tonnes from 21.58 lakh per hectare (Anon., 2020) [3], with major production in Uttar Pradesh, West Bengal, Bihar, Madhya Pradesh, Gujarat, Punjab, Haryana, Assam and Karnataka. In Karnataka, Hassan alone contributes more than 40% of state output (Bhajantri, 2011) [4].
Potato is a high-yielding, short-duration crop requiring mild temperatures during vegetative growth and cooler conditions for tuber development. Its performance varies with season, environment and genotype, necessitating region-specific evaluation of clones. Considering the lack of region-specific varietal data in southern India, particularly under the agro-climatic conditions of the Horticultural Research and Extension Centre (HREC), Somanahallikaval, Hassan, the present study was conducted to evaluate the performance of potato clones for growth, yield and quality attributes.

## Materials and Methods

The experiment was conducted at AICRP on Potato, Horticulture Research and Extension Centre, Somanahallikaval, Hassan district, Karnataka located at 12º 13′ and 13 º 33′ N, 75 º 33′ and 76 º 38′ E during *Kharif* 2024 (June-August) with 15 potato genotypes in a Randomized Complete Block Design (RCBD) with three replications at a spacing of 60 × 20 cm using 60 plants per plot. The treatments consisted of fifteen potato genotypes namely P-1, RH-2, P-14, P-45, P-46, C-15, C-17, P-16, P-53, P-76, P-82, P-93, P-99, P-7 and Kufri Himalini as the check. The recommended quantity of farm yard manure was applied to the experimental site at the rate of 25 tonnes per hectare and thoroughly incorporated into soil. Then the land was laid out into sub plots of size 3.0 m x 2.4 m with total 45 plots were prepared. Five tagged plants per treatment were selected randomly and observations were recorded on selected plants for different growth, yield and quality characters in different potato genotypes in each replication.

### Growth parameters

#### Germination percentage (%)

The germination percentage was worked out after 20 days after planting. It was calculated by using the formula

$$\text{Germination (\%)} = \frac{\text{Total number of tubers germinated}}{\text{Total number of tubers planted}} \times 100$$

#### Plant height (cm)

Height of the plant was measured from ground level to the tip of the plant at 45 and 75 days after planting (DAP) and expressed in centimetres.

#### Plant spread (cm)

It was measured by recording the plant spread from North-South to East-West directions in tagged plants at 45 and 75 DAP. Average was worked out and expressed in centimetres.

#### Total fresh weight of plant (g)

Fresh biomass production of different plant parts at 45 and 75 days after planting was estimated by uprooting the five plants randomly in each treatment. Then leaves, stem and root were separated and recorded the fresh weight. The total fresh biomass production was calculated by adding fresh weight of leaves, stem and roots and the mean value is expressed in grams per plant.

#### Total dry weight of plant (g)

Five plants were sampled randomly at 45 and 75 days after planting and at harvest and which were separated into leaf, stem and roots. The same were dried in hot air oven at 80 $^0$C until a constant weight was attained. The total dry biomass production was calculated by adding dry weight of leaves, stem and root and expressed as grams per plant.

#### Leaf area per plant (cm$^2$)

The leaves from five selected plants from each treatment were used for estimation of leaf area. Leaf area was computed by using Leaf Area Meter (LAM 211) and was expressed as square centimeters per plant.

### Yield parameters

#### Tuber length

Tuber length was recorded from the tagged five plants and expressed in centimeters.

#### Tuber weight (g)

The weight of tubers in each grade was recorded in grams per plant during harvesting using sensitive balance and the average was recorded.

#### Number of tubers per plant

The numbers of tubers in each of five plants were counted. The mean was recorded as number of tubers per plant.

#### Total tuber yield per plot (kg)

Total tuber yield from each five tagged plants and non-tagged plants were measured and expressed in kilograms.

#### Total tuber yield per hectare (t/ha)

The total tuber yield per plot was computed by summing up all the harvested tubers of each treatment, converted to tuber yield per hectare and expressed in tonnes per hectare**.**

$$\text{Tuber yield (t/ha)} = \frac{\text{plot yield}}{\text{plot size}} \times \frac{10{,}000}{1000}$$

#### Marketable yield per hectare (t/ha)

Marketable yield per plot was calculated by subtracting tuber rottage from total tuber yield per plot and converted to tonnes per hectare.

### Quality parameters

#### Chlorophyll content (mg/g)

The total chlorophyll content in leaves were measured at 45 days after planting by using dimethyl sulfoxide (DMSO) method given by Shoaf and Lilum (1976) [24].

Procedure: Fresh and fully matured leaves from the plant were brought to laboratory in polyethylene bag from the field and were cut into small pieces. Known weight of sample (100 mg) was incubated in 7.0 ml of dimethyl sulfoxide at 65 °C for 120 minutes. After the incubation, supernatant was collected by decanting and leaf tissue was discarded, then the volume of the supernatant was made up to 10 ml using Dimethyl Sulfoxide (DMSO). The absorbance of the extract was measured at 645 nm and 663 nm using dimethyl sulfoxide as blank in spectrophotometer. The total chlorophyll content was calculated by using formulae given below.

$$\text{Total Chlorophyll} = [20.2\ (A_{645}) + 8.02\ (A_{663})] \times \frac{V}{1000 \times W \times a}\ (\text{mg/g fr. wt.})$$

Where,

A = Absorbance at specific wave length (645 nm and 663 nm)

V = Final volume of the chlorophyll extract (10 ml)

W = Fresh weight of the sample (100 mg)

a = Path length of light in cuvette (1 cm)

#### Tuber dry matter (%)

**Step 1:** Chop five tubers (about 500 g) into small 1-2 cm cubes, mix thoroughly and take two sub-samples of 200 g each. It is important to sample all parts of the tubers, because dry matter content is not uniform throughout the tuber. Determine the exact weight of each sub-sample and record it as fresh weight.

**Step 2:** Place each sub-sample in an open container or paper bag and put in an oven at 80 °C for 72 hours or after checking sample weight at regular intervals, until constant

dry weight is reached. Weigh each sub-sample immediately and record as dry weight (Anon, 1960) [2].

**Step 3:** Calculate the percent dry matter content for each sub-sample with the following formula:

$$\text{Dry matter} = \frac{\text{Dry weight}}{\text{Fresh weight}} \times 100$$

**Starch (%)**

The residue left was dried after reducing sugar extraction in an oven at 80 °C for starch extraction. To this residue, 5 ml of distilled water was added and the tube was put in a boiling water bath for 15 minutes with occasional stirring. Then after cooling 6.5 ml of 50 percent $HClO_4$ (Perchloric acid) was added to it. The tube was kept as such for 15 minutes with occasional stirring followed by centrifugation for 15 minutes. The supernatant was collected in 50 ml volumetric flask. The residue was extracted with 50 percent $HClO_4$ using the same procedure. The combined supernatant was made to 50 ml distilled water. A quantity of 5 ml of this solution was diluted to 25 ml with distilled water and starch was analysed from this extract.

Properly diluted starch extract of 0.2 ml was taken in Pyrex tube along with blank containing distilled water only. The volume of the extract was made to 1 ml by adding water; 4 ml of anthrone reagent was added to test tube slowly and mixed thoroughly. The tube was put into boiling water bath for 10 minutes after which that was immediately cooled in ice and the absorbance was read at 630 nm.

The amount of starch was estimated from the standard curve which was prepared using a series of five standard glucose solutions (20-100 micro gram/ml).

Method used: Anthrone reagent method (Ranganna, 1977) [21].

**Reducing sugars (%)**

Reducing sugars present in the tomato samples were estimated by DNSA reagent method and is expressed in percentage. The clean and dried test tubes were taken to which 0, 0.2, 0.4, 0.6, 0.8 and 1 ml of prepared standard glucose was added. This was made up to 1 ml using distilled water and 1ml of DNSA reagent was added. The test tubes were closed with aluminium foil and were kept in boiling water bath for 10 minutes. The test tubes were cooled, and 4 ml of distilled water was added. The test tubes were vortexed and O.D measured at 540 nm. Clean and dried test tubes were taken to which 2.5 ml prepared sample was taken and O.D was measured at 540 nm. The amount of reducing sugar present in the sample was calculated using standard graph.

$$\text{Reducing sugars (\%)} = \frac{\text{Glucose (mg) in sample from standard curve}}{\text{aliquot taken for test (ml)}} \times \frac{\text{Vol. made (ml) after alcohol evaporation}}{\text{1000 Vol. taken for alcohol evaporation}} \times \frac{\text{Vol. made (ml) after alcohol evaporation}}{\text{sample taken for alcohol extraction (mg)}} \times 100$$

**Non-reducing sugars (%)**

Non-reducing sugars are estimated by subtracting the reducing sugar from total sugar content of the sample. Total sugars content was estimated as follows.

Non-reducing sugars (%) = Total sugars-Reducing sugars

**Total Sugars (%)**

Total sugars present in the tomato samples were estimated by anthrone reagent method and is expressed in percentage. The sample aliquot (1 ml) was pipetted out and different concentrations (0, 0.2, 0.4, 0.6, 0.8 and 1.0 ml) of standard glucose solution in different test tubes and volume was made up to 2.5 ml each with distilled and all the tubes are kept in an ice bath and 5 ml of anthrone reagent was added slowly and the contents were stirred gently with a glass rod. Then the contents were heated on boiling water bath exactly for 7.5 minutes and cooled immediately in ice bath. After cooling, the absorbance of the solutions was measured at 630 nm against the blank. Then the sugar content was calculated through standard glucose curve.

$$\text{Total sugars (\%)} = \frac{\text{Glucose (mg)in sample from standard curve}}{\text{aliquot taken for test (ml)}} \times \frac{\text{Vol. made (ml) after alcohol hydrolysis}}{\text{1000 Vol. taken for alcohol hydrolysis}} \times \frac{\text{Vol. made (ml) after alcohol evaporation}}{\text{sample taken for alcohol extraction (mg)}} \times 100$$

**Experimental results**

**Growth parameters**

Significant variations among potato genotypes were observed in growth parameters such as germination percentage, plant height, plant spread, total fresh weight of the plant and total dry weight of the plant and leaf area per plant across different growth stages (Table 1 and Table 2).

**Germination percentage (%)**

The variety with the highest germination percentage at 20 DAP is P-1 (93.00%), followed by P-7 (92.11%). P-82 had the lowest germination rate (67.67%).

**Plant height (cm)**

At 45 DAP the genotype P-1 (67.57 cm) recorded the maximum plant height followed by P-7 (67.36 cm). The minimum plant height was recorded in P-82 (37.07 cm) whereas, at 75 DAP The genotype P-1 recorded the maximum plant height (84.66 cm), followed by P-7 (84.21 cm). The minimum plant height was recorded in P-82 (46.77 cm).

**Plant spread (cm)**

At 45 DAP, the highest plant spread was observed in genotype P-1 (56.16 cm), followed by P-7 (52.27 cm). The lowest plant spread was recorded in P-82 (36.32 cm). At 75 DAP, the highest plant spread was observed in genotype P-1 (64.59 cm), followed by P-7 (60.11 cm). The lowest plant spread was recorded in P-82 (41.77 cm).

**Total fresh weight of plant (g)**

At 45 DAP the highest total fresh weight of the plant was

recorded in P-1 (287.21 g), followed by P-7 (281.13 g). The lowest fresh weight was observed in P-82 (81.57 g). At 75 DAP the highest total fresh plant weight was recorded in P-1 (301.77 g), followed by P-7 (296.30 g). The lowest total fresh weight of the plant was observed in P-82 (109.53 g).

**Total dry weight of plant (g)**
At 45 DAP the highest total dry weight of the plant was recorded in P-1 (19.75 g), followed by P-7 (19.72 g). The lowest total dry weight of the plant was observed in P-82 (13.94 g). At 75 DAP the highest total dry weight of the plant was recorded in P-1 (29.63 g), followed closely by P-7 (29.58 g). The lowest total dry weight of the plant was observed in P-82 (20.79 g).

**Leaf area per plant ($cm^2$)**
At 45 DAP the maximum leaf area was recorded in P-1 (396.91 $cm^2$), followed by P-7 (355.20 $cm^2$). The minimum leaf area was observed in P-82 (221.00 $cm^2$). At 75 DAP the maximum leaf area was recorded in P-1 (496.91 $cm^2$) followed by P-7 (482.61 $cm^2$). The minimum leaf area was observed in P-82 (378.76 $cm^2$).

**Yield parameters**
Significant variations among potato genotypes were observed in yield parameters such as tuber length, tuber weight, number of tubers per plant, total tuber yield per hectare and marketable yield per hectare in different potato genotypes (Table 3)

**Tuber length (cm)**
The highest tuber length was recorded in P-1 (8.70 cm) followed by P-7 (8.67 cm). The lowest was observed in P-82 (6.12 cm).

**Tuber weight (g)**
The highest average tuber weight was noted in the genotype P-1 (118.83 g), followed by P-7 (114.15 g). The lowest tuber weight was observed in P-82 (58.11 g).

**Number of tubers per plant**
The maximum number of tubers per plant was recorded in P-1 (9.23), followed by P-7 (8.37). The lowest number of tubers per plant was observed in P-82 (4.33).

**Total tuber yield per plot (kg)**
The highest total tuber yield per plot was recorded in P-1 (13.67 kg), followed by P-7 (13.54 kg). The lowest yield was observed in P-82 (10.69 kg).

**Total tuber yield per hectare (t/ha)**
P-1 (18.99 t/ha) recorded the highest tuber yield per hectare, followed by P-7 (18.81 t/ha). The lowest tuber yield per hectare was observed in P-82 (14.51 t/ha).

**Marketable yield per hectare (t/ha)**
P-1 (17.10 t/ha) recorded the highest marketable yield per hectare, followed by P-7 (16.98 t/ha). The lowest marketable yield per hectare was found in P-82 (12.15 t/ha).

**Quality parameters**
Significant variations among potato genotypes were observed in quality parameters such as chlorophyll content, tuber dry matter, starch, reducing sugars, non-reducing sugars and total sugars in different potato genotypes (Table 4).

**Chlorophyll content (mg/g)**
The genotype P-7 recorded the highest chlorophyll content (4.00 mg/g), followed by P-16 (3.51 mg/g) and P-76 (3.20 mg/g), while the lowest was observed in P-82 (1.52 mg/g).

**Tuber dry matter (%)**
The highest dry matter content was recorded in P-7 (24.40%), followed by C-17 (23.78%), whereas the lowest was observed in P-82 (15.23%).

**Starch (%)**
The genotype P-7 (24.00%) recorded the highest starch content, followed by C-17 (23.80%), with P-82 (17.50%) showing the least.

**Reducing sugars (%)**
The highest reducing sugar content was observed in C-17 (1.52%), followed by P-1 (1.49%), while the genotype P-45 (1.30%) recorded the lowest reducing sugar content.

**Non-reducing sugars (%)**
The highest non-reducing sugar content was observed in genotype C-17 (1.41%), followed by P-7 (1.38%), while the lowest non-reducing sugar content was recorded in P-45 (1.14%).

**Total sugars (%)**
The genotype C-17 (2.78%) recorded the highest total sugar content, followed by P-7 (2.74%), while the lowest was observed in P-45 (2.54%).

**Discussion**
The variations in the growth parameters of potato varieties might be associated with genotypes difference among varieties. Genotype P-1 exhibited the highest germination percentage at 20 DAP, closely followed by P-7, whereas P-82 recorded the lowest. This highlights their potential for rapid and reliable establishment across seasons. The variability in germination among the genotypes can be attributed to genetic factors and their differential response to environmental conditions, as observed by Hari (2007) [11], Santhosh (2010) [22], Lavanya *et al*. (2016) [16], Nagar *et al*. (2019) [19] and Yadav *et al*. (2024) [31]. Plant height, plant spread, total fresh weight of the plant, total dry weight of the plant exhibited noticeable variation among the evaluated potato genotypes across both 45 and 75 days after planting (DAP). Overall, a progressive increase in all parameters was observed as the crop advanced in age. Genotypes such as P-1, P-7 and C-17 demonstrated vigorous growth and attained comparatively greater plant height. Similar findings were observed by Lavanya *et al*. (2016) [16], Chindi *et al*. (2021) [7], Das *et al*. (2021) [8] and Yadav *et al*. (2024) [31], respectively. Vigorous canopy development at various suggests their suitability for better ground coverage and light interception (Gobana, 2002; Lavanya *et al*., 2016) [10, 16]. The variations in total fresh weight of plant might be due to differences in growth vigour and water uptake efficiency among the genotypes. Genotypes with broader leaf area and thicker stems may have accumulated more fresh weight because of better hydration and cell expansion. Similarly, higher dry weight of the plant could be due to increased

accumulation of structural materials like lignin and cellulose (Ramachandra *et al*., 2017 and Sood *et al*., 2020) [20, 27]. At both stages, genotypes P-1, P-7 and C-17 consistently recorded higher leaf area, while P-82 showed the lowest values across seasons. These results indicated that the genotypes like P-1, P-7 and C-17 have a broader photosynthetic surface and potential for better growth, while P-82 was relatively less vigorous. Similar findings of variation in leaf area among potato genotypes were also observed by Lavanya *et al*. (2016) [16], Ahmed *et al*. (2017) [1] and Mehara *et al*. (2018) [18].

Noticeable variations among potato genotypes were observed in yield parameters such as tuber length, tuber weight, number of tubers per plant, total tuber yield per plot, total tuber yield per hectare and marketable yield per hectare in different potato genotypes. The genotypes P-1, P-7 and C-17 consistently outperformed all the genotypes, whereas P-82 remained as least performing genotype. Similar results in the tuber length and tuber weight was observed by Santhosh (2010) [22], Katiyar *et al*. (2013) [13], Ismail and Atteif (2015) [12] and Lavanya *et al*. (2016) [16]. The superior performance of these genotypes in terms of number of tubers per plant could be attributed to their robust vegetative growth, better canopy development and efficient photosynthetic activity, which likely enhanced assimilate translocation towards tuber formation (Mehara *et al*., 2018, Ullah *et al*., 2019) [18, 29]. The remarkable performance of these genotypes in total tuber yield per plot, tuber yield per hectare and marketable tuber yield per hectare can be imputed to a combination of factors, including higher tuber count and weight per plant, effective assimilate translocation and efficient physiological traits. Additionally, their favourable interaction with environmental factors such as temperature, soil fertility and moisture availability along with lower proportion of unmarketable tubers further contributed to their superior yield performance. These results were in confirmation with Katiyar *et al*. (2013) [13], Mehara *et al*. (2018) [18], Tessema *et al*. (2020) [28] and Zeleke *et al*. (2021) [32] in potato.

Noticeable variations among potato genotypes were observed in quality parameters such as chlorophyll content, tuber dry matter, starch, reducing sugars, non-reducing sugars and total sugars in different potato genotypes. The genotypes P-7, P-16 and P-76 consistently outperformed all the genotypes, whereas P-99 remained as least performing genotype. Similar patterns of variation in chlorophyll content among potato genotypes have also been reported by Katiyar *et al*. (2013) [13]. P-7, C-17 and P-1 showed the highest values, while P-82 had the lowest. Similar patterns of variation in dry matter and starch content among potato genotypes have also been reported by Tessema *et al*. (2020) [28], DAS *et al*. (2021) [8], Lautre *et al*. (2023) [15] and Seid and Abebe (2024) [23].

The genotypes P-1, P-7 and C-17 consistently outperformed all the genotypes, whereas P-45 remained as least performing genotype. The observed differences among genotypes could be attributed to their inherent genetic potential for carbohydrate accumulation, variation in enzymatic activity related to sugar metabolism and differential response to environmental factors such as temperature and soil moisture. Similar patterns of variation among potato genotypes have also been reported by Kumar *et al*. (2023) [14] and Lautre *et al*. (2023) [15]

**Table 1:** Germination percentage, plant height and plant spread at different stages of plant growth in various genotypes of potato

| S. No | Genotypes | Germination (%) | Plant height (cm) | Plant height (cm) | Plant spread (cm) | Plant Spread (cm) |
|---|---|---|---|---|---|---|
| | | 20 DAP | 45 DAP | 75 DAP | 45 DAP | 75 DAP |
| 1 | P-1 | 93.00 | 67.57 | 84.66 | 56.16 | 64.59 |
| 2 | RH-2 | 80.44 | 50.93 | 64.14 | 43.10 | 48.70 |
| 3 | P-14 | 84.89 | 55.12 | 68.75 | 44.83 | 55.45 |
| 4 | P-45 | 80.00 | 49.60 | 62.71 | 44.40 | 46.89 |
| 5 | P-46 | 80.83 | 51.83 | 65.22 | 42.06 | 50.60 |
| 6 | C-15 | 81.14 | 54.11 | 67.33 | 43.41 | 51.65 |
| 7 | C-17 | 91.78 | 61.71 | 77.28 | 51.37 | 58.88 |
| 8 | P-16 | 81.04 | 53.49 | 67.22 | 45.82 | 50.82 |
| 9 | P-53 | 85.22 | 57.07 | 71.65 | 49.23 | 55.82 |
| 10 | P-76 | 81.44 | 54.20 | 67.92 | 46.78 | 54.04 |
| 11 | P-82 | 67.67 | 37.07 | 46.77 | 36.32 | 41.77 |
| 12 | P-93 | 89.53 | 61.01 | 76.31 | 47.95 | 57.05 |
| 13 | P-99 | 77.22 | 46.29 | 58.23 | 42.08 | 45.94 |
| 14 | P-7 | 92.11 | 67.36 | 84.21 | 52.27 | 60.11 |
| 15 | Kufri Himalini | 87.41 | 58.08 | 72.63 | 49.04 | 56.40 |
| | Mean | 83.58 | 55.03 | 69.00 | 46.32 | 53.24 |
| | S.Em± | 2.95 | 1.70 | 2.38 | 2.29 | 1.68 |
| | CD at 5% | 8.55 | 4.93 | 6.90 | 6.65 | 4.87 |

**Table 2:** Total fresh weight of plant, Total dry weight of plant and Leaf area per plant at different stages of plant growth in various genotypes of potato

| S. No | Genotypes | Total fresh weight of plant (g) | Total fresh weight of plant (g) | Total dry weight of plant (g) | Total dry weight of plant (g) | Leaf area per plant ($cm^2$) | Leaf area per plant ($cm^2$) |
|---|---|---|---|---|---|---|---|
| | | 45 DAP | 75 DAP | 45 DAP | 75 DAP | 45 DAP | 75 DAP |
| 1 | P-1 | 287.21 | 301.77 | 19.75 | 29.63 | 396.91 | 496.91 |
| 2 | RH-2 | 93.13 | 120.20 | 17.75 | 26.63 | 260.00 | 386.81 |
| 3 | P-14 | 113.07 | 140.90 | 19.39 | 29.08 | 276.70 | 398.09 |
| 4 | P-45 | 92.93 | 118.50 | 17.42 | 26.13 | 252.85 | 382.75 |
| 5 | P-46 | 94.90 | 121.90 | 17.92 | 26.88 | 267.61 | 390.00 |
| 6 | C-15 | 108.27 | 138.77 | 18.41 | 27.61 | 267.96 | 394.17 |
| 7 | C-17 | 274.40 | 294.65 | 19.55 | 29.32 | 322.51 | 482.58 |
| 8 | P-16 | 105.63 | 134.00 | 17.95 | 26.93 | 267.86 | 394.17 |
| 9 | P-53 | 164.83 | 213.00 | 19.42 | 29.13 | 276.74 | 410.44 |
| 10 | P-76 | 112.47 | 138.77 | 18.76 | 28.14 | 267.96 | 394.34 |
| 11 | P-82 | 81.57 | 109.53 | 13.94 | 20.79 | 221.00 | 378.76 |
| 12 | P-93 | 201.33 | 252.70 | 19.55 | 29.32 | 316.46 | 430.37 |
| 13 | P-99 | 91.55 | 110.23 | 15.00 | 20.91 | 244.19 | 379.63 |
| 14 | P-7 | 281.13 | 296.30 | 19.72 | 29.58 | 355.20 | 482.61 |
| 15 | Kufri Himalini | 172.83 | 214.67 | 19.45 | 29.17 | 298.31 | 430.14 |
| | Mean | 151.68 | 180.39 | 18.27 | 27.28 | 286.15 | 415.45 |
| | S.Em± | 9.15 | 9.24 | 0.83 | 1.36 | 14.06 | 23.00 |
| | CD at 5% | 26.50 | 26.77 | 2.42 | 3.93 | 40.74 | 66.63 |

**Table 3:** Tuber length, tuber weight, number of tubers per plant, number of tubers per plot, total tuber yield per hectare, marketable yield per hectare and tuber color in different potato genotypes

| S. No | Genotypes | Tuber length (cm) | Tuber weight (g) | Number of tubers per plant | Total tuber yield per plot (kg) | Total tuber yield per hectare (t/ha) | Marketable yield per hectare (t/ha) |
|---|---|---|---|---|---|---|---|
| 1 | P-1 | 8.70 | 118.83 | 9.23 | 13.67 | 18.99 | 17.10 |
| 2 | RH-2 | 6.83 | 74.24 | 5.07 | 11.10 | 15.42 | 14.02 |
| 3 | P-14 | 7.60 | 85.02 | 7.20 | 12.80 | 17.78 | 16.10 |
| 4 | P-45 | 6.53 | 62.95 | 4.77 | 11.00 | 15.28 | 14.00 |
| 5 | P-46 | 6.90 | 74.53 | 5.13 | 11.13 | 15.46 | 14.12 |
| 6 | C-15 | 7.00 | 81.32 | 6.23 | 11.58 | 16.08 | 15.21 |
| 7 | C-17 | 8.27 | 112.33 | 8.10 | 13.21 | 18.35 | 16.98 |
| 8 | P-16 | 6.90 | 79.98 | 5.47 | 11.34 | 15.75 | 14.50 |
| 9 | P-53 | 7.70 | 85.38 | 7.58 | 12.84 | 17.83 | 16.82 |
| 10 | P-76 | 7.03 | 84.39 | 6.67 | 12.14 | 16.86 | 15.32 |
| 11 | P-82 | 6.23 | 58.11 | 4.33 | 10.45 | 14.51 | 12.15 |
| 12 | P-93 | 8.17 | 99.27 | 7.93 | 13.00 | 18.06 | 16.93 |
| 13 | P-99 | 6.23 | 61.03 | 4.40 | 10.69 | 14.85 | 13.67 |
| 14 | P-7 | 8.67 | 114.15 | 8.37 | 13.54 | 18.81 | 16.98 |
| 15 | Kufri Himalini | 7.80 | 88.79 | 7.90 | 12.25 | 17.01 | 15.52 |
| | Mean | 7.37 | 85.35 | 6.56 | 12.05 | 16.74 | 15.29 |
| | S.Em± | 0.37 | 3.69 | 0.37 | 1.26 | 0.75 | 0.69 |
| | CD at 5% | 1.08 | 10.69 | 1.09 | 3.67 | 2.19 | 2.00 |

**Table 4:** Chlorophyll content, tuber dry matter, Starch, reducing sugars, non-reducing sugars and total sugars in different potato genotypes

| S. No | Genotypes | Chlorophyll content (mg/g) | Tuber dry matter (%) | Starch (%) | Reducing sugars (%) | Non-reducing sugars (%) | Total sugars (%) |
|---|---|---|---|---|---|---|---|
| 1 | P-1 | 3.19 | 23.77 | 23.5 | 1.49 | 1.37 | 2.73 |
| 2 | RH-2 | 2.25 | 17.87 | 20.3 | 1.35 | 1.23 | 2.62 |
| 3 | P-14 | 2.27 | 20.5 | 21.2 | 1.41 | 1.27 | 2.67 |
| 4 | P-45 | 3.17 | 18.89 | 19.7 | 1.3 | 1.14 | 2.54 |
| 5 | P-46 | 3.00 | 19.44 | 19.8 | 1.38 | 1.24 | 2.65 |
| 6 | C-15 | 1.83 | 18.3 | 20 | 1.44 | 1.33 | 2.72 |
| 7 | C-17 | 1.72 | 23.78 | 23.8 | 1.52 | 1.41 | 2.78 |
| 8 | P-16 | 3.51 | 22.4 | 20.5 | 1.34 | 1.21 | 2.59 |
| 9 | P-53 | 2.33 | 18.2 | 19.5 | 1.41 | 1.27 | 2.71 |
| 10 | P-76 | 3.20 | 17.5 | 21 | 1.4 | 1.24 | 2.66 |
| 11 | P-82 | 1.52 | 15.23 | 17.5 | 1.33 | 1.21 | 2.58 |
| 12 | P-93 | 2.18 | 16.8 | 22.5 | 1.35 | 1.24 | 2.63 |
| 13 | P-99 | 1.57 | 22.54 | 18.5 | 1.38 | 1.24 | 2.65 |
| 14 | P-7 | 4.00 | 24.4 | 24 | 1.46 | 1.38 | 2.74 |
| 15 | Kufri Himalini | 1.65 | 20.4 | 21.5 | 1.43 | 1.28 | 2.71 |
| | Mean | 2.49 | 20 | 20.89 | 1.4 | 1.27 | 2.67 |
| | S.Em± | 0.02 | 0.68 | 0.26 | 0.03 | 0.04 | 0.04 |
| | CD at 5% | 0.07 | 1.96 | 0.76 | 0.08 | 0.12 | 0.12 |

## Conclusion

Among the evaluated genotypes, P-1 was found superior in terms of germination, plant growth, tuber yield per plot, total tuber yield per hectare and marketable yield per hectare under Hassan conditions. Genotype P-7 recorded maximum chlorophyll content, dry matter and starch content whereas C-17 was superior for reducing sugar, non-reducing sugar and total sugar content. Hence, P-1 can be recommended as the best genotype for growth and yield performance, while P-7 and C-17 may be preferred for quality traits.

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