J Bangladesh Agril Univ 23(3): 342–358, 2025 https://doi.org/10.3329/jbau.v23i3.84454

ISSN 1810-3030 (Print) 2408-8684 (Online)

Journal of Bangladesh Agricultural University

Journal home page: http://baures.bau.edu.bd/jbau

Research Article

Evaluation of Carrot Cultivars for Higher Growth, Yield and Postharvest Quality

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ARTICLE INFO

Article history
Received: 09 August 2025
Accepted: 18 September 2025
Published: 30 September 2025

Keywords
Carrot Cultivars,
Growth,
Yield,
Postharvest quality

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ABSTRACT

An experiment was conducted at the Horticulture Farm of the Bangladesh Agricultural University, Mymensingh during the period from October, 2023 to February, 2024 for evaluation of carrot cultivars for higher growth, yield and postharvest quality. The experiment consisted of twelve cultivars viz. Kuroda, New Kuroda, Kuroda 35, King Kuroda, Improved Shin Kuroda, Kuroda Improved, Shidur, Pusha Keshor, Bankim Keshor, BAU Gazor 5, Brasilia Agroflora and Prima Agroflora. The single factor experiment was laid out in Randomized Complete Block Design with three replications. Significant variation was observed for all the parameters studied. At 70 DAS, the highest plant height (81.33 cm), number of leaves per plant (12.20) were obtained from Pusha Keshor. The maximum root length (15.93 cm), root diameter (4.78 cm), fresh root weight (204.40 g), yield per plot (1.72 kg), gross yield of root (17.17 t/ha) and marketable yield of root (14.75 t/ha) were obtained from King Kuroda and dry mater content root (11.46%) were obtained from kuroda 35. In case of postharvest performance, maximum TSS content (20.20% brix), weight loss (46.19 %), was obtained from BAU Gazor 5, the highest disease incidence (60%) was found in Kuroda, whereas the maximum disease severity (54%) was observed in King kuroda and no disease incidence and severity were recorded in Improved Shin Kuroda, Bankim Keshor, Brasilia Agroflora and Prima Agroflora and the highest shelf life (12 days) was obtained from Improved shin kuroda. Therefore, it can conclude that G_4 (King Kuroda) was found to be better in respect of higher growth, yield and quality and G_5 (Improved Shin Kuroda) for better postharvest performance compared to other cultivars

Introduction

Carrot (*Daucus carota* var. *sativus* L.) is a widely cultivated root vegetable that belongs to the family Apiaceae (Peirce, 1987). It is believed to have originated in Europe and Southwestern Asia, with Iran considered a likely center of origin where it was initially cultivated for its leaves and seeds (Shinohara, 1984). Over time, it became recognized for its edible root, making it one of the oldest vegetables cultivated, particularly in temperate climates. Carrots are commonly recognized by their orange-colored roots, although a wide range of colored cultivars including purple, red, white, and yellow also exist, each with distinct phytochemical properties (Sharma et al., 2018). Nutritionally, carrots are highly valued for their β-carotene content, which is a provitamin A compound essential for vision, immunity, skin health, and reproduction (Ellison et al., 2017). They also contain significant levels of thiamin (0.04 mg/g), riboflavin (0.05 mg/g), and carotene (10 mg/100g) (Sharfuddin and Siddique, 1985), along with vitamin C, B vitamins, iron, carbohydrates, and natural sugars. Of the sugars, sucrose is predominant, found in quantities nearly ten times higher than glucose and fructose, which greatly contribute to carrot's sweet taste. From a medicinal and nutritional perspective, carrots offer a range of health benefits, including prevention of vitamin A deficiency (especially in children), reduction of blood pressure and cholesterol levels, and protection against chronic diseases such as heart disease and cancer (Singh et al., 2001). Their antioxidant and dietary fiber content enhances these health-promoting properties. Furthermore, carrots contain various phytonutrients, including carotenoids and phenolic compounds, which enhance their functional and nutritional value (Arscott et al., 2010).

Bangladesh produces 43,396 metric tons of carrots under 6,858 acres, (BBS, 2024) covering the districts like Manikgonj, Pabna, Rajshahi, Bogra, Dinajpur, Gaibandha, Rangpur, and Panchagar. The increasing demand for carrots globally is driven by growing health

Cite This Article
Islam, A., Rashid, M. H.A., Hossain, M.M., Rabbani, M.G. and Zahura, M.F.T.2025. Evaluation of Carrot Cultivars for Higher Growth, Yield and Postharvest Quality. *Journal of Bangladesh Agricultural University*, 23(3): 342–358. https://doi.org/10.3329/jbau.v23i3.84454

consciousness and awareness of their nutritional benefits. However, achieving high yields and maintaining quality are ongoing challenges, especially in areas with sub-optimal growing conditions. Now a days, various hybrid and improved cultivars are introduced to boost both productivity and market appeal. These new varieties often offer better root uniformity, color, disease resistance, and postharvest characteristics. However, performance across agro-climatic zones can vary significantly due to differences in soil type, temperature, irrigation practices, and cultural management (Rani *et al*., 2016). Consequently, systematic evaluation of available cultivars is critical for identifying genotypes that combine high yield potential with desirable quality traits suited to local growing conditions. Research has shown that genetic variation among carrot cultivars leads to significant differences in root weight, size, and quality. For instance, these findings highlight the importance of cultivar selection in improving overall production efficiency. Therefore, current research was undertaken to evaluate carrot cultivars for higher yield, quality and postharvest performance.

Materials and Methods

Experimental site and plant materials

The field experiment was conducted at the Horticulture Farm of the Department of Horticulture, Bangladesh Agricultural University, Mymensingh during the period from October 2023 to February 2024 in order to evaluate carrot cultivars for higher yield and postharvest quality. The following 12 carrot cultivars viz. G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora and G_{12}=Prima Agroflora were evaluated in the present study.

Design and treatments for the experiment

The single factor experiment was laid out in randomized complete block design (RCBD) with three replications. Thus, there were 36 units plot (12x 3) in total. The seeds of various carrot cultivars were sown in line and the size of each unit plot was 1 m x 1 m = 1 m^2, where spacing was 25 cm x 10 cm. A distance of 0.5 m between blocks and between unit plots were kept to facilitate different intercultural operations.

Land preparation

The land of the experimental field was prepared well for planting carrot seeds on 25th October 2023. The experimental plot was thoroughly prepared by ploughing for several times with a power tiller. The clods were broken into friable soil and the surface was levelled until the desired tilth was obtained. Then it was exposed to the sunshine for 7 days prior to the next ploughing. Thereafter, the land was ploughed and cross-ploughed to obtain good tilth. Finally, the experimental plot was partitioned into unit plots in accordance with the experimental design.

Application of manures and fertilizers

The experimental plots were treated with recommended doses of NPKS fertilizers. Whole dose of TSP and half dose of MoP were applied during final land preparation, whereas urea was applied in three instalments at 30, 45 and 60 days after sowing of carrot seeds. The remaining dose of K fertilizer was applied at 45 days of seed sowing.

Seed sowing

Seeds were soaked for 24 hours before sowing. The seeds were sown in line in the field at a depth of 1.5 cm by maintaining a distance of 25 cm between the lines and plant to plant distance 10 cm. Seeds were sown on 9 November, 2023 and just after sowing seeds were covered with loose soil immediately. After completion of sowing, the experimental plots were subjected to light irrigation and covered by banana leaves for seven days to provide optimum moisture and dark condition to facilitate seed germination.

Intercultural operations

All the required intercultural operations for plant growth and development including thinning, manuring and fertilizer application, weeding, irrigation, pesticide application were done as and when necessary.

Parameters measured

Data on various parameters were recorded at 10 days intervals starting from 40 days of seed sowing up to harvesting from five random plants under each treatment and replications on growth and yield contributing characters like plant height (cm), number of leaves per plant, root length (cm), root diameter (cm), root weight (g), leaf weight (g), branched root (%). crack root (%), yield (t/ha), marketable yield (t/ha), dry matter of root (%).

Vegetative growth of plants were recorded at 40, 50, 60 and 70 DAS (days after sowing). Plant height of each five sample plants was measured in cm by using meter scale and mean was calculated. Number of leaves were recorded by counting all leaves and mean was calculated.

At harvest, fruit length and diameter were measured using meter scale (cm) and slide callipers (cm), respectively and mean was calculated for each treatment. For individual root weight five uniform roots were taken and measured by a Table Top Electric Balance and expressed in gram (g) and then mean was calculated. For leaf weight, leaves were detached by a sharp knife after harvest from the selected plants and its fresh weight was taken by a Table Top Electric Balance (g) and then its average value was recorded.

For percentage of branched and crack roots, number of branched and crack roots were counted at the time of harvest and branching and cracking percentage of roots per plot was calculated by the following formula:

Branched roots (%)

$$= \frac{\text{Number of branched roots}}{\text{Number of total roots}} \times 100$$

Cracked roots (%) =

$$\frac{\text{Number of cracked roots}}{\text{Number of total roots}} \times 100$$

For yield (to/ha), yield of individual plot (kg/plot) were measured by Table Top Electric Balance and then it was converted into tons per hectare. For marketable yield of root (t/ha), weight of carrot roots after discarding the roots damaged by cracking, rotting and branching taken from the total yield of roots in kilograms (kg), then it was converted into tons per hectare.

For determining the dry matter percentage of root, roots under each cultivar and replication were cut into small pieces and 20 gm of them were taken for oven dry at 78^0 C for 72 hours. Then weight of oven dried roots was taken by a precision electric balance and calculated as following formula:

% Dry matter of root

$$= \frac{\text{Dry weight of roots (g)}}{\text{Fresh weigt of roots (g)}} \times 100$$

For determining TSS (total soluble solids) (%brix), TSS of roots was taken with the help of hand refractometer for each treatment and replication at 2 days interval (0, 2, 4, 6 and 8 days during storage) and expressed in %brix. Before measurement, the refractometer was calibrated with distilled water to give a zero reading.

For determining the weight loss, weight of five roots under each treatment and replication were taken at 2 days interval (0, 2, 4, 6, 8 and 10 days during storage) and percentage was calculated by following formula:

% Weight loss of root=

$$\frac{Initial\ weight - Final\ weight\ of\ roots\ (g)}{Initial\ weight\ of\ roots\ (g)} \times 100$$

For determining the disease incidence (%), following formula was used:

% Disease incidence =

$$\frac{\text{Number of infected carrot}}{\text{Total number of carrot under study}} \times 100$$

For determining the disease severity (%), the percentage of area diseased was measured based on eye estimation.

For determining the Shelf life (days), shelf life of roots (days) was determined by visual observation depending on edibility of roots.

Statistical analysis

The data obtained from experiment on various parameters were statistically analysed using MSTAT computer program. The mean values for all the parameters were calculated and the analysis of variance for the characters was accomplished by F variance test. The significance of difference between pair of means was tested by the Least Significant Difference (LSD) test at 5 and 1 % levels of probability (Gomez and Gomez, 1984).

Results and Discussion

Plant height (cm)

The study found significant variation in plant height among carrot cultivars at 40, 50, 60, and 70 days after sowing (DAS). The maximum plant height was observed in the G_8 (Pusha Keshor) were 31.00 cm, 59.29 cm, 71.40 cm and 81.33 cm, while the minimum plant height was recorded in G_1 (Kuroda) 21.71 cm, 43.13 cm, 52.67 cm at 40, 50, 60 and 70 DAS respectively (Table 1). These differences are attributed to varietal characteristics, highlighting the strong influence of genetic makeup on morphological and yield traits. The results are consistent with findings by Ladumor (2019) and Mehedi (2008), who noted that plant height in carrots is mainly governed by cultivar and environmental interactions.

Number of leaves per plant

Significant variation was observed among carrot cultivars in the number of leaves per plant measured at 40, 50, 60, and 70 days after sowing (DAS). At 40 DAS, G_8 (Pusha Keshor) had the highest leaf count (4.60), while at later stages (50, 60, and 70 DAS), G_9 (Bankim Keshor) recorded the maximum number of leaves (10.52, 7.82, 11.87). Conversely, G_1 (Kuroda) consistently showed the lowest leaf numbers (3.64, 6.87, 6.13 and 9.13) across all stages (Table 1). The increase in leaf number over time is attributed to enhanced vegetative growth. The higher leaf count in G_9 indicates more vigorous canopy development, which supports greater photosynthate production and potentially higher root yield. These findings align with

Lutfunnahar et al. (2020), who reported a positive correlation between leaf number, plant vigor, and yield in carrots.

Table 1. Main effect of cultivars on plant height and number of leaves per plant at different days after sowing (DAS) of carrot

Genotypes	Plant height (cm) at different days after sowing				Number of leaves/plant at different days after sowing			
	40	50	60	70	40	50	60	70
G_1	21.71	43.13	52.67	55.73	3.64	6.87	6.13	9.13
G_2	23.29	43.47	53.73	56.40	4.47	7.13	7.20	10.47
G_3	27.33	52.27	60.20	62.43	4.47	7.60	7.07	9.60
G_4	26.61	58.73	65.47	67.53	4.53	8.60	7.40	9.87
G_5	22.50	49.75	54.40	56.00	3.87	6.93	6.53	9.93
G_6	25.09	48.53	58.32	57.93	4.20	7.53	6.70	9.67
G_7	26.63	49.31	58.33	61.27	4.40	7.27	6.87	9.20
G_8	31.00	59.29	71.40	81.33	4.60	7.93	6.73	11.47
G_9	25.18	53.07	61.13	65.93	4.35	13.47	7.82	12.20
G_{10}	23.74	50.16	63.85	75.97	4.33	10.52	6.93	11.87
G_{11}	24.85	50.96	63.87	74.47	4.33	9.80	6.20	9.13
G_{12}	22.02	48.04	58.88	71.97	4.13	8.50	6.38	9.93
$LSD_{0.05}$	4.23	7.27	8.91	8.79	0.27	1.30	0.34	0.93
$LSD_{0.01}$	5.75	9.88	12.12	11.94	0.37	1.77	0.46	1.26
Level of significance	**	**	**	**	**	**	**	**

** = Significant at 1% level of probability. G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora

Root length (cm)

Root length among carrot cultivars showed significant variation, with G_4 (King Kuroda) exhibiting the longest root (15.93 cm), while the shortest root length was recorded in G_{10} (BAU Gazor 5) (9.74 cm) (Table 2). Additionally, G_4 (King Kuroda) also had the highest root diameter roots, highlighting its superior root size.

Table 2. Main effect of cultivars on yield and yield contributing characters of carrot

Genotypes	Root length (cm)	Root diameter (cm)	% cracked root	% branched root	Fresh weight of roots (g)	Fresh weight of leaves (g)	% Dry matter content
G_1	13.20	3.88	11.75	9.19	111.74	117.46	9.39
G_2	15.87	4.25	11.11	5.55	142.20	139.00	9.30
G_3	15.33	4.31	3.03	11.11	204.40	164.46	11.46
G_4	15.93	4.78	2.42	17.38	121.26	166.34	10.33
G_5	14.53	4.01	0.00	1.96	117.46	137.00	8.57
G_6	14.37	3.76	7.08	6.75	115.06	141.34	9.27
G_7	15.40	4.18	5.89	22.48	130.54	114.6	8.63
G_8	15.30	4.17	6.67	16.19	152.20	213.13	9.42
G_9	15.53	3.77	10.08	19.05	96.86	163.34	8.58
G_{10}	9.74	2.73	0.00	0.00	35.60	185.00	10.59
G_{11}	10.34	3.53	0.00	9.26	50.86	221.20	9.04
G_{12}	13.59	3.58	8.92	3.03	61.94	246.33	8.02
$LSD_{0.05}$	2.39	0.75	2.17	4.00	5.71	7.13	1.20
$LSD_{0.01}$	3.25	1.02	2.93	5.43	7.76	9.7	1.63
Level of significance	**	**	**	**	**	**	**

** = Significant at 1% level of probability. G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora

Root diameter (cm)

Significant variation was obtained in root diameter among the different cultivars. The maximum diameter was G_4 (King Kuroda) (4.78 cm) and the minimum diameter was found in G_{10} (BAU Gazor 5) (2.73 cm) (Table 2), reflecting genotype-specific root thickening ability (Ali *et al.*, 2021).

Branched and cracked root (%)

Different carrot germplasms had significant variation on branching percentages of carrot root. The maximum percentage of branched root (22.48%) was found from G_7 (Shidur), whereas no branched root (0.00%) was produced by G_{10} (BAU Gazor 5) (Table 2). Different germplasms had significant variations on cracked percentages of carrot root. The highest percentage of cracked root (11.75%) was found from G_1 (Kuroda), while no cracked root (0.00%) was produced from G_5 (Improved Shin Kuroda), G_{10} (BAU Gazor 5), G_{11}(Brasilia Agroflora) (Table 2). Branching and cracking percentages are crucial for marketability, possibly due to better soil-root interaction or genetic traits (Teli *et al.*, 2017, Ahmad *et al.*, 2005).

Fresh weight of roots (g)

Different genotypes exhibited a significant variation in fresh weight of individual root. The maximum individual root weight was observed in G_4 (King Kuroda) (204.4 g), while the minimum weight was in G_{10} (BAU Gazor 5) (35.60 g) (Table 2).

Fresh weight of leaves (g)

The influence of different carrot ciltivars in relation to fresh weight of leaf was found to be statistically significant. The maximum fresh weight of leaves (246.34 g) was found from G_{12} (Prima Agroflora), whereas the minimum significant fresh weight of leaves was recorded from G_7 (Shidur) (114.60 g) (Table 2).

Gross yield (t/ha) and marketable yield (t/ha)

The variation due to the effect of different cultivars in respect of gross yield of roots t ha^{-1} was highly significant. The highest yield was recorded in G_4 (King Kuroda) which was 17.17 t/ha and the lowest was in G_{10} (BAU Gazor 5) which was 2.71 t/ha. (Figure 1). The variation due to the effect of different genotypes in respect of marketable yield of roots ton per hectare was significant. Considering the edible root the highest marketable yield (14.75 t/ha) was also in G_4 (King Kuroda) and the lowest (2.30 t/ha) was in G_{10} (BAU Gazor 5) (Figure 2). This supports (Ladumor *et al.* 2019), who demonstrated that varietal selection plays a pivotal role in optimizing carrot production.

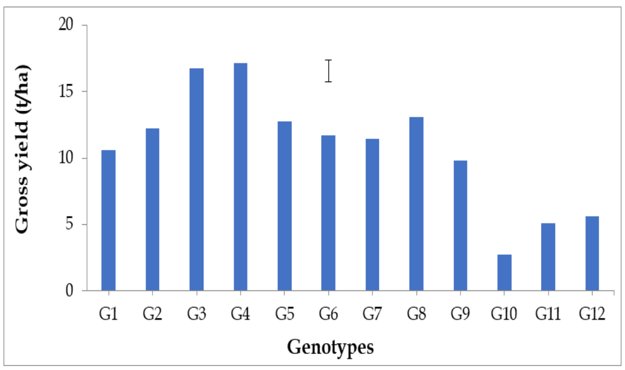

Figure 1. Effect of carrot cultivars on gross yield. Vertical bar indicates LSD at 1% level of probability. G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora

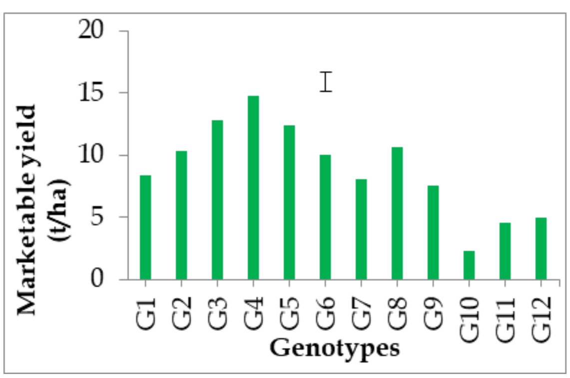

Figure 2. Effect of carrot cultivars on marketable yield. Vertical bar indicates LSD at 1% level of probability. G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora

Dry matter of root (%)

In case of percent dry matter of root, there was a significant difference among different cultivars. The maximum amount of dry matter was seen in the G_3 (Kuroda 35) (11.46 %) and the minimum dry matter content was observed in G_{12} (Prima Agroflora) (8.02 %) (Table 2). Root dry matter content varied among cultivars.

Total soluble solids (% brix)

Total soluble solids (TSS) in carrots varied significantly among cultivars and increased with storage duration (2, 4, 6, and 8 days). Initially, G_1 (Kuroda) had the highest TSS at 15.00 %brix, while G_9 (Bankim Keshor) had the lowest at 12.40 %brix. After 8 days of storage, G_{10} (BAU Gazor 5) showed the highest TSS at 20.20 %brix and the lowest was in G_{11} (Brasilia Agroflora) at 13.30 %brix (Table 3). The increase in TSS over time is likely due to moisture loss and sugar concentration during storage, consistent with findings by Bithi *et al*. (2019).

Weight loss (%)

Weight loss percentage in carrots increased progressively over storage time (2, 4, 6, 8, and 10 days) and varied significantly among different cultivars. The highest weight loss was observed in G_{10} (BAU Gazor 5), reaching up to 46.19% after 10 days, while the lowest weight loss was recorded in G_5 (Improved Shin Kuroda) at 27.70% (Table 3). This variation in weight loss is likely due to differences in moisture content and skin properties that influence transpiration and respiration rates, as supported by Yara et al. (2024).

Table 3. Main effect of cultivars on total soluble solids (TSS) (% brix) and weight loss (%) at different days after storage of carrot

Genotypes	TSS at different days after storage (% brix)					Weight loss at different days after storage (%)				
	0	2	4	6	8	2	4	6	8	10
G_1	15.00	14.00	15.00	15.00	16.10	8.85	14.99	20.84	29.24	34.18
G_2	14.00	15.40	15.20	17.00	14.40	8.12	13.77	18.92	26.13	30.24
G_3	13.00	14.10	14.30	15.00	17.10	7.69	12.85	17.49	24.24	28.35
G_4	13.30	14.30	15.10	15.00	15.00	8.68	14.37	19.75	27.65	32.22
G_5	13.20	14.10	15.10	17.00	16.30	7.49	12.54	17.07	23.69	27.70
G_6	14.00	15.30	14.20	15.40	14.40	8.09	13.71	18.67	26.24	30.81
G_7	13.60	14.30	14.30	14.20	14.30	7.95	13.59	18.97	26.67	31.03
G_8	13.80	15.00	14.40	16.30	16.00	8.63	14.52	19.65	26.85	31.12
G_9	12.40	13.40	16.00	16.40	20.00	9.69	15.75	21.06	28.64	33.03
G_{10}	13.00	14.30	20.20	16.10	20.20	13.19	21.53	29.17	39.93	46.19
G_{11}	13.20	15.30	14.20	16.10	13.30	10.82	18.38	24.68	34.77	39.79
G_{12}	12.60	14.10	14.10	15.30	15.10	12.18	19.90	26.62	35.82	41.54
$LSD_{0.05}$	1.09	0.79	0.74	1.16	1.31	0.56	1.10	2.10	2.51	2.52
$LSD_{0.01}$	1.48	1.06	1.00	1.57	1.78	0.76	1.49	2.85	3.40	3.42
Level of significance	**	**	**	**	**	**	**	**	**	**

** = Significant at 1% level of probability. G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora

Disease incidence (%)

During the initial two days of storage, no disease symptoms were observed across all carrot cultivars. After 10 days of storage of carrot root, disease incidence increased significantly in some cultivars, with the highest infestation recorded in G_1 (Kuroda, 60%), that shown in (Figure 3). In contrast, G_5 (Improved Shin Kuroda), G_9 (Bankim Keshor), G_{11} (Brasilia Agroflora), and G_{12} (Prima Agroflora) remained completely disease-free, suggesting strong resistance.

Disease severity (%)

The study revealed significant variation in disease severity (%) among carrot cultivars during storage. The highest severity was recorded in G_4 (King Kuroda, 54%) (Figure4), in contrast, G_5 (Improved Shin Kuroda), G_9 (Bankim Keshor), G_{11} (Brasilia Agroflora), and G_{12} (Prima Agroflora) remained entirely unaffected throughout the storage period, demonstrating strong disease resistance.

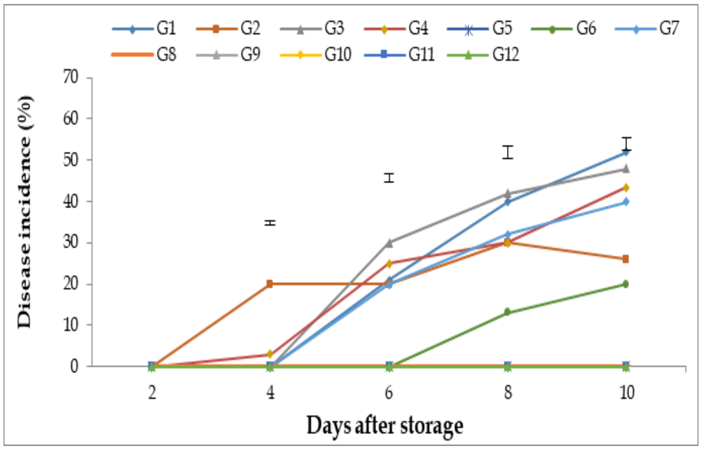

Figure 3. Effect of carrot cultivars on disease incidence (%) at different days after storage. Vertical bars indicate LSD at 1% level of probability. G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora

40 DAS

50 DAS

Plate 1. Vegetative growth of carrot cultivars at 40, 50, 60 and 70 DAS

60 DAS

70 DAS

Plate 1. Vegetative growth of baby carrot at 80 DAS (days after sowing) from the interaction between germplasms and coloured plastic mulches where G1= PI L1408, G2= PI Nantes 5, G3= PI 261650, G4= PI 1408, G5= PI Upper cut; T0= Control, T1= Black, T2= Silver, T3= Blue, T4= Red

G_1= Kuroda

G_2 = New Kuroda

G_3 = Kuroda 35

G_4 = King Kuroda

G_5 = Improved Shin Kuroda

G_6 = Kuroda Improved

G_7 = Shidur

G_8 = Pusha Keshor

G_9 = Bankim Keshor

G_{10} = BAU Gazor 5

G_{11} = Brasilia Agroflora

G_{12} = Prima Agroflora

Plate 2. Pictorial view of the harvesting of carrots

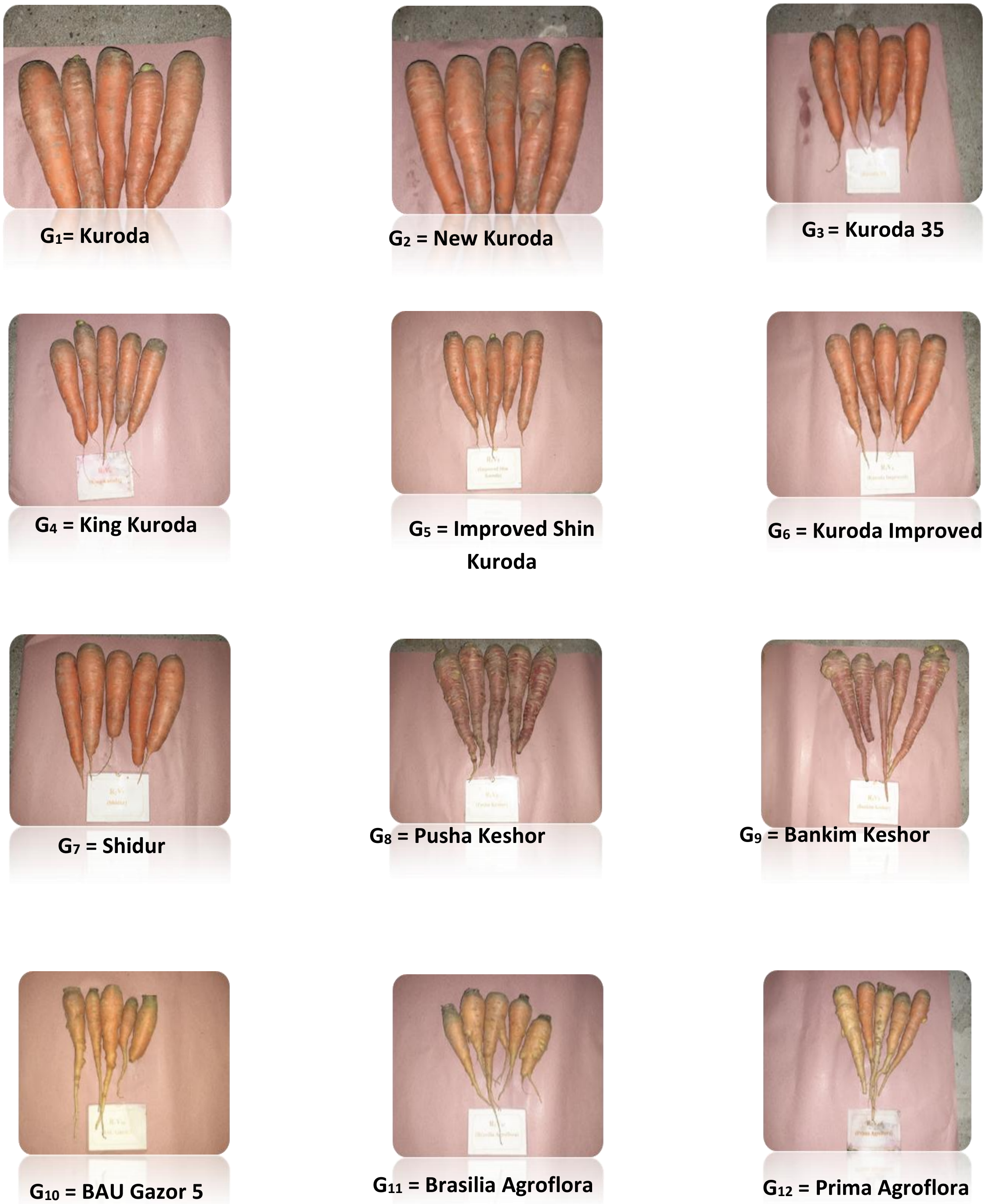

Plate 3. Postharvest observation of carrot cultivars at 0 day (G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora)

Shelf life (days)

Shelf life showed significant variations among the various carrot cultivars as shown in plates 3-9. Results showed that the longest shelf life of 12 days was found from G_5 (Improved Shin Kuroda) while the shortest shelf life of 7.5 days was recorded from G_1 (Kuroda) (Figure 5). Longer shelf life was associated with lower weight loss, higher dry matter content, and better resistance to postharvest deterioration, as supported by Rashed Sarkar et al. (2024).

Plate 4. Postharvest observation of carrot cultivars at 2 days (G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia

G_1= Kuroda

G_2 = New Kuroda

G_3 = Kuroda 35

G_4 = King Kuroda

G_5 = Improved Shin Kuroda

G_6 = Kuroda Improved

G_7 = Shidur

G_8 = Pusha Keshor

G_9 = Bankim Keshor

G_{10} = BAU Gazor 5

G_{11} = Brasilia Agroflora

G_{12} = Prima Agroflora

Plate 5. Postharvest observation of carrot cultivars at 4 days (G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora)

Plate 6. Postharvest observation of carrot cultivars at 6 days (G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora

G_1= Kuroda

G_2 = New Kuroda

G_3 = Kuroda 35

G_4 = King Kuroda

G_5 = Improved Shin Kuroda

G_6 = Kuroda Improved

G_7 = Shidur

G_8 = Pusha Keshor

G_9 = Bankim Keshor

G_{10} = BAU Gazor 5

G_{11} = Brasilia Agroflora

G_{12} = Prima Agroflora

Plate 7. Postharvest observation of carrot cultivars at 8 days (G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora

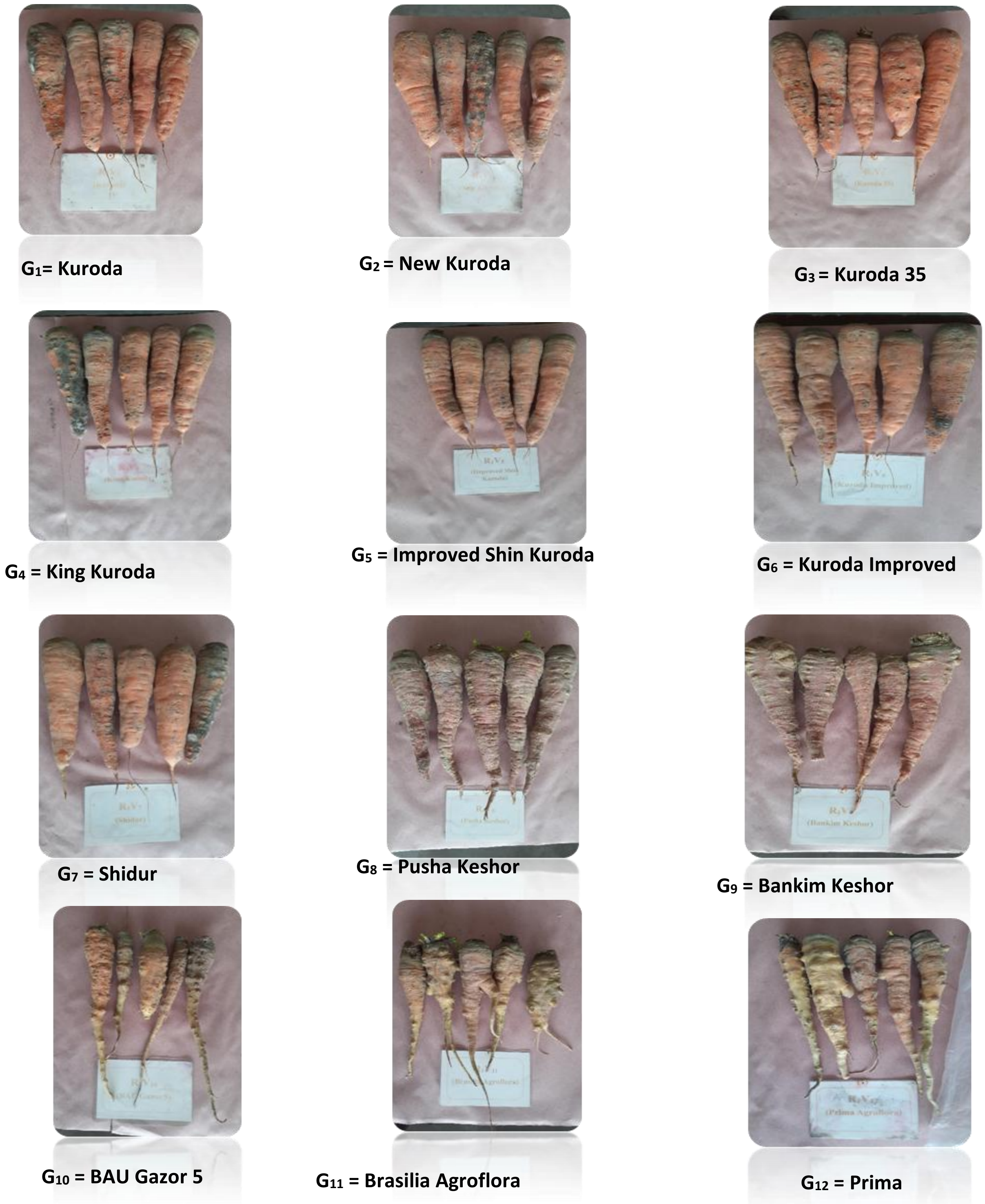

Plate 8. Postharvest observation of carrot cultivars at 10 days (G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora

G_1= Kuroda

G_2 = New Kuroda

G_3 = New Kuroda

G_4 = King Kuroda

G_5 = Improved Shin Kuroda

G_5 = Improved Shin Kuroda

G_7 = Shidur

G_8 = Pusha Keshor

G_9 = Bankim Keshor

G_{10} = BAU Gazor 5

G_{11} = Brasilia Agroflora

G_{12} = Prima Agroflora

Plate 9. Postharvest observation of carrot cultivars at 12 days (G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora

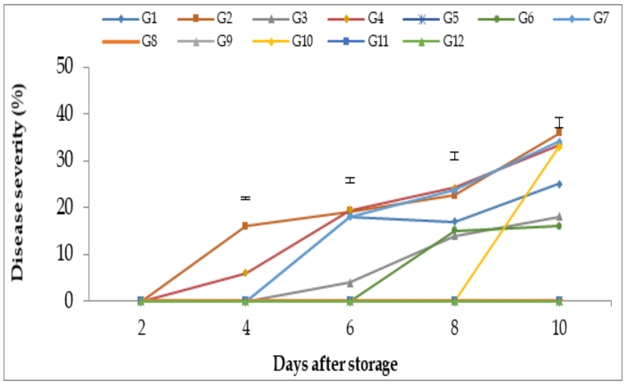

Figure 5. Effect of carrot cultivars on disease severity (%) at different days after storage. Vertical bars indicate LSD at 1% level of probability. G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora

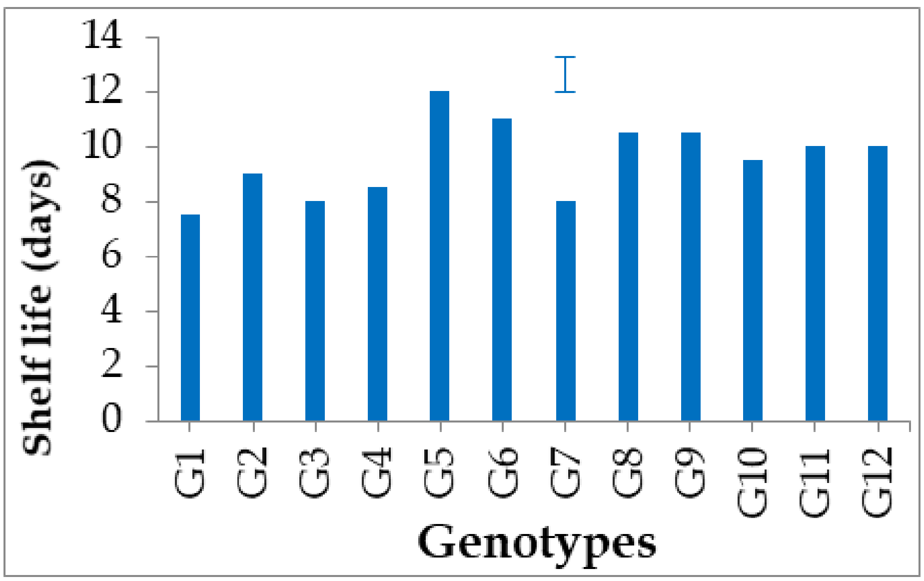

Figure 6. Effect of carrot cultivars on shelf life (days). Vertical bar indicates LSD at 1% level of probability. G_1=Kuroda, G_2=New Kuroda, G_3=Kuroda 35, G_4=King Kuroda, G_5=Improved Shin Kuroda, G_6=Kuroda Improved, G_7=Shidur, G_8=Pusha Keshor, G_9=Bankim Keshor, G_{10}=BAU Gazor 5, G_{11}=Brasilia Agroflora, G_{12}=Prima Agroflora.

Conclusion

The study was undertaken to evaluate twelve carrot cultivars for higher growth, yield and postharvest quality. Therefore, based on all results, it can be concluded that G_4 (King Kuroda) was found to be better in respect of higher growth, yield and quality and G_5 (Improved Shin Kuroda) for better postharvest quality compared to other cultivars.

Acknowledgements

The authors are thankful to the Bangladesh Agricultural University Research System (BAURES) for funding this work (Project no. 2023/66/BAU).

Conflict of interest

The authors did this research and wrote the article and there is no conflict of interest with other people.

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