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Physico-chemical Composition and Acceptability of Newer Carrot Germplasms

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A B S T R A C T

Nine newly identified carrot germplasms and one local carrot variety were evaluated in terms of their physico-chemical composition and acceptability. The physical parameters *viz.* weight, length and diameter of the carrot germplasms ranged from 46 - 91.40 g, 11.87 – 18.48 cm and 3.11 – 4.43 cm respectively. There was no significant difference observed for circumference, volume, bulk density and phloem to xylem ratio among the carrot germplasms. All the germplasms were cylindrical in shape. The different colours were noted in the carrot germplasms i.e. yellow red in three carrot germplasms and local carrot variety, red in four germplasms, yellow green and red purple in one each of germpalsms. The physico-chemical parameters *viz.* dry matter, TSS, pH and vitamin C content of the carrot germpalsms ranged from 9.92 - 18.11 %, 5.92 – 8.44^0 Brix, 6.70 – 7.84 and 4.01 – 4.7 mg/100 g respectively. Germpalsms *viz*. UHSBC64, UHSBC23-1, UHSBC44-1 had better acceptability indices in boiled and sauted carrots. Germplasms UHSBC53, UHSBC64 and UHSBC23-1 were on par with local carrot variety with regard to physico-chemical composition and acceptability.

Introduction

Carrot is globally important vegetable crop that has a source of important nutritional compounds through their carotenoid content and add flavour and texture to many diets across the world. It is a root vegetable and is in demand throughout the year. Carrot also contains wide spectrum of other antioxidant substances, such as phenolic compounds and vitamin C, which is one of the important compounds present in vegetables. Carrots are usually orange but white, black, yellow, red and purple colour also available. Preference for carrot cultivars are not only for its nutritive value and antioxidants but also for sensory properties, physical parameters *viz.*, shape, uniform size, bright colour and xylem phloem ratios.

Carrots can be consumed fresh or cooked, either alone or with other vegetables in the preparation of soups, curries, bhajis and pickles. They are grated and used as salads and tender roots are pickled. Carrot juice is considered as a health food. Cooking methods

like boiling, microwaving, baking and frying lead to changes in texture and nutritional properties of vegetables i.e. cooking softens the cell walls which lead to increase in the extraction of carotenoids and loss of water soluble vitamins. Sauteing is the optimum method of cooking carrot which results in highest retention and an increase in the antioxidant constituents.

Realising the nutritional importance of natural antioxidant and other bioactive compounds present in carrot and overwhelming demand of consumer, various research institutes and private seed companies started breeding to develop high yielding bright coloured carrot cultivars. In the horticulture department high yielding newer carrot varieties are grown and need to be tested for their physicochemical properties and sensory characteristics. Hence, the present study was undertaken with the objective to analyze the physico-chemical composition and acceptability of newer carrot germplasms.

Materials and Methods

Nine newly identified carrot germplasms *viz*. UHSBC51, UHSBC52, UHSBC53, UHSBC59, UHSBC64, UHSBC101, UHSBC23-1, UHSBC34-1 and UHSBC44-1 were collected from Regional Horticulture Research and Extension centre Dharwad, University of Horticulture sciences Bagalkot. One variety was taken for comparison from Dharwad local market as a control (LC).

For the physical parameters of the carrots the weight was taken using electronic balance and length and diameter were measured with the help of vernier calliper to nearest 0.01 mm. Volume was measured by using water displacement method. The cylindrical form of the root was determined using formula $C = W/\pi r^2 L$ where C= cylindricity; W = weight in g; L= length in cm; r = radius in cm (Silva *et.al* 2007). Colour of the carrots was recorded by matching with Munsell colour chart. Dry matter was determined by drying samples in 105^0 C until constant weight (AOAC 1998). pH was measured using pH meter and TSS by hand refractometer (Gajewski *et al.,* 2010). Vitamin C determined by titrimetric method by using 2, 6-dichlorophenol indophenol dye (Ranganna 1986).

Acceptability was assessed by sensory evaluation method by subjecting to cooking methods *viz.* boiling and sautéing and they were evaluated using 9 - point hedonic scale by ten semi trained judges. The results were statistically analyzed by one way ANOVA using SPSS software.

Results and Discussion

The physical parameters of carrot cultivars have been presented in Table 1. The weight, length and diameter of the carrots differed significantly among the germplasms. Weight of carrots ranged from 46 – 91.40g. The highest weight was observed in the germplasm UHSBC23-1 (91.40g) and least in the germplasm UHSBC101 (46 g). The length of the carrot germplasms varied from 11.87 – 18.48cm. The highest length was observed in the local carrot variety (18.48 cm) and least in the germplasms UHSBC51 (11.87 cm). The study conducted by Saha *et al.,* (2016) reported higher values for weight and length (129 – 165 g and 18.82 – 22.85 cm). The diameter of the carrots ranged from 3.11 – 4.43cm. The highest diameter was observed in the germplasm UHSBC23-1 (4.43 cm) and least in the germplasms UHSBC59 (3.09 cm). Study conducted by Karkeline *et al.,* (2009) reported similar values for diameter (3.4- 4.1 cm). There was no significant difference were observed in circumference, volume and bulk density among the carrot germplasms. Circumference ranged from 9.94 – 14.08 cm. Utabo *et al.,* (2015) reported lower values for

circumference (5 - 9.99 cm). Volume varied from 25.60 – 50.60 ml. Hailu *et al.,* (2008) reported higher values for volume (46 – 75 ml). Bulk density varied from 1.50 – 2.56 g/ml. Lim *et al.,* (2014) reported similar results for bulk density (1.61g/ml). The difference in the physical parameters of the present study in comparison to other studies of carrots may be due to genetic variability and growing conditions such as temperature, soil, moisture, rainfall, light intensity and day length.

The carrot roots have two different types of transport tissues: the xylem which is inner core and phloem that forms the outer cortex. Majority of the carotenoids are present in the phloem tissue. In the present study the phloem and xylem ratio of carrot germplasms are presented in the Table 2. The length of phloem and xylem ranged from 1.46 - 2.03 cm and 0.50 – 0.93cm respectively and differences in means were significant at $p < 0.05$ level among the carrot germplasms. The highest length of the phloem was observed in the local carrot variety, UHSBC51 and UHSBC59 (2.03cm). The highest length of xylem was observed in local carrot variety (0.93cm). Higher ratios of phloem to xylem are more desirable in carrots. The phloem and xylem ratio ranged from 2.91 – 3.20 with no significant difference among the germpalsms. The values in the present study were on par with those reported by Sink *et al.,* (2017) who noted the mean ratio of 2.1.

Apart from physical parameters of carrots external and internal root colour and shape are important quality characteristics. Carrots with bright coloured and uniform shape are preferred by the consumers. They are classified as conical ($C = \leq 0.33$) or cylindrical shape (0.33 to 1). In the present study the local carrot variety had conical shape (Table 3) while all the germplasms were cylindrical in shape. The study conducted by Silva *et al.,* (2007) reported similar cylindrical shape of carrots. The different colours were noted in the carrot germplasms i.e. yellow red in three carrot germplasms and local carrot variety, red in four germplasms, yellow green and red purple in one each of germpalsms. Carotenoids and lycopene are responsible for imparting orange and red colours, chlorophyll and anthocynins are responsible for imparting green and purple colours. The study conducted by Leja *et.al* (2013) reported similar differences in colour of carrots.

The physicochemical characteristics of carrot germplasms *viz.* dry matter, TSS, pH and vitamin C are presented in the Table 4. The dry matter, TSS and pH were significant at $p < 0.01$ level among the carrot germplasms. The dry matter content of the carrots ranged from 9.92 - 18.11 %. The highest dry matter content was observed in the germplasm UHSBC59 (18.11%) and least in UHSBC101 (9.92%). The TSS level of the carrots ranged from 5.92 – 8.44^0 Brix. Highest TSS level was observed in the germplasm UHSBC34-1(8. 44^0 Brix) and least in the germplasm UHSBC44-1 (5.92^0 Brix). Study conducted by Silva *et al.,* (2007) reported lower values for dry matter content (12.17 – 13.63%) and higher values for TSS (9.7.0 – 10.30^0 Brix). The pH level of the carrot germplasms varied from 6.70 – 7.84. The highest pH level was found in the germplasm UHSBC101 (7.84) and least in the germplasm UHSBC44-1 (6.70). Gajewski *et al.,* (2010) reported lower value for pH (6.14 – 6.27). The vitamin C content of the carrot germpalsms ranged from 4.01 – 4.7 mg/100 g. There was no significant difference observed in vitamin C content among the germplasm. Study conducted by Bembem and Sadana (2014) reported lower value for vitamin C (3.02 mg/100 g). The variation in the values in the present study in comparison to other studies on carrots may be due to difference in genotypes, soil type and climatic conditions.

Table.1 Physical characteristics of carrot germplasms

Carrot germplasms	Weight (g)	Length (cm)	Diameter (cm)	Circumference (cm)	Volume (ml)	Bulk density (g/ml)
LC (Control)	78.40 ± 24.52^{ab}	18.48 ± 1.4^{a}	4.04 ± 0.41^{ab}	13.26 ± 1.72	42 ± 7.38	1.95 ± 0.52
UHSBC 51	60.80 ± 21.08^{bc}	11.87 ± 0.87^{c}	3.11 ± 0.52^{b}	10.88 ± 2.52	28.80 ± 20.29	2.56 ± 1.00
UHSBC 52	46.80 ± 14.25^{c}	13.84 ± 2.09^{bc}	3.37 ± 0.50^{b}	14.08 ± 1.61	25.60 ± 14.79	2.06 ± 0.67
UHSBC 53	51.80 ± 20.11^{bc}	14.33 ± 1.84^{bc}	3.11 ± 0.74^{b}	12.82 ± 2.69	27.20 ± 9.65	1.90 ± 0.21
UHSBC 59	49.40 ± 18.51^{bc}	13.28 ± 2.43^{c}	3.09 ± 0.71^{b}	13.24 ± 5.32	29 ± 19.26	2.00 ± 0.76
UHSBC 64	61.40 ± 26.04^{bc}	13.35 ± 1.35^{c}	3.82 ± 1.04^{ab}	11.40 ± 2.33	28.80 ± 13.35	2.21 ± 0.40
UHSBC 101	46.00 ± 11.59^{c}	13.01 ± 1.96^{c}	3.13 ± 0.49^{b}	10.50 ± 1.66	30.20 ± 11.71	1.66 ± 0.64
UHSBC 23-1	91.40 ± 15.50^{a}	15.89 ± 2.66^{b}	4.43 ± 0.43^{a}	12.48 ± 2.40	50.60 ± 8.93	1.80 ± 0.10
UHSBC 34-1	65.00 ± 24.26^{abc}	13.27 ± 0.97^{c}	3.78 ± 0.71^{ab}	10.56 ± 1.39	38.40 ± 16.59	1.72 ± 1.10
UHSBC 44-1	53.80 ± 18.28^{bc}	12.71 ± 1.20^{c}	3.29 ± 0.64^{b}	9.94 ± 3.78	36.40 ± 10.06	1.50 ± 0.40
Mean ± SD	60.48 ± 0.22	14.00 ± 2.42	3.52 ± 0.74	11.91 ± 2.87	33.70 ± 14.83	1.94 ± 0.58
F- value	2.70	5.77	2.63	1.31	1.61	1.44
S. Em. ±	8.93	0.78	0.28	1.24	17.97	0.25
C. D. @ 1% level	25.52*	2.25**	0.82*	NS	NS	NS

Note: Mean ± S.D; C.D – Critical Difference; S. Em. ± Standard Error mean; * Significant at 0.05 percent level; ** Significant at 0.01percent level; NS- Non significant; Different superscript within a column indicate significant difference at 0.05 level by DMRT

Table.2 Phloem and xylem ratio of carrot germplasms

Carrot germplasms	Length (cm)		
	Phloem	**Xylem**	**Phloem/Xylem ratio**
LC (Control)	2.03 ± 0.15^{a}	0.93 ± 0.11^{a}	2.19 ± 0.18
UHSBC 51	2.03 ± 0.20^{a}	0.70 ± 0.10^{ab}	2.95 ± 0.61
UHSBC 52	1.46 ± 0.30^{c}	0.50 ± 0.10^{c}	2.93 ± 0.11
UHSBC 53	1.53 ± 0.11^{bc}	0.63 ± 0.15^{c}	2.48 ± 0.42
UHSBC 59	2.03 ± 0.15^{a}	0.66 ± 0.15^{c}	3.14 ± 0.65
UHSBC 64	1.83 ± 0.57^{abc}	0.70 ± 0.26^{ab}	2.66 ± 0.28
UHSBC 101	1.56 ± 0.11^{abc}	0.53 ± 0.05^{c}	2.96 ± 0.45
UHSBC 23-1	2.00 ± 0.20^{ab}	0.73 ± 0.05^{ab}	2.73 ± 0.35
UHSBC 34-1	1.83 ± 0.15^{abc}	0.70 ± 0.10^{ab}	2.63 ± 0.17
UHSBC 44-1	1.80 ± 0.10^{abc}	0.56 ± 0.05^{c}	3.20 ± 0.38
Mean ± SD	1.81 ± 0.29	0.66 ± 0.16	2.79 ± 0.44
F- value	2.38	2.65	1.77
S. Em. ±	0.14	0.07	0.23
C. D. @ 1% level	0.42*	0.22*	NS

Note: Mean ± S.D; C.D – Critical Difference; S. Em. ± Standard Error mean; * Significant at 0.05 percent level; NS- Non significant; Different superscript within a column indicate significant difference at 0.05 level by DMRT

Table.3 Shape and colour of carrot germplasms

Carrot germplasms	Cylindrical form $C=W/\pi r^2 L$ (g/cm^3)	Shape	Colour	
			Root/ Phloem	Xylem
LC (Control)	0.31 ± 0.03^{c}	Conical	Yellow red	Light yellow red
UHSBC 51	0.66 ± 0.11^{a}	Cylindrical	Red	Yellow
UHSBC 52	0.38 ± 0.13^{bc}	Cylindrical	Yellow red	Yellow
UHSBC 53	0.48 ± 0.11^{b}	Cylindrical	Red	Yellow red
UHSBC 59	0.51 ± 0.11^{b}	Cylindrical	Green yellow	Dark yellow green
UHSBC 64	0.39 ± 0.01^{bc}	Cylindrical	Red	Yellow red
UHSBC 101	0.47 ± 0.12^{b}	Cylindrical	Red	Yellow red
UHSBC 23-1	0.38 ± 0.12^{bc}	Cylindrical	Yellow red	Light yellow red
UHSBC 34-1	0.42 ± 0.03^{bc}	Cylindrical	Yellow red	Light yellow red
UHSBC 44-1	0.49 ± 0.07^{b}	Cylindrical	Red purple	Yellow red
Mean ± SD	0.45 ± 0.12			
F- value	4.21			
S. Em. ±	0.12			
C. D. @ 1% level	0.04^{**}			

Note: Mean ± S.D; C.D – Critical Difference; S. Em. ± Standard Error mean; ** Significant at 0.01 percent level; Different superscript within a column indicate significant difference at 0.05 level by DMRT

Table.4 Physicochemical characteristics of carrot germplasms

Carrot germplams	Dry matter (%)	TSS (°Brix)	pH	Vitamin C (mg/100g)
LC (Control)	10.94 ± 0.16^{de}	6.92 ± 0.13^{e}	7.12 ± 0.08^{d}	4.53±0.44
UHSBC 51	11.12 ± 0.41^{de}	7.92 ± 0.13^{c}	6.86 ± 0.05^{ef}	4.28±0.45
UHSBC 52	11.27 ± 0.27^{de}	7.96 ± 0.11^{c}	7.22 ± 0.08^{cd}	4..7±0.46
UHSBC 53	12.80 ± 0.68^{c}	8.14 ± 0.11^{b}	7.34 ± 0.11^{b}	4.01±0.008
UHSBC 59	18.11 ± 0.11^{a}	7.30 ± 0.22^{d}	7.24 ± 0.13^{bc}	4.29±0.46
UHSBC 64	15.93 ± 0.18^{b}	6.34 ± 0.15^{f}	6.90 ± 0.07^{e}	4.01±0.007
UHSBC 101	9.92 ± 0.88^{f}	6.82 ± 0.08^{e}	7.84 ± 0.05^{a}	4.54±0.46
UHSBC 23-1	10.76 ± 0.18^{e}	6.34 ± 0.08^{f}	6.76 ± 0.05^{fg}	4.27±0.44
UHSBC 34-1	11.07 ± 0.11^{de}	8.44 ± 0.15^{a}	6.94 ± 0.05^{e}	4.26±0.46
UHSBC 44-1	11.62 ± 0.31^{d}	5.92 ± 0.13^{g}	6.70 ± 0.07^{g}	4.53±0.45
Mean ± SD	12.35 ± 2.54	7.21 ± 0.84	7.09 ± 0.33	4.30±0.38
F- value	119.97	202.91	86.05	0.66
S. Em. ±	0.23	0.06	0.014	0.23
C. D. @ 1% level	0.70**	0.17**	0.04**	NS

Note: Mean ± S.D; C.D – Critical Difference; S. Em. ± Standard Error mean; ** Significant at 0.01 percent level; Different superscript within a column indicate significant difference at 0.05 level by DMRT

Table.5 Sensory scores of boiled carrot germplasms

Carrot germplams	Appearance	Colour	Flavour	Taste	Texture	Overall acceptability	Acceptability index
LC (Control)	8.60 ± 0.51^{a}	8.60 ± 0.51^{a}	8.20 ± 0.42^{a}	8.00 ± 0.66^{a}	8.20 ± 0.42^{a}	8.40 ± 0.51^{a}	92.59
UHSBC 51	6.80 ± 0.78^{d}	7.10 ± 0.73^{bd}	6.70 ± 0.67^{bcd}	6.90 ± 0.87^{bc}	7.30 ± 0.82^{b}	6.80 ± 0.63^{bc}	77.03
UHSBC 52	7.20 ± 0.78^{cd}	7.40 ± 0.69^{bcd}	6.60 ± 0.69^{cd}	6.50 ± 0.52^{c}	7.10 ± 0.99^{b}	6.90 ± 0.73^{bc}	77.22
UHSBC 53	7.40 ± 0.96^{bcd}	7.60 ± 0.84^{bc}	7.00 ± 0.66^{bcd}	6.80 ± 0.42^{bc}	7.20 ± 0.78^{b}	7.20 ± 0.63^{bc}	80.00
UHSBC 59	6.90 ± 0.73^{cd}	7.00 ± 0.81^{bd}	6.50 ± 0.70^{d}	6.30 ± 0.48^{c}	6.30 ± 0.48^{c}	6.60 ± 0.84^{c}	73.33
UHSBC 64	8.00 ± 0.47^{ab}	8.00 ± 0.47^{b}	7.30 ± 0.82^{bc}	7.00 ± 0.81^{bc}	7.40 ± 0.96^{b}	7.40 ± 0.84^{b}	83.51
UHSBC 101	7.60 ± 0.69^{bc}	7.50 ± 0.70^{bcd}	6.77 ± 0.83^{bcd}	6.90 ± 0.87^{bc}	7.30 ± 0.67^{b}	7.10 ± 0.73^{bc}	80.18
UHSBC 23-1	7.00 ± 0.66^{cd}	7.20 ± 0.63^{bd}	7.10 ± 0.73^{bcd}	7.00 ± 0.66^{bc}	7.20 ± 0.78^{b}	7.10 ± 0.71^{bc}	78.88
UHSBC 34-1	7.10 ± 0.56^{cd}	7.10 ± 0.56^{bd}	6.90 ± 0.73^{bcd}	6.80 ± 0.63^{bc}	7.00 ± 0.66^{b}	7.10 ± 0.72^{bc}	77.77
UHSBC 44-1	6.90 ± 0.56^{cd}	6.90 ± 0.50^{d}	7.40 ± 0.69^{b}	7.30 ± 0.82^{b}	7.40 ± 0.69^{b}	7.30 ± 0.67^{bc}	80.00
Mean ± SD	7.35 ± 0.85	7.44 ± 0.80	7.06 ± 0.82	6.95 ± 0.79	7.24 ± 0.84	7.19 ± 0.82	-
F- value	6.87	6.16	4.95	4.35	3.82	4.16	-
S. Em. ±	0.21	0.20	0.22	0.21	0.23	0.22	-
C. D. @ 1% level	0.60**	0.58**	0.62**	0.61**	0.66**	0.63**	-

Note: Mean ± S.D; C.D – Critical Difference; S. Em. ± Standard Error mean; ** Significant at 0.01 percent level; Different superscript within a column indicate significant difference at 0.05 level by DMRT

Table.6 Sensory scores of sauted carrot germplasms

Carrot germplams	Appearance	Colour	Flavour	Taste	Texture	Overall acceptability	Acceptability index
LC (Control)	8.00 ± 0.66^{a}	7.60 ± 0.84^{a}	7.50 ± 0.70	7.70 ± 0.48^{a}	7.80 ± 0.42^{a}	7.80 ± 0.42^{a}	85.95
UHSBC 51	6.90 ± 0.73^{bc}	6.90 ± 0.87^{bcd}	6.90 ± 0.73	7.30 ± 0.48^{abc}	7.30 ± 0.48^{abc}	7.00 ± 0.66^{b}	78.33
UHSBC 52	6.80 ± 0.63^{bc}	6.70 ± 0.67^{cd}	6.60 ± 0.96	6.80 ± 0.91^{bc}	6.70 ± 0.94^{c}	6.90 ± 0.99^{b}	75.00
UHSBC 53	6.70 ± 0.84^{c}	6.60 ± 0.69^{d}	6.70 ± 0.82	6.70 ± 0.69^{c}	6.70 ± 0.82^{c}	6.70 ± 0.82^{b}	74.88
UHSBC 59	6.60 ± 0.82^{c}	6.50 ± 0.70^{d}	6.80 ± 0.78	6.60 ± 0.67^{c}	6.60 ± 0.48^{c}	6.60 ± 0.82^{b}	73.25
UHSBC 64	7.50 ± 0.84^{ab}	7.60 ± 0.69^{a}	6.90 ± 0.73	7.00 ± 0.81^{abc}	7.40 ± 0.81^{bc}	7.30 ± 0.94^{ab}	80.18
UHSBC 101	7.30 ± 0.82^{abc}	7.60 ± 0.51^{a}	7.20 ± 0.63	7.50 ± 0.70^{ab}	7.30 ± 0.67^{abc}	7.20 ± 0.67^{ab}	81.85
UHSBC 23-1	7.30 ± 0.67^{abc}	7.40 ± 0.51^{ab}	7.20 ± 0.78	7.10 ± 0.87^{abc}	7.20 ± 0.91^{abc}	7.30 ± 0.67^{ab}	80.55
UHSBC 34-1	7.10 ± 0.87^{bc}	7.00 ± 0.66^{abcd}	7.10 ± 0.87	7.20 ± 0.87^{abc}	7.10 ± 0.87^{abc}	7.00 ± 0.81^{b}	78.51
UHSBC 44-1	7.10 ± 0.56^{bc}	7.30 ± 0.48^{abc}	7.30 ± 0.67	7.10 ± 0.56^{abc}	7.50 ± 0.70^{bc}	7.40 ± 0.69^{ab}	80.92
Mean ± SD	7.13 ± 0.82	7.12 ± 0.76	7.02 ± 0.79	7.09 ± 0.76	7.13 ± 0.78	7.14 ± 0.80	-
F- value	3.70	4.07***	1.34	2.25	2.48	1.9	-
S. Em. ±	0.23	0.21	0.24	0.22	0.23	0.24	-
C. D. @ 1% level	0.67**	0.60**	NS	0.64*	0.65*	0.68*	-

Note: Mean ± S.D; C.D – Critical Difference; S. Em. ± Standard Error mean; * Significant at 0.05 percent level; ** Significant at 0.01 percent level; NS- Non significant; Different superscript within a column indicate significant difference at 0.05 level by DMRT

Sensory characteristics of carrots was evaluated by subjecting to different cooking methods *viz.*, boiling and sauteing. Acceptability of boiled and sauted carrot germplasms are presented in Table 5. There was significant difference observed in the mean values for appearance, colour, flavour, taste, texture and over all acceptability of boiled and sauted carrot germplasms. Sensory scores for overall acceptability of boiled and sauted carrot germplasms ranged from 6.60 – 8.40 and 6.60 – 7.80 respectively. Germpalsms *viz*. UHSBC64, UHSBC23-1 and UHSBC44-1 had high acceptability index in boiled and sauted carrots. However, germplasm UHSBC53 had higher scores only in boiled form and germplasm UHSBC101 had higher scores after sautéing. Acceptability of carrots is affected by appearance, colour, taste, flavour and texture. Germplasms UHSBC64 had higher scores for appearance and colour and germplasms UHSBC44-1 has got higher scores for flavour, taste and texture in boiled and sauted form. But germplasm UHSBC59 had lower scores for appearance, flavour, taste and texture in boiled and sauted carrot germplasms because of its yellow green colour and hard texture (Table 6). The differences noted in the appearance, colour, taste, flavour, texture and over all acceptability of boiled and sauted carrot germplasms may be attributed to genetic variability, physico-chemical properties and phenolic compounds present in the carrots.

The study on physico-chemical composition and acceptability of newer carrot germplasms showed that germpalsms UHSBC53, UHSBC64 and UHSBC23-1 were on par with local carrot variety and best in terms of physico-chemical composition and sensory characters.

References

Anonymous, 1998. Official methods of Analysis, Association of Official Analytical Chemists, 15th edition, Arlington, VA.

Bembem, K. and Sadana, B, 2014. Effect of different cooking methods on the antioxidant components of carrot. *J. Bio sci. Dicovery.*, 5(1):112-116.

Gajewski, M.,Szymczak, P., and Danilcenko, H, 2010. Changes of physical and chemical traits of roots of different carrot cultivars under cold store conditions. *J.Veg. Crop. Res.*, 72:115-127.

Hailu, S., Seyoum, T., and Dechassa N., 2008. Effect of combined application of organic P and inorganic N fertilizers on post harvest quality of carrot. *African. J. Biotech*.,

Karkleliene, R., Radzevicius, A. and Bobinas, C., 2009. Productivity and root crop quality of Lithuanian carrot breeder lines. J. *Proces. Latvian Acad. Sci*., 63:63-65.

Leja, M., Kaminska, I., Kramer, M., Kaul., Kammerer, D., Carle, R. and Baranski, R., 2013. The content of phenolic compound and radical scavenging activity varies with carrot origin and root colour. *J. Plant Foods Human Nutr.*, 68:163-170.

Lim, C., Kim, H., Lee, C., Kim, K., Back, K. and Martynenko, A., 2014. True particle and bulk density of shrinkabable biomaterials: evaluation from drying experiments. *J. Taylor Francis Group*, 32: 1313-1325.

Ranganna, S., 1986. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products*, 2nd edn., Tata McGraw-Hill Publishing Company Limited, New Delhi, pp. 9-10, 105-106.

Saha, S., Kalia, P., Kumar, S. and Sarkar, S., 2016. Breeding tropical carrots for enhanced nutrition and high temperature stress. *Indian J. Agri. Sci*., 86(7): 940-945.

Silva, E.,Vieira, M.,Amboni, R.,Amante, E. and Tiexeira, E, 2007. Chemical, physical

and sensory parameters of different carrot varieties. *J. Food Process. Eng*., 30:746-756.

Sink, N., Mikulic, P., Veberic, R. and Kacjan, N., 2017. Chemical composition and morphometric traits and yield of carrots grown in organic and integrated farming systems. *Turk. J. Agric*., 41: 452-462.

Utabo, E., Ekwu, L., Nwogbaga, A. and Nwanchor, K., 2015. Evaluating eco-friendly potting media on growth and yield of carrot varieties in Abakaliki, South Eastern Nigeria. *Int. J. Sci. Res*., 5 (7): 2319-7064.

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