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Preservation of Ready to Serve Blended Carrot and Kinnow (Mandarin) Drink by Ginger Extract

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Abstract

This study explore the effect of lemon and ginger extract on carrot and kinnow blended ready to serve (RTS) drinks during three months refrigeration temperature storage. The treatments were CKG0,CKG1,CKG2,CKG3,CKG4,CKG5 and CKG6 having 0.5 liter carrot juice, 0.5 liter kinnow juice, 1 g/kg CMC, 1 kg sugar, 5 liter water with variations in lemon and ginger extract in different levels. All the RTS samples were evaluated for total solids, moisture, ash, pH, reducing sugar, ascorbic acid, non-reducing sugar, titratble acidy, total soluble solids, total microbial count and sensory attribute (taste, colour, flavor and overall acceptability). Statistical analysis revealed that treatment as well as storage had significant ($p<0.05$) effect on physicochemical and sensory properties. Results showed that pH and sugar acid ration of the treated samples was decrease during storage. While TSS, acidity, reducing and non-reducing sugar and vitamin C increased were observed during storage. Generally this is observed from the results that CKG6 sample was more acceptable than RTS of the samples on the basis of physiochemically. On the other hand, in terms of taste and flavor CKG6 sample was highly acceptable, sample CKG3 had good color and over all acceptability. However, RTS drinks prepared from with carrot and kinnow blends (CKG6) is recommended for commercial use and for production on large scale.

Keywords: Ginger; Ready to serve beverage; Physico-chemical properties; Sensory properties; Microbial analysis

Introduction

Carrot (*Daucus carota*) is winter vegetable, production wise carrot ranked in third position. In Pakistan, carrot is produced 192000 metric tons annually in an area of 11000 hectars. Carrots are one of the rich sources of moisture, protein, carbohydrate, crude fiber and minerals.

Kinnow Mandarin (*Citrus reticulate*) is a citrus fruits having sweet taste, bright colour and appearance grown. Mandarin is an important fruit and contain vitamins mostly vitamin C, vitamin A, minerals such as iron, phosphorus and calcium and citric acid [1]. Citrus fruit juice contains highly ascorbic acid 60 to 70 mg which is good for body health. It is also contains antioxidants (vitamin C) and flavonoids which has healthier effect than dietary benefits.

Ginger has been widely used as spice and flavoring agents in foods and beverages. Ginger has been used as a spice for over 2000 years. The composition of raw ginger is water, Protein, carbohydrate, fiber and Ash. Ginger is used to obtain different extracts. It is a good source of polyphenol compounds and composed as other roots. Ginger used as an antioxidants and their extracts is used as anti tumor effects which caused due to Epstein-Barr virus or applied against cancer.

This is quite challenging to prepare RTS beverage without the addition of chemical preservatives. The aim of study is to develop an acceptable quality RTS by blending carrot, kinnow, lemon juices and with addition of ginger extract to determine the most suitable concentration of lemon juice and ginger extract for the commercial preparation of RTS beverage with longer shelf life. This study also aimed to formulate carrot and kinnow blend RTS beverage to take advantage of both fruits which are nutritionally diverse and have synergetic effect when consume simultaneously. Citrus fruits are considered to be the rich source of ascorbic acid, pectin, carotenes, citric acid, and minerals like calcium and phosphorous. Carrots contain high levels of carbohydrates and ß-carotene. Keeping in view the nutritional and medicinal importance of ginger, the treatments has been formulated with a unique formulation.

Objectives

- To produce value added ready to serve beverage from various blends of carrot, kinnow and lemon.
- To develop suitable combination of carrot, kinnow and lemon RTS juice.
- To study the effect of ginger extract as an alternate of chemical preservative in prepared RTS juice.
- To study physicochemical and organoleptic properties of blended carrot and kinnow RTS juice.

Methods and Materials

This study was carried out in Agriculture research institute (ARI), Tarnab and Department of Food Science and Technology laboratories. Carrot, kinnow, lemon and ginger were purchased from the local market at Tarnab, Peshawar and brought to the laboratory of ARI Tarnab, Peshawar for preparation of ready to serve drinks.

Preparation of ready to serve drink (RTS)

The carrots were peeled and then heated in water having temperature up to 90-95°C for 25-30 minutes in order to soften the pulp. The boiled carrot was put in the pulping machine (Pulper juicing machine made in Jiangsu China) to get the pulp. The pulp was passed through muslin cloth in order to get clear juice. The kinnow were cut into two equal halves and the juice was extracted through juice

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extractor. Then juice was passed through muslin cloth to separate juice from pulp. The lemon were cut into two equal halves and the juice was extracted manually and filtered through muslin cloth to remove debris and unwanted materials. Ginger were peeled and cut into small pieces then crushed and juice was extracted with the help of blender and filtered from muslin cloth to separate juice from pulp. Ready to serve drinks were prepared in three replications from carrot, kinnow and lemon juice. All the juices were mixed in water along with other ingredients namely; sugar, CMC (used as a viscosity modifier or thickener, dissolves rapidly in cold or hot water and stabilize emulsions in various products these properties and functions make it suitable for use in a broad range of applications in the food) and ginger extract (Table 1).

Physicochemical analysis

pH, Total Soluble Solids, Total Titratble Acidity, Sugar acid ratio, Ascorbic acid Reducing and Non reducing sugars were determined by the standard method of AOAC [2].

Sensory evaluation

The sensory evaluation for taste, flavor, color and overall acceptability should be conducted by using nine hedonic [3].

Microbial study

The sample will be analyzed for the total fungal by total plate count (TPC) method as described by Kumar et al. [4].

Statistical analysis

Statistically the data was analyzed by using CRD with two factors (treatment and storage) and mean were separated by LSD test at 0.05% significant level [5].

Result and Discussion

pH

Table 2 shows the impact of storage and treatments on pH of value added ready to serve drinks prepared from blend of carrot, kinniow and ginger. Statistically both storage and treatments had significant ($p<0.05$) effect on pH of ready to serve drinks. This was observed from the data that pH of the treated sample were in range of 3.5 (CKG_6) to 3.91 (CKG_4) on zero day of storage, which decrease upto3.37 (CKG_6) 3.76 (CKG_4) after 90 days of storage. Highest mean pH (3.83) was observed for treatment CKG_4, while the lowest mean pH (3.56) was observed for control sample. In term of storage maximum mean pH (3.69) was noticed at zero day of storage while minimum mean pH (3.54) was recorded after 90 days of storage prepared RTS. However higher pH decrease was found in sample CGG_0 (4.44%) while lower pH was observed in CKG_6 (3.71%). The degradation of reducing sugar and formation of acidic compounds from it causes a decline in pH (Zia).

Treatments	Carrot juice	Kinnow juice	CMC	Sugar	Water	Ginger extract	Lemon juice
CKG0(control)	0.5 L	0.5 L	1 g/kg	1 kg	5 L		
CKG1	0.5 L	0.5 L	1 g/kg	1 kg	5 L		50 ml
CKG2	0.5 L	0.5 L	1 g/kg	1 kg	5 L	10 ml	
CKG3	0.5 L	0.5 L	1 g/kg	1 kg	5 L	10 ml	50 ml
CKG4	0.5 L	0.5 L	1 g/kg	1 kg	5 L		80 ml
CKG5	0.5 L	0.5 L	1 g/kg	1 kg	5 L	20 ml	
CKG6	0.5 L	0.5 L	1 g/kg	1 kg	5 L	20 ml	80 ml

Table 1: Proposes study plan, shows the ratios of different ingredients for ready to serve drinks.

Treatment	Storage Intervals				% decrease	Means
	0	30	60	90		
CKG_0	3.6	3.55	3.49	3.44	4.44	3.52f
CKG_1	3.8	3.75	3.69	3.65	3.95	3.72b
CKG_2	3.7	3.65	3.6	3.54	4.32	3.62d
CKG_3	3.71	3.65	3.6	3.57	3.77	3.63c
CKG_4	3.91	3.86	3.8	3.76	3.84	3.83a
CKG_5	3.63	3.58	3.53	3.48	4.13	3.56e
CKG_6	3.5	3.46	3.41	3.37	3.71	3.44g
Means	3.69a	3.64b	3.59c	3.54d		

Figures having different small letters shows significant difference ($p<0.05$)

Table 2: Effect of ginger extract on the pH of carrot and kinnow ready to serve beverage.

Treatment	Storage Intervals				% decrease	Means
	0	30	60	90		
CKG_0	15.5	15.9	16.4	16.9	8.28	16.17a
CKG_1	15.5	15.9	16.4	16.8	7.74	16.15a
CKG_2	15.6	16	16.5	17	8.24	16.27a
CKG_3	15.4	15.7	16.2	16.6	7.23	15.97b
CKG_4	15.6	15.9	16.5	16.9	7.69	16.22a
CKG_5	15.3	15.8	16.2	16.6	7.83	15.97b
CKG_6	15.4	15.7	15.9	16.3	5.52	15.82c
Means	15.47d	15.84c	16.30b	16.72a		

Figures having different small letters shows significant difference ($p<0.05$)

Table 3: Effect of ginger extract on the TSS (0Brix) of carrot and kinnow ready to serve beverage.

Similarly, decreased was observed in pH of ginger and kinnow squash during storage. The pH has got importance to maintain shelf stability and it can also influence the flavor of ready to serve beverage [6].

Total soluble solids (TSS)

The impact of storage and treatments on Total soluble solids TSS of value added ready to serve drinks prepared from blend of carrot, kinnow and ginger stored at refrigeration temperature presented in Table 3. Statistically both storage and treatments had significant ($p<0.05$) effect on TSS of ready to serve drinks. This is observed from the data that TSS of the treated sample were in range of 15.3 (CKG_5) to 15.6 (CKG_2 and CKG_4) on zero day of storage, which increase up to 16.3 (CKG_6) to 17 (CKG_2) after 90 days of storage. Highest mean TSS (3.83) was observed for treatment CKG_4, while the lowest mean TSS (3.56) was observed for control sample. In term of storage maximum mean TSS (16.72) was noticed at 90 day of storage , while minimum mean TSS (15.47) was recorded at day first of storage prepared RTS. However higher TSS increase was found in sample CGG_0 (8.82%) while lower TSS was observed in CKG_6 (5.52%). Polysaccharides conversion into sugars during hydrolysis processes might be the reason for increase in TSS. Similarly, Sarolia and Mukherjee, Mehta and Bajaj, Bhardwaj and Mukherjee [7] reported that TSS increased during processing and storage of mandarin juice. This might be due to ginger juice inhibit microbial growth and subsequently reducing metabolic rate.

Acidity

Table 4 shows the impact of storage and treatments on acidity of value added ready to serve drinks made from blend of carrot, kinnow and ginger. Statistically both storage and treatments had significant ($p<0.05$) effect on acidity of ready to serve drinks. Similarly to TSS, acidity of prepared treated RTS drinks was increased during three months of storage from 0.45-0.5% CKG_4 and CKG_3 to 0.59% CKG_5

Treatment	Storage Intervals				% decrease	Means
	0	30	60	90		
CKG_0	0.47	0.52	0.58	0.63	25.40	0.55c
CKG_1	0.47	0.52	0.57	0.62	24.19	0.54c
CKG_2	0.48	0.53	0.59	0.64	25.00	0.56b
CKG_3	0.5	0.55	0.61	0.65	23.08	0.57a
CKG_4	0.45	0.49	0.55	0.59	23.73	0.52d
CKG_5	0.49	0.55	0.6	0.65	24.62	0.57a
CKG_6	0.46	0.5	0.55	0.59	22.03	0.52d
Means	0.47d	0.52c	0.57b	0.62a		

Figures having different small letters shows significant difference (p<0.05)

Table 4: Effect of ginger extract on the acidity of carrot and kinnow ready to serve beverage.

Treatment	Storage Intervals				% decrease	Means
	0	30	60	90		
CKG_0	32.29	30	27.79	26.25	18.71	29.08c
CKG_1	32.76	30.19	28.42	26.77	18.28	29.53b
CKG_2	32.97	30.57	28.27	26.82	18.65	29.65b
CKG_3	34.66	32.44	30	28.64	17.37	31.43a
CKG_4	31.22	28.72	27	25.53	18.23	28.11d
CKG_5	30.8	28.54	26.06	25.07	18.60	27.61e
CKG_6	33.69	32	30	28.81	14.49	31.12a
Means	32.62a	30.35b	28.22c	26.84d		

Figures having different small letters shows significant difference (p<0.05)

Table 5: Effect of ginger extract on the sugar acid ratio of carrot and kinnow ready to serve beverage.

and CKG_6, respectively. Highest mean acidity (0.57) was observed for treatment CKG_3 and CKG_5, while the lowest mean acidity (0.52) was observed at sample CKG_4. In term of storage maximum mean acidity (0.62) was noticed at 90 day of storage, while minimum mean acidity (0.47) was recorded at day first of storage prepared RTS. However, higher increase in acidity was found in sample CGG_0 (25.40%) while lower acidity was observed in CKG_6 (23.03%). The results are similar to the previous study which showed increase in acidity during storage which might be effected by the presence of microorganisms and sugar degradation [7]. Conclusively, acidity is an important characteristic which effect on the flavor and overall acceptability of juice.

Sugar acid ratio

The effect of storage and treatments on sugar acid ratio of value added ready to serve drinks prepared from blend of carrot, kinniow and ginger stored at refrigeration temperature was presented at Table 5. Statistically both storage and treatments had significant (p<0.05) effect on acidity of ready to serve drinks. This was observed from the data that sugar acid ratio of the treated sample were in range of 30.8 (CKG_5) to 34.66 (CKG_3) on zero day of storage, which decrease up to 25.07 (CKG_5) 25.82 (CKG_2) during 90 days of storage. In sugar acid ratio highest mean (31.43) was observed for treatment CKG_3, while the lowest mean sugar acid ratio (27.61) was observed for control sample. In term of storage maximum mean sugar acid ratio (32.62) was noticed at zero day of storage, while minimum mean sugar acid ratio (26.84) was recorded after 90 days of storage prepared RTS. However higher sugar acid ratio decrease was found in sample CGG_0 (18.71%) while lower sugar acid ratio was observed in CKG_6 (14.49%). The same result were found by Asad and Durrani [8] who concluded decreasing of sugar acid ratio during the storage of apple pulp.

Reducing sugar

Table 6 shows the effect of storage and treatments on reducing sugar of value added ready to serve drinks prepared from blend of carrot, kinnow and ginger. Statistically both storage and treatments had significant (p<0.05) effect on reducing sugar of ready to serve drinks. This was observed from the data that reducing sugar of the treated sample were in range of 12.62 (CKG_2) to 15.58 (CKG_2) on zero day of storage, which decrease up to 12.9 (CKG_0) to 15.73 (CKG_1) after 90 days of storage. Highest mean reducing sugar (15.65) was observed for treatment CKG_1, while the lowest mean reducing sugar (12.68) was observed at CKG_1. In term of storage maximum mean reducing sugar (14.10) was recorded after 90 days of storage, while minimum mean reducing sugar (13.96) was noticed at zero day storage prepared RTS. However, higher reducing sugar was found in sample CGG_0 (1.40%) while lower sugar acid ratio was observed in CKG_6 (0.87%). The results are parallel to result of Babsky et al. [9], Pruthi et al., [10]; Tripathi et al., [11] Attri et al., [12] which studied raise in reducing sugar of juice in storage duration, which might be influenced by the conversion of non-reducing sugar (sucrose).

Non reducing sugar

The impact of storage and treatments on non-reducing sugar of value added ready to serve drinks prepared from blend of carrot, kinnow and ginger stored at refrigeration temperature was presented in Table 7. Statistically both storage and treatments had significant (p<0.05) effect on non-reducing sugar of ready to serve drinks. This was observed from the data that non reducing sugar of the treated sample were in range of 4.87 (CKG_5) to 7.79 (CKG_4) on zero day of storage, which decrease up to 4.75 (CKG_5) to 7.64 (CKG_4) after 90 days of storage. Highest mean non reducing sugar (7.71) was observed for treatment CKG_4, while the lowest mean non reducing sugar (4.80) was observed at CKG_0. In term of storage maximum mean non reducing sugar (6.12) noticed at zero day of storage, while minimum (5.98) mean non reducing sugar recorded after 90 days of storage prepared

Treatment	Storage Intervals				% decrease	Means
	0	30	60	90		
CKG_0	12.72	12.8	12.84	12.9	1.40	12.81f
CKG_1	15.58	15.63	15.68	15.73	0.95	15.65a
CKG_2	12.62	12.66	12.71	12.75	1.02	12.68g
CKG_3	14.55	14.58	14.63	14.68	0.89	14.61c
CKG_4	13.65	13.69	13.75	13.78	0.94	13.71e
CKG_5	13.81	13.86	13.91	13.95	1.00	13.88d
CKG_6	14.78	14.83	14.87	14.91	0.87	14.84b
Means	13.96d	14.00c	14.05b	14.10a		

Figures having different small letters shows significant difference (p<0.05)

Table 6: Effect of ginger extract on the reducing of carrot and kinnow ready to serve beverage.

Treatment	Storage Intervals				% decrease	Means
	0	30	60	90		
CKG_0	4.88	4.83	4.77	4.73	3.07	4.80f
CKG_1	5.78	5.73	5.68	5.65	2.25	5.71d
CKG_2	5.66	5.61	5.57	5.51	2.65	5.58e
CKG_3	6.9	6.86	6.83	6.77	1.88	6.84c
CKG_4	7.79	7.74	7.68	7.64	1.93	7.71a
CKG_5	4.87	4.84	4.78	4.75	2.46	4.81f
CKG_6	6.97	6.93	6.88	6.85	1.72	6.90b
Means	6.12a	6.07b	6.02c	5.98d		

Figures having different small letters shows significant difference (p<0.05)

Table 7: Effect of ginger extract on the non reducing sugar of carrot and kinnow ready to serve beverage.

RTS. However higher non reducing sugar was found in sample CGG_0 (3.07%) while lower non reducing sugar was observed in CKG_6 (1.72%). Pruthi et al., [10] suggested that the decrease in non-reducing sugar might be due to conversion of non-reducing sugar into reducing sugar during their study on Kinnow and Malta juice. Similar decline in non-reducing sugar were also observed in sugar contents, of pasteurized yellow passion fruit juice during storage during his study.

Vitamin C

Table 8 shows the effect of storage and treatments on vitamin C of value added ready to serve drinks prepared from blend of carrot, kinnow and ginger. Statistically both storage and treatments had significant ($p<0.05$) effect on vitamin C of ready to serve drinks. Differences in ascorbic acid contents were noticed in various treatments. This was observed from the data that vitamin-C of the treated sample were in range of 25.23 (CKG_0) to 28.34 (CKG_5) on zero day of storage, which decreased to 25.09 (CKG_0) to 27.19 (CKG_5) after 90 days of storage. Highest mean vitamin C (28.26) was observed for treatment CKG_5, while the lowest mean non vitamin C (25.15) was observed at CKG_0. In term of storage maximum mean vitamin-C (26.84) noticed at zero day of storage, while minimum (26.70) mean vitamin-C recorded after 90 days of storage prepared RTS. However higher vitamin-C was found in sample CGG_0 (0.55%) while lower vitamin C was observed in CKG_6 (0.45%). Decline trend in ascorbic acid contents was reported during changes in Aonla pulp under different storage conditions [13]. Ascorbic acid content in orange squashes reduced dueto exposure to light. The degradation of vitamin C in RTS may pursue anaerobic and aerobic pathways [14].

Taste

Table 9 shows the effect of storage and treatments on taste of value added ready to serve drinks prepared from blend of carrot, kinnow and ginger. Statistically both storage and treatments had significant ($p<0.05$) effect on taste of ready to serve drinks. Taste is very important factor in organoleptic evaluation after color and texture. This was observed from the data that taste of the treated sample were in range of 8 (CKG_5) to 8.6 (CKG_3) on zero day of storage, which decrease up to 6.5 (CKG_5) to 7.9 (CKG_3) after 90 days of storage. Highest mean taste (8.25) was observed for treatment CKG_3, while the lowest mean taste (7.30) was observed at CKG_5. In term of storage maximum mean taste (8.34) noticed at zero day of storage, while minimum (7.05) mean taste recorded after 90 days of storage prepared RTS. However higher taste was found in sample CGG_0 (19.28%) while lower taste was observed in CKG_3 (8.14%). Loss in the taste of kinnow anola juice was reported due to changes in volatile compounds throughout storage [15]. The difference in taste might be due to in stored products. Similarly, loss in taste of juice was observed by Jain and Khurdiya, Jain et al., [16] during their study on physiochemical and sensory properties of orange drink.

Treatment	Storage Intervals				% decrease	Means
	0	30	60	90		
CKG_0	25.23	25.18	25.13	25.09	0.55	25.15g
CKG_1	26.88	26.83	26.79	26.74	0.52	26.81d
CKG_2	27.58	27.53	27.49	27.43	0.54	27.50b
CKG_3	25.99	25.96	25.91	25.87	0.46	25.93f
CKG_4	27.22	27.18	27.13	27.08	0.51	27.15c
CKG_5	28.34	28.29	28.24	28.19	0.53	28.26a
CKG_6	26.66	26.61	26.57	26.54	0.45	26.59e
Means	26.84a	26.79b	26.75c	26.70d		

Figures having different small letters shows significant difference ($p<0.05$)

Table 8: Effect of ginger extract on the vitamin-c of carrot and kinnow ready to serve beverage.

Treatment	Storage Intervals				% decrease	Means
	0	30	60	90		
CKG_0	8.3	7.8	7.3	6.7	19.28	7.52d
CKG_1	8.4	7.9	7.4	7	16.67	7.67cd
CKG_2	8.2	7.7	7.4	6.9	15.85	7.55d
CKG_3	8.6	8.4	8.1	7.9	8.14	8.25a
CKG_4	8.4	8	7.5	7.1	15.48	7.75b
CKG_5	8	7.6	7.1	6.5	18.75	7.30e
CKG_6	8.5	8.2	7.8	7.3	14.12	7.95b
Means	8.34a	7.94b	7.51c	7.05d		

Figures having different small letters shows significant difference ($p<0.05$)

Table 9: Effect of ginger extract on the taste of carrot and kinnow ready to serve beverage.

Color

The effect of storage and treatments on color of value added ready to serve drinks prepared from blend of carrot, kinnow and ginger stored at refrigeration temperature was presented in Table 10. Statistically both storage and treatments had significant ($p<0.05$) effect on color of ready to serve drinks. This was observed from the data that color of the treated sample were in the range of 8.1 (CKG_2) to 8.6 (CKG_6) on zero day of storage, which decreases up to (6) at CKG_0 to (6.8) at CKG_5 after 90 days of storage. Highest mean color (8.25) was observed for treatment CKG_6, while the lowest mean color (7.40) was observed at CKG_0. In term of storage maximum mean color (8.35) was recorded after at first day of storage, while minimum mean color (7.17) was noticed at 90 days storage prepared RTS. However higher decrease in color was found in sample CGG_0 (27.71%) while lower decrease in color was observed in CKG_6 (8.14%). Millard reaction was accelerated throughout storage which resulted in loss of color of carrot and kinnow RTS. Loss of color in beverage during storage of 2-Methyl-3-furanthiol and methanol are possible off-flavors in stored orange juice were [17]. Ascorbic acid retention in orange squashes as related to exposure to light and container types well as action of acids present in RTS beverage.

Treatment	Storage Intervals				% decrease	Means
	0	30	60	90		
CKG_0	8.3	7.9	7.4	6	27.71	7.40d
CKG_1	8.4	8	7.7	7.3	13.10	7.85bc
CKG_2	8.1	7.7	7.3	7	13.58	7.52cd
CKG_3	8.5	8.3	8	7.7	9.41	8.12ab
CKG_4	8.4	8.1	7.9	7.5	10.71	7.97ab
CKG_5	8.2	7.8	7.3	6.8	17.07	7.52cd
CKG_6	8.6	8.4	8.1	7.9	8.14	8.25a
Means	8.35a	8.02b	7.67c	7.17d		

Figures having different small letters shows significant difference ($p<0.05$)

Table 10: Effect of ginger extract on the color of carrot and kinnow ready to serve beverage.

Flavor

Table 11 shows the effect of storage and treatments on flavor of value added ready to serve drinks prepared from blend of carrot, kinnow and ginger. Statistically both storage and treatments had significant ($p<0.05$) effect on flavor of ready to serve drinks. This was observed from the data that flavor of the treated sample were in range of 8.1 (CKG_4) to 8.5 (CKG_3) on zero day of storage, which decrease up to 6.7 (CKG_0) to 7.7 (CKG_3) after 90 days of storage. Highest mean

Treatment	Storage Intervals				% decrease	Means
	0	30	60	90		
CKG_0	8.2	7.8	7.3	6.7	18.29	7.50d
CKG_1	8.3	7.9	7.5	7	15.66	7.67cd
CKG_2	8.4	8.1	7.7	7.2	14.29	7.85bc
CKG_3	8.5	8.3	8	7.7	9.41	8.12a
CKG_4	8.1	7.7	7.4	7	13.58	7.55d
CKG_5	8.3	7.7	7.3	6.8	18.07	7.52d
CKG_6	8.4	8.1	7.9	7.6	9.52	8.00ab
Means	8.31a	7.94b	7.58c	7.14d		

Figures having different small letters shows significant difference ($p<0.05$)

Table 11: Effect of ginger extract on the flavor of carrot and kinnow ready to serve beverage.

Treatment	Storage Intervals				% decrease	Means
	0	30	60	90		
CKG_0	8.1	7.7	7.4	6	25.93	7.30c
CKG_1	8.3	7.9	7.6	7.2	13.25	7.75b
CKG_2	8.2	7.9	7.5	7.1	13.41	7.67b
CKG_3	8.3	8	7.6	7.3	12.05	7.80b
CKG_4	8.1	7.8	7.4	7.1	12.35	7.60b
CKG_5	8.4	8.1	7.7	7.2	14.29	7.85ab
CKG_6	8.5	8.3	8	7.6	10.59	8.10a
Means	8.27a	7.95b	7.60c	7.07d		

Figures having different small letters shows significant difference ($p<0.05$)

Table 12: Effect of ginger extract on the overall acceptability of carrot and kinnow ready to serve beverage.

flavor (8.12) was observed for treatment CKG_3, while the lowest mean flavor (6.7) was observed at CKG_5. In term of storage maximum mean flavor (8.31) noticed at zero day of storage, while minimum (7.14) mean taste recorded after 90 days of storage prepared RTS. However higher flavor was found in sample CGG_0 (18.29%) while lower flavor was observed in CKG_3 (9.41%). Off flavour was reported due to changes in volatile compounds of kinnow anola beverages. The difference in flavor might be due to storage conditions and storage time. Similar observation during research on physiochemical and sensory properties of orange drink were also noticed by Jain et al., [16]. A decrease in flavor during storage study on 2-Methyl-3-furanthiol and methional in stored orange juice of beverage was also reported by Bezman [17].

Overall acceptability

The impact of storage and treatments on overall acceptability of value added ready to serve drinks prepared from blend of carrot, kinnow and ginger stored at refrigeration temperature was presented in Table 12. Statistically both storage and treatments had significant ($p<0.05$) effect on overall acceptability of ready to serve drinks. This was observed from the data that Overall acceptability of the treated sample were in the range of 8.1 (CKG_0 and CKG_4) to 8.5 (CKG_6) on zero day of storage, which decreases up to (6) at CKG_0 to (7.6) at CKG_6 after 90 days of storage. Highest mean over all acceptability (8.10) was observed for treatment CKG_6, while the lowest mean overall acceptability (7.30) was observed at CKG_0. In term of storage maximum mean overall acceptability (8.27) noticed at zero day of storage, while minimum (7.07) mean overall acceptability recorded after 90 days of storage prepared RTS. However higher overall acceptability was found in sample CGG_0 (25.93%) while lower overall acceptability was observed in CKG_6 (10.59%). These results are in agreement with result showed by Rosario [18], who observed decline in overall acceptability is due to increase in storage interval which leads to progressive degradation. Loss of overall acceptability in orange juice might be due to processing conditions like, temperature and storage time.

Conclusion and Recommendation

Carrot and kinnow RTS was prepared in this research, Study concluded that the ginger can be effectively used in different proportions as natural antioxidant and alternative source of chemical preservatives for inhibition of microbial growth in carrot and kinnow RTS. Ready to serve beverage was packed in glass bottles, stored at –refrigeration temperature and for three months. The products were studied for physic-chemical and sensory evaluations at the interval of 30 days. On the basis of result obtained it is concluded that treatments CKG_6 and CKG_3 were best treatments having best keeping quality during storage and can be used in commercialization of carrot and kinnow RTS. Some changes were noticed in physiochemical characteristics but these changes did not influence the product considerably. The sensory parameters decrease slightly but remains in acceptable range during storage period.

Recommendations

- Further research work should be done on various proportions of ginger.
- The present research work was conducted at refrigeration temperature, so this research work should also be carried out in other storage conditions.
- Same proportions of ginger can also be used in other RTS beverages.

Other natural anti oxidant can also be used in carrot and kinnow RTS.

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