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Effect of natural preservative (Ginger extract) on the over quality of carrot and kinnow blended jam

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Abstract
The present study explores the effect of lemon and ginger extract on carrot and kinnow mixed jam during 90 days of storage. The treatments were KCG_0, KCG_1, KCG_2, KCG_3, KCG_4 and KCG_5 having carrot pulp and kinnow juice at ratio of (7:3), 750g sugar, 10ml lemon juice with variations in ginger extract in different levels. All the mixed carrot and kinnow jam samples were eximned physico-chemically (pH, total soluble solids, titratable acidy, Vitamin-C, reducing and non-reducing sugar) and sensory attribute (colour, flavor, texture 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, vitamin-C, non-reducing sugar of the treated samples was decrease during storage. While TSS, acidity and reducing sugar increased were observed during storage. Generally it was observed from results that KCG_5 sample was more acceptable than carrot and kinnow mixed jam samples on the basis of physiochemically and sensory evaluation. Hence, mixed jam prepared from carrot and kinnow blends (KCG_5) is recommended for commercial use and for production on large scale.

Keywords: natural preservative, ginger extract, blended jam

Introduction
Carrot (*Daucus carota* L) contains a high amount of carbohydrates (sugars) and ß-carotene (Vitamin A). In Pakistan about 11,000 hectares of area were covered with the cultivation of carrots which produced about 192000 metric tons every year (Anjum and Amjad 2002) [5]. Carrot have high moisture level from 86 to 89% (Gill and Kataria 1974) [17]. Carbohydrates and minerals are likely found in carrots which are in the form of Ca, p, Fe and Mg. It has been proved that carrots are fulfill with protein, minerals, crude fiber and carbohydrates (Gopalan *et al*., 1991; Holland *et al*., 1991). All over the world carrots are used is an important vegetable which is good for health. Carrot is flashy roots which are commonly used as salad in raw form also used in vegetables dishes in boiled or steamed form (Amjad *et al*., 2005).

Kinnow Mandarin (*Citrus reticulata*) is belong to citrus fruits which is one of the most important fruit in Pakistan cultivated absolutely in many places of Khyber Pakhtunkhwa and Punjab province. Kinnow have very attractive color with sweet taste and flavor. Punjab province is adjustable climate for the production of Kinnow mandarin which give 95% production of citrus fruit in Pakistan (Anon, 2008). In Pakistan 199.5 thousand hectares areas were covered with the cultivation of kinnow and produce 22943.3 thousand tons of kinnow in which Khyber Pakhtunkhwa, contribution is 30.7 metric tons (Agri. Stat. Pak., 2011-2012).

Kinnow have a burden of vitamins like vitamin A and vitamin C, carotenes, citric acid and pectin and minerals like calcium, iron and phosphorus (Mubeen Ahmed *et al*., 2008). For the maintaining of collagen production the important nutrient which is very necessary is Vitamin C, collagen is a protein which is the main constituent which holds the body structure together, give support to the muscle, teeth, bones, skeletal system and also keep the skin smooth (Koop, 1989). Citrus fruit juice is composed of ascorbic acid content and mineral. Polyphenolic antioxidants, carotenoids and ascorbic acid is found in kinnow peel in a larg amount (Anwar *et al*., 2008). The use of this fruit is vary in so many product which is very necessary for health like it is used in diet and ready to serve drink. Citrus drinks are used probably in all fruit drinks (Nchez *et al*., 2003; Gorinstein *et al*., 2004) [26, 16].

Mostly Kinnow as used fresh fruit all the time, due to its high neutrative value it must preserved and also processed for different product like jellies, marmalades, for jam making and specially for ready to serve juice drinks (Hussain, 1997).

Lemon (*Citrus limon*) stand on the third position in citrus species because its important after orange and kinnow. Limon production is about 4.4 million tons (FAO. 2003) [12]. Italy, Spain, Greece and California are the most popular subtropic region where lemon give more production (Codd *et al.*, 1972) [7]. The most used of lemon are in teas, in fruit juices, as a flowering agent and also used as antioxidant for most food product (Codd *et al.*, 1972) [7]. To formulate healther product which is newly made like beef burger, bologna and dry cured sausage, due to high contact of dietary fiber the uses of lemon is so much.

Since 2000 years Ginger was used in many foods as a spices. Ginger is used as antioxidant because of its polyphenols compound in the roots and also contain (gingerol and its derivatives), which have a high antioxidant activity (Herrmann, 1994). Water, Protein, CHO, Fibre and Ash are in the composition of raw Ginger. Ginger give various types of extract. Polyphenol compounds are present in CO_2 extract which show closest composition to roots. The use of ginger is so much beneficial for human health and its antioxidant characterization are present their application to commercial ginger preparation. Ginger extract have anti-tumor effects on certain cells which is infected with the special type of viruses called Epstein-Barr virus (Vimala *et al.*, 2000) and also have antioxidant effects which could lead applications against many types of cancer.

Fruit which are more perishable are only available in season only and most of the fruit are surpluses in another part of year and also in different region. Perishable fruits wasted in the session due to lake of facilities like due to proper handling, distribution, marketing and storage. Perishable fruit in there session become scare due abundance in the market (Agarwal *et al.*, 2005) [3]. Moderan storage facilities is less (30-40%) that's why fruit processing is very necessary. Due to spoilage more crop destroy (Singh *et al.*, 1994) [36].

Jam is a semi solid mixture formed when pure cooked with sugar fruit. Through boiling fruit pulp with relative amount of sugar make the jam is intermediate moisture food. Other ingredient like pectin, acids, and many others like (preservative agent, flavoring agent and colouring materials) have a thicker reliability, and give enough firmness to the fruits tissues to hold it in a good position. The ended jam have a TSS(total soluble solids) upto 68% while the codex Aliment Arius Commission says that the TSS (total soluble solids) of the ended jam must be upto 65% (Baker *et al.*, 2005) the important product which have high amount of total solid like, jellies, jam and marmalade are processed and manufactured in the industries. Obviously single fruit jam is also prepared and jam is also formed from the combination of two different fruit mixture (Manay *et al.*, 2005) [24].

The contribution of Sugar in the final product weight is more than 40%. The sugar effect is the essential properties of the jam and also effect the stability of the final products. The sugar possibly make the pectin gelatinization and give good appearance to the final product body. The sugar acts as a dehydrating agent, and also permit the contact between the molecules and reduce the water activity upto 0.8, so the chance of occurrence of spoilage organism in the jam does not exist (Hyvonen and Torma, 1983) [20].

Citric acid is so much important for making of jam and jelly which is used in correct balance in the products. Lemon juice and lime are high amount of citric acid and is used in jam making instead of citric acid usage (Desrosier and Desrosier, 1978) [8].

Objectives

1. The present aim of research work is the preservation of carrot and kinnow Jam by Ginger extract (natural preservative).
2. To analyze the organoleptic and physicochemical characteristics i.e. pH, TSS, sugar acid value, % acidity, total sugar (reducing, non-reducing) of the samples for 3 months storage, after 15 days of interval.

Methods and Materials

The research work was carried out in the laboratory of food science and technology department agriculture university Peshawar. All the products that were used in the research work are carrot, kinnow, lemon and ginger were purchased from the local market at Peshawar and was brought to the laboratory of food science and technology Department University of agriculture Peshawar.

Preparation of sample

The carrot were peeled and then heated in water in order to soften the pulp. The boiled carrot were put in the pulping machine to get the pulp. The kinnow were cut into two equal halves and the juice was extracted through juice extractor. The lemon were cut into two equal halves and the juice were extract manually. Ginger were peeled, cut into small pieces, crushed and then its juice was extracted through juicer machine. For preparation of carrot, kinnow mixed jam the lemon extracts were mixed and kept on fire, TSS were continuously checked throughout with hand refractometer until it's brix reaches to 65, for each treatment specific amount of Ginger extract were used to study its preservation effect.

Proposed plan of the study

Carrot and kinnow blended jam were prepared with following different ratio.

Treatments	Carrot Pulp: Kinnow Juice	Sugar	Lemon juice	Ginger extract
T0 (control)	7:3	750 g	--------	-------
T1	7:3	750 g	10ml	5 ml
T2	7:3	750 g	10 ml	10 ml
T3	7:3	750 g	10 ml	15 ml
T4	7:3	750 g	10 ml	20 ml
T5	7:3	750 g	10 ml	25 ml

Packaging and storage of carrot kinnow blended jam

Carrot and kinnow blended jam were packed in sterilized 550 g glass jar. All the Samples were analyzed for physicochemical and sensory analysis. The samples were analyzed after fifteen days of intervals for three months of storage.

Physicochemical analysis

Samples were analyzed for physicochemical properties i.e. pH, TSS, Acidity, Reducing sugar, Non-reducing sugar and

Ascorbic acid by the method of Association of Analytical Communities (AOAC) 2012 [2].

Sensory evaluation

The sensory evaluation for taste, flavor, color and overall acceptability should be conducted by using nine hedonic scale of Larmond (1977). Sensory evaluation was carried out for total period of 3 months with 30 days of interval. All samples were presented to trained judges for comparison and for assigning score sample between one and nine (1-9), score 1 represent dislike extremely and 9 represent like extremely.

Result and Discussion

1. pH

Table-4.1 shows the effect of storage and treatments on pH of value added carrot, and kinnow blended Jam. Statistically both storage and treatments had significant (p<0.05) effect on pH of blended Jam. Initially the pH reading of samples (KC_0 to KC_5) was 3.59, 3.59, 3.75, 3.64, 3.63 and 3.56 which were decreased to 3.33, 3.35, 3.5, 3.41, 3.44 and 3.41 respectively during storage. The mean value of pH significantly (p<0.05) decreased from 3.62 to 3.40 during storage. For treatments maximum mean value of pH was recorded in sample CK_2 (3.63) followed by CK_4 (3.53) and minimum mean value was observed in sample CK_0 (3.46) followed by CK_1 (3.47). Maximum decrease in pH was recorded in sample CK_0 (7.24%) followed by CK_1 (6.69%) and minimum increase was observed in sample CK_5 (4.21%) followed by CK_4 (5.23%).

During storage intervals the increase in percent acidity of fruits jam is due to formation of acidic compounds which results in decrease of pH values of the product (Sogi and Singh, 2001) [38]. The previous literature also supporting the present finding as they have concluded decrease in the pH values of fruit jam during storage. (Shakir *et al*., 2007) [33]. Ehsan *et al*. (2002) [10] also investigated that pH value of watermelon jam decreased during storage interval. pH value of fruits is very important factor because it helps in the formation of optimum gel in jam preparation. In distinction, pH values of apricot and apple jam prepared and studied by Hussain and Shakir (2010) [19] investigated slightly higher than present study.

Table 4-1: pH

Treatment	Storage Intervals							% decrease	Means
	initial	1	2	3	4	5	6		
KC0	3.59	3.55	3.51	3.46	3.42	3.37	3.33	7.24	3.46d
KC1	3.59	3.56	3.52	3.48	3.44	3.4	3.35	6.69	3.47cd
KC2	3.75	3.71	3.68	3.63	3.59	3.55	3.5	6.67	3.63a
KC3	3.64	3.6	3.56	3.51	3.47	3.45	3.41	6.32	3.52b
KC4	3.63	3.6	3.56	3.54	3.5	3.46	3.44	5.23	3.53b
KC5	3.56	3.54	3.51	3.49	3.46	3.43	3.41	4.21	3.48c
Means	3.62a	3.59b	3.55c	3.51d	3.48e	3.44f	3.40g		

2. TSS

Table-4.2 shows the effect of storage and treatments on TSS of value added carrot, and kinnow blended Jam. Statistically both storage and treatments had significant (p<0.05) effect on TSS of blended Jam. Initially the TSS reading of samples (KC_0 to KC_5) was 67.1, 67.9, 67.4, 67.2, 67.7 and 67.5 which were increased to 75.1, 75.1, 71.9, 69.8, 69.4 and 68.8 respectively during storage. The mean value of TSS significantly (p<0.05) increased from 67.46 to 71.68 during storage. For treatments maximum mean value of TSS was recorded in sample CK_1 (71.12) followed by CK_0 (71.08) and minimum mean value was observed in sample CK_5 (68.07) followed by CK_4 (68.32). Maximum increase in TSS was recorded in sample CK_0 (10.65%) followed by CK_1 (9.59%) and minimum increase was observed in sample CK_5 (1.89%) followed by CK_4 (2.45%).

The increase in total soluble solids TSS might be due to hydrolysis of starch into simple sugar. Ehsan *et al*. (2002) [10] and Ehsan *et al*. (2003) [9] revealed increase in TSS values (70 to 70.8 ^{0}brix) in lemon jam and watermelon jam. The present findings are similar to Khan *et al*. (2012) [23] who observed increase from 66.5 to 68.8 ^{0}brix in total soluble solids TSS while his study on fruit jam. Similarly, Shakir *et al*. (2007) [33], also showed the same results who investigated an increases in total soluble solids TSS from (68.5-71.2 ^{0}brix) in pear apple mixed jam during 90 days of storage.

Table 4-2: TSS

Treatment	Storage Intervals							% increase	Means
	initial	1	2	3	4	5	6		
KC0	67.1	68.3	69.7	71.1	72.5	73.8	75.1	10.65	71.08a
KC1	67.9	68.8	69.9	70.8	72	73.4	75.1	9.59	71.12a
KC2	67.4	68	68.7	69.4	70.3	71.1	71.9	6.26	69.54b
KC3	67.2	67.5	67.9	68.2	68.7	69.2	69.8	3.72	68.35c
KC4	67.7	67.8	68	68.1	68.4	68.9	69.4	2.45	68.32c
KC5	67.5	67.6	67.8	68	68.3	68.5	68.8	1.89	68.07c
Means	67.46e	68.00e	68.66de	69.26cd	70.03bc	70.81ab	71.68a		

3. Acidity

Table-4.3 shows the effect of storage and treatments on Acidity of value added carrot, and kinnow blended Jam. Statistically both storage and treatments had significant (p<0.05) effect on Acidity of blended Jam. Initially the Acidity reading of samples (KC_0 to KC_5) was 0.62, 0.61, 0.62, 0.64, 0.66 and 0.65 which were increased to 1.09, 0.98, 0.83, 0.74, 0.75 and 0.71 respectively during storage. The mean value of Acidity significantly (p<0.05) increased from 0.63 to 0.85 during storage. For treatments maximum mean value of Acidity was recorded in sample CK_0 (0.84) followed by CK_1 (0.77) and minimum mean value was observed in sample CK_5 (0.67) followed by CK_4 (0.69). Maximum increase in Acidity was recorded in sample CK_0 (43.12%) followed by CK_1 (37.76%) and minimum increase was observed in sample CK_5 (8.45%) followed by CK_4 (12.00%).

The increase of acidity in fruit jam might be due to degradation of ascorbic acid (Vit-C) and hydrolysis of pectin. The increase in percent acidity of fruits jam may also be due to increase in total soluble solids TSS contents and breaking down of sugars of the samples (Sogi and Singh,

2001) [38]. The present findings is supporting by Ehsan *et al*. (2002) [10] who noticed an increase in percent acidity of jam throughout interval storage. Similarly Khan *et al*. (2012) [23] observed increase in percent acidity in strawberry jam from 0.68 to 0.86 percent also Shakir *et al*. (2007) [33] determined increase in percent acidity from 0.60 to 0.78% during storage of fruit jam. The present findings are also supported by Anjum *et al*. (2000), who noticed an increase in acidity of apricot jam from 0.65-0.70% during whole storage interval.

Table 4-3: Acidity

Treatment	Storage Intervals							% Increase	Means
	Initial	1	2	3	4	5	6		
KC0	0.62	0.69	0.76	0.83	0.90	0.99	1.09	43.12	0.84a
KC1	0.61	0.66	0.71	0.77	0.82	0.89	0.98	37.76	0.77ab
KC2	0.62	0.65	0.69	0.73	0.76	0.79	0.83	25.30	0.72bc
KC3	0.64	0.66	0.68	0.69	0.70	0.72	0.74	13.51	0.70c
KC4	0.66	0.67	0.68	0.70	0.72	0.74	0.75	12.00	0.69c
KC5	0.65	0.65	0.66	0.67	0.69	0.70	0.71	8.45	0.67c
Means	0.63e	0.663e	0.69cde	0.73cd	0.76bc	0.80ab	0.85a		

4. Vitamin-C

Table- 4.4 shows the effect of storage and treatments on Vitamin-C of value added carrot, and kinnow blended Jam. Statistically both storage and treatments had significant (p<0.05) effect on Vitamin-C of blended Jam. Initially the Vitamin-C reading of samples (KC0 to KC5) was 4.67, 6.71, 6.61, 4.69, 6.29 and 5.48 which were decreased to 3.67, 6.01, 5.97, 4.4, 5.94 and 5.39 respectively during storage. The mean value of Vitamin-C significantly (p<0.05) increased from 5.74 to 5.23 during storage. For treatments maximum mean value of Vitamin-C was recorded in sample CK1 (6.35) followed by CK2 (6.15) and minimum mean value was observed in sample CK0 (4.20) followed by CK3 (4.55). Maximum increase in Vitamin-C was recorded in sample CK0 (21.41%) followed by CK1 (10.43%) and minimum increase was observed in sample CK5 (1.64%) followed by CK4 (5.56%).

Ascorbic acid (Vit-C) is the most important factor for the quality of the product. Veltman *et al*., (2000) [43] revealed that Ascorbic acid (Vit-C) is considerably affected due to the oxidation during processing and storage also the lost of Vitamin-C content is caused by the effect of light in the storage environment. The same findings in the decrease of Ascorbic acid (Vit-C) were observed by Jawaheer *et al*. (2003) [22] during his experiment on fruit jam. Similarly Riaz *et al*., (1999) [29] also revealed that the Vitamin-C quantity of strawberry jam was significantly decreased from (18 mg/100g to 13 mg/100g) during whole storage interval.

Table 4-4: Vit-C

Treatment	Storage Intervals							% decrease	Means
	Initial	1	2	3	4	5	6		
KC0	4.67	4.53	4.36	4.21	4.12	3.86	3.67	21.41	4.20e
KC1	6.71	6.59	6.44	6.31	6.27	6.13	6.01	10.43	6.35a
KC2	6.61	6.52	5.41	6.31	6.2	6.09	5.97	9.68	6.15ab
KC3	4.69	4.65	4.6	4.56	4.51	4.46	4.4	6.18	4.55d
KC4	6.29	6.24	6.18	6.13	6.07	6.01	5.94	5.56	6.12b
KC5	5.48	5.47	5.45	5.44	5.42	5.41	5.39	1.64	5.43c
Means	5.74a	5.66ab	5.40cd	5.49bc	5.43cd	5.32cd	5.23d		

5. Reducing Sugar

Table- 4.5 shows the effect of storage and treatments on reducing sugar of value added carrot, and kinnow blended Jam. Statistically both storage and treatments had significant (p<0.05) effect on reducing sugar of blended Jam. Initially the reducing sugar reading of samples (KC0 to KC5) was 16.69, 16.17, 16.35, 16.12, 16.43 and 16.78 which were increased to 28.57, 21.99, 21.12, 19.73, 18.53 and 17.37 respectively during storage. The mean value of reducing sugar significantly (p<0.05) increased from 16.42 to 21.21 during storage. For treatments maximum mean value of reducing sugar was recorded in sample CK0 (22.35) followed by CK1 (19.29) and minimum mean value was observed in sample CK5 (17.06) followed by CK4 (17.44). Maximum increase in reducing sugar was recorded in sample CK0 (41.58%) followed by CK1 (26.47%) and minimum increase was observed in sample CK5 (3.40%) followed by CK4 (11.33%).

The increase in reducing sugar might be caused due to fluctuation in temperature and acidic condition which results in the conversion of sucrose to glucose and fructose (Singh *et al*., 1999) [35]. The similar findings were found of grape and apple marmalade by Ehsan *et al*. (2003) [9] who revealed that reducing sugar value of product were increased from 16.55 to 31.36 throughout storage interval. This result was also justified by Riaz *et al*., (1999) [29], who observed a regular increase in reducing sugar content of strawberry jam during storage of the product. Similarly, the significant increase in reducing sugar content reveled in apricot jam (Anjum *et al*., 2000).

Table 4-5: Reducing Sugar

Treatment	Storage Intervals							% Increase	Means
	Initial	1	2	3	4	5	6		
KC0	16.69	18.21	20.1	22.23	24.17	26.54	28.57	41.58	22.35a
KC1	16.17	16.92	18.68	19.54	20.46	21.29	21.99	26.47	19.29b
KC2	16.35	17.12	18.01	18.94	19.68	20.31	21.12	22.59	18.79bc
KC3	16.12	16.66	17.19	17.74	18.48	19.05	19.73	18.30	17.85bcd
KC4	16.43	16.72	17.04	17.49	17.8	18.07	18.53	11.33	17.44cd
KC5	16.78	16.88	16.95	17.08	17.16	17.25	17.37	3.40	17.06d
Means	16.42d	17.08d	17.99cd	18.83bc	19.62abc	20.41ab	21.21a		

6. Non reducing sugar

Table-4.6 shows the effect of storage and treatments on Non reducing sugar of value added carrot, and kinnow blended Jam. Statistically both storage and treatments had significant (p<0.05) effect on Non reducing sugar of blended Jam. Initially the Non-reducing sugar reading of samples (KC_0 to KC_5) was 47.3, 46.4, 47, 45.32, 45.6 and 46.9 which were decreased to 19.71, 22.64, 29.05, 35.34, 39.14 and 43.65 respectively during storage. The mean value of Non-reducing sugar significantly (p<0.05) decreased from 46.42 to 31.58 during storage. For treatments maximum mean value of Non-reducing sugar was recorded in sample CK_5 (45.40) followed by CK_5 (42.13) and minimum mean value was observed in sample CK_0 (32.13) followed by CK_1 (34.37). Maximum decrease in Non-reducing sugar was recorded in sample CK_0 (58.33%) followed by CK_1 (51.21%) and minimum increase was observed in sample CK_5 (6.93%) followed by CK_4 (14.17%).

Fluctuation in temperature and acidic condition occur with time which results in the conversion of sucrose to glucose and fructose and hence caused decrease in Non-reducing sugar (Singh *et al*., 1999) [35]. The present values of decrease in non-reducing sugar were justified by Shakir *et al*. (2007) [33] who observed a significant decrease in sugar in mixed pear apple jam during storage interval. Ehsan *et al.*, (2003) [9] reveled a decline in non-reducing sugar values while conducting physico-chemical analysis of grape and apple marmalade. The present study also shows similarity with the results of Riaz *et al*. (1999) [29], who reveled a significant decrease non-reducing sugars of the strawberry jam from (44.64 to 32.35) throughout storage interval.

Table 4-6: Non Reducing Sugar

Treatment	Storage Intervals							% decrease	Means
	initial	1	2	3	4	5	6		
KC0	47.3	42.03	37.17	31.52	25.8	21.43	19.71	58.33	32.13c
KC1	46.4	42.43	38.85	33.74	30.02	26.51	22.64	51.21	34.37c
KC2	47	45.57	43.79	40.13	36.08	33.27	29.05	38.19	39.27b
KC3	45.32	43.52	41.92	40.25	38.96	36.73	35.34	22.02	40.29b
KC4	45.6	44.81	43.39	41.97	40.31	39.73	39.14	14.17	42.13ab
KC5	46.9	46.27	46.13	45.67	44.93	44.31	43.65	6.93	45.40a
Means	46.42a	44.10ab	41.87bc	38.88cd	36.01de	33.66ef	31.58f		

7. Color

Table- 4.7 shows the effect of storage and treatments on color of value added carrot, and kinnow blended Jam. Statistically both storage and treatments had significant (p<0.05) effect on color of blended Jam. Initially the color reading of samples (KC_0 to KC_5) was 7.6, 7.6, 7.7, 8, 7.9 and 7.8 which were decreased to 4, 4.6, 5.9, 7, 7 and 7.1 respectively during storage. The mean value of color significantly (p<0.05) decreased from 7.76 to 5.93 during storage. For treatments maximum mean value of color was recorded in sample CK_5 (7.45) followed by CK_4 (7.42) and minimum mean value was observed in sample CK_0 (5.87) followed by CK_1 (6.15). Maximum decrease in color was recorded in sample CK_0 (47.37%) followed by CK_1 (39.47%) and minimum increase was observed in sample CK_5 (8.97%) followed by CK_4 (11.39%).

Color of a food product considered a key parameters concerning consumer's opinion. Decline in color might be due to enzymatic browning and degradation of ascorbic acid. The current findings are similar with Ehsan *et al.* (2003) [9] who observed a decrease in grape apple marmalade color from 7.8 to 6.8 during storage. Similarly, during storage the color of product was significantly declined (Gimenez *et al.*, 2001) [15] also Khan *et al.* (2012) [23] revealed that mean color in strawberry jam decreased from 9.00 to 7.00 during storage.

Table 4-7: Color

Treatment	Storage Intervals							% decrease	Means
	Initial	1	2	3	4	5	6		
KC0	7.6	6.8	6	6.3	5.6	4.8	4	47.37	5.87c
KC1	7.6	7.1	6.7	6.2	5.7	5.2	4.6	39.47	6.15c
KC2	7.7	7.3	7	6.6	6.4	6.1	5.9	23.38	6.71b
KC3	8	7.7	7.6	7.4	7.2	7.1	7	12.50	7.42a
KC4	7.9	7.7	7.5	7.4	7.3	7.2	7	11.39	7.42a
KC5	7.8	7.7	7.6	7.5	7.3	7.2	7.1	8.97	7.45a
Means	7.76a	7.38ab	7.06bc	6.90bc	6.58cd	6.26de	5.93e		

8. Flavor

Table-4.8 shows the effect of storage and treatments on flavor of value added carrot, and kinniow blended Jam. Statistically both storage and treatments had significant (p<0.05) effect on flavor of blended Jam. Initially the flavor reading of samples (KC_0 to KC_5) was 7.4, 7.4, 8.1, 8.3, 8 and 8.5 which were decreased to 2.4, 3.6, 6.5, 7, 7 and 7.6 respectively during storage. The mean value of flavor significantly (p<0.05) decreased from 7.95 to 5.68 during storage. For treatments maximum mean value of flavor was recorded in sample CK_5 (8.08) followed by CK_4 (7.87) and minimum mean value was observed in sample CK_0 (4.82) followed by CK_1 (5.61). Maximum decrease in flavor was recorded in sample CK_0 (67.57%) followed by CK_1 (51.35%) and minimum increase was observed in sample CK_5 (10.59%) followed by CK_4 (12.50%).

During storage decline in flavor might be due to in decrease of pH values of the product or due to fluctuation in acids (Rathore *et al.*, 2007) [30]. The present results are similar with Ehsan *et al.* (2002) [10] who observed a decrease in flavor of watermelon and lemon mixed Jam form during whole period of five months. Similarly a decline in apple jam flavor from 8.60 to 5.90 was observed throughout 90 days of storage.

Table 4-8: Flavor

Treatment	Storage Intervals							% decrease	Means
	Initial	1	2	3	4	5	6		
KC0	7.4	6.6	5.6	4.7	3.6	3.5	2.4	67.57	4.82d
KC1	7.4	6.9	6.3	5.7	5	4.4	3.6	51.35	5.61c
KC2	8.1	7.9	7.7	7	6.8	6.7	6.5	19.75	7.24b
KC3	8.3	8	7.7	7.6	7.4	7.2	7	15.66	7.60ab
KC4	8	8.7	8.4	8	7.7	7.3	7	12.50	7.87ab
KC5	8.5	8.4	8.2	8.1	8	7.8	7.6	10.59	8.08a
Means	7.95a	7.75a	7.31ab	6.85bc	6.41c	6.15cd	5.68d		

9. Texture

Table- 4.9 shows the effect of storage and treatments on texture of value added carrot, and kinnow blended Jam. Statistically both storage and treatments had significant (p<0.05) effect on texture of blended Jam. Initially the texture reading of samples (KC_0 to KC_5) was 7.9, 7.5, 7.8, 7.5, 7.7 and 7.9 which were decreased to 5, 5.3, 6, 5.8, 7 and 7.2 respectively during storage. The mean value of texture significantly (p<0.05) decreased from 7.71 to 6.05 during storage. For treatments maximum mean value of texture was recorded in sample CK_5 (7.57) followed by CK_4 (7.34) and minimum mean value was observed in sample CK_0 (6.57) followed by CK_1 (6.40). Maximum decrease in texture was recorded in sample CK_0 (36.71%) followed by CK_1 (29.33%) and minimum increase was observed in sample CK_5 (8.86%) followed by CK_4 (9.09%).

The present findings are parallel with Muhammad *et al*. (2009) [25] who observed decrease in texture of apple jam from 9.00 to 6.70. Similarly a gradual decrease in texture properties was revealed by Suutarinen *et al*. (2000) [40] in strawberry jam. However these values are found to be slightly different from Ehsan *et al.* (2003) [9] who revealed a texture decline in grape and apple marmalade during the entire period of storage.

Table 4-9: Texture

Treatment	Storage Intervals							% decrease	Means
	Initial	1	2	3	4	5	6		
KC0	7.9	7.5	7.1	6.7	6.2	5.6	5	36.71	6.57c
KC1	7.5	7.2	6.8	6.4	6	5.6	5.3	29.33	6.40c
KC2	7.8	7.6	7.3	7	6.7	6.3	6	23.08	6.95b
KC3	7.5	7.2	6.9	6.6	6.4	6.1	5.8	22.67	6.64bc
KC4	7.7	7.6	7.5	7.3	7.2	7.1	7	9.09	7.34a
KC5	7.9	7.8	7.7	7.6	7.5	7.3	7.2	8.86	7.57a
Means	7.71a	7.48ab	7.21bc	6.93cd	6.66de	6.33ef	6.05f		

10. Over all acceptability

Table-4.10 shows the effect of storage and treatments on over all acceptability of value added carrot, and kinnow blended Jam. Statistically both storage and treatments had significant (p<0.05) effect on over all acceptability of blended Jam. Initially the overall acceptability reading of samples (KC_0 to KC_5) was 7, 7.2, 7.4, 7.6, 7.6 and 7.7 which were decreased to 2.5, 2.9, 3.5, 4.8, 5.7 and 6.7 respectively during storage. The mean value of overall acceptability significantly (p<0.05) decreased from 7.41 to 4.35 during storage. For treatments maximum mean value of overall acceptability was recorded in sample CK_5 (7.24) followed by CK_5 and CK_2 (6.64) and minimum mean value was observed in sample CK_0 (4.61) followed by CK_1 (5.08). Maximum decrease in overall acceptability was recorded in sample CK_0 (64.29%) followed by CK_1 (59.72%) and minimum increase was observed in sample CK_5 (12.99%) followed by CK_4 (25.00%).

The overall acceptability was also declined in mixed lemon and watermelon jam Ehsan *et al*. (2002) [10]. The present findings are also supporting by Khan *et al.* (2012) [23] who revealed decreased in overall acceptability from (9.00 to 7.00) in fruit jam. Similarly a decrease in overall acceptability of apple and grape marmalade from 8.8 to 7.96 was examined during the whole storage interval (Ehsan *et al*., 2003) [9].

Table 4-10: Over All Acceptability

Treatment	Storage Intervals							% decrease	Means
	Initial	1	2	3	4	5	6		
KC0	7	6.2	5.4	4.5	3.7	3	2.5	64.29	4.61d
KC1	7.2	6.5	5.8	5.2	4.4	3.6	2.9	59.72	5.08cd
KC2	7.4	6.8	6.1	5.5	5	4.3	3.5	52.70	6.64b
KC3	7.6	7.2	6.8	6.3	5.7	5.2	4.8	36.84	6.22b
KC4	7.6	7.3	7	6.6	6.3	6	5.7	25.00	6.64b
KC5	7.7	7.6	7.4	7.3	7.1	6.9	6.7	12.99	7.24a
Means	7.41a	6.93ab	6.41bc	5.90cd	5.36de	4.83ef	4.35f		

Summary

The present research work was done to examine the effect of natural preservative (ginger extract) on the over quality of carrot and kinnow blended jam. Carrot juice contains β-carotenoids which is helpful in reducing the risk of skin and breast cancer. Kinnow is rich source of vitamin-C which is helpful in collagen production also necessary for maintaining smooth skin, keep teeth strong and helps in muscle repairing. Lemon is rich source of vital oils and used by flavouring industry since ancient times. Ginger extracts having polyphenol compounds (gingerol and its derivatives), having high antioxidant property. The pungent smell of ginger is due to Zingerone. It acts as anti-emetic, anti-ulcer, anti-inflammatory, antioxidant, anti-platelet, cardio-protective and anti-cancer properties also prevent nausea and vomiting in post-operative patients. For preparation of carrot, kinnow mixed jam the lemon extracts were mixed with Carrot and kinnow extracts and were kept on fire, the TSS were continuously checked with hand refractometer until it's brix reached to 65, Ginger extract were used in specific amounts for each treatment to study its preservation effect.

The pH of carrot, kinnow mixed jam significantly (p<0.05) decreased from 3.62 to 3.40 during storage, throughout storage maximum decrease in pH was recorded in sample CK_0 (7.24%) followed by CK_1 (6.69%) and minimum increase was observed in sample CK_5 (4.21%) followed by CK_4 (5.23%). The mean TSS values were significantly (p<0.05) increased from 67.46 to 71.68 during storage. Maximum increase in TSS was recorded in sample CK_0 (10.65%) followed by CK_1 (9.59%) and minimum increase was observed in sample CK_5 (1.89%) followed by CK_4 (2.45%). The mean value of Acidity significantly (p<0.05) increased from 0.63 to 0.85 during storage. Maximum increase in Acidity was recorded in sample CK_0 (43.12%) followed by CK_1 (37.76%) and minimum increase was observed in sample CK_5 (8.45%) followed by CK_4 (12.00%). The Vitamin-C mean value were significantly (p<0.05) increased from 5.74 to 5.23 during storage. Maximum increase in Vitamin-C was recorded in sample CK0 (21.41%) followed by CK1 (10.43%) and minimum increase was observed in sample CK5 (1.64%) followed by CK4 (5.56%). The mean value of reducing sugar significantly (p<0.05) increased from 16.42 to 21.21 during storage. Maximum increase in reducing sugar was recorded in sample CK0 (41.58%) followed by CK1 (26.47%) and minimum increase was observed in sample CK5 (3.40%) followed by CK4 (11.33%). The mean value of Non-reducing sugar significantly (p<0.05) decreased from 46.42 to 31.58 during storage. Maximum decrease in Non-reducing sugar was recorded in sample CK_0 (58.33%) followed by CK_1 (51.21%) and minimum increase was observed in sample CK_5 (6.93%) followed by CK_4 (14.17%).

The color mean value were significantly (p<0.05) decreased from 7.95 to 5.68 during storage. Maximum decrease in color was recorded in sample CK_0 (67.57%) followed by CK_1 (51.35%) and minimum increase was observed in sample CK_5 (10.59%) followed by CK_4 (12.50%). The mean value of flavor significantly (p<0.05) decreased from 7.95 to 5.68 during storage. Maximum decrease in flavor was recorded in sample CK_0 (68.57%) followed by CK_1 (51.35%) and minimum increase was observed in sample CK_5 (10.59%) followed by CK_4 (12.50%). The texture mean value were significantly (p<0.05) decreased from 7.71 to 6.05 during storage. Maximum decrease in texture was recorded in sample CK_0 (36.71%) followed by CK_1 (29.33%) and minimum increase was observed in sample CK_5 (8.86%) followed by CK_4 (9.09%). The mean value of overall acceptability significantly (p<0.05) decreased from 7.41 to 4.35 during storage. Maximum decrease in overall acceptability was recorded in sample CK_0 (64.29%) followed by CK_1 (59.72%) and minimum increase was observed in sample CK_5 (12.99%) followed by CK_4 (25.00%).

Results showed that the treatment KC_5 was found most acceptable physiochemically and organoleptically. Hence, KC_5 RTS is recommended for commercial use and for large scale production at industrial level.

Conclusion and Recommendation

Carrot and kinnow mixed jam was prepared in the present research, Study concluded that the ginger can be effectively used in different proportions as natural antioxidant as an alternative source of chemical preservatives. Carrot and kinnow mixed jam was stored for three months. The products were studied for physico-chemical and sensory evaluations at interval of 15 days. On the basis of result obtained it is concluded that treatments KC_5 was the best treatment with having best keeping quality during storage. Some changes were experienced physiochemically but it did not influence the product considerably also the sensory parameters decrease slightly but remains in acceptable range during storage period.

Recommendations

1. Further research work can be done on various proportions of ginger
2. Same proportions of ginger extract can also be used in other fruits jam
3. Other natural anti-oxidant can also be used in carrot and kinnow mixed jam

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