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Studies on development of squash from mango (*Mangifera indica* L.), Citrus (*Citrus aurantifolia* Swingle), Aloe vera (*Aloe barbadensis* Miller.) and ginger (*Zingiber officinale* Rosc.) blends

Harendra and Bhagwan Deen

Abstract
The present investigation was carried out at Post Graduate Laboratory of Department of Fruit Science, College of Horticulture and Forestry, A.N.D. University of Agriculture & Technology, Kumarganj, Ayodhya (U.P.) during the year 2019-2020. Mango (*Mangifera indica* L.), Citrus (*Citrus aurantifolia* Swingle.), Aloe vera (*Aloe barbadensis* Miller.) and Ginger *(Zingiber officinale* Rosc.) have nutritional, spicy, medicinal and therapeutic values. In the present study, the mango pulp, kagzi lime juice, aloe vera gel and ginger juice were blended in different ratios *viz*., 100:00:00:00 (T_1), 00:100:00:00 (T_2), 00:00:100:00 (T_3), 00:00:00:100 (T_4), 25:25:25:25 (T_5), 40:20:20:20 (T_6), 70:10:10:10 (T_7), 20:40:20:20 (T_8), 55:25:10:10 (T_9) and 50:20:15:15 (T_{10}) for the preparation of squash. The squashes were prepared using 50% TSS, 1.20% acidity, 350 ppm SO_2 and 25% blend from each blend combination. Among different proportions, the treatment (T_9) comprising 55 percent mango pulp, 25 percent kagzi lime juice, 10 percent aloe vera gel and 10 percent ginger juice was found best on 9-point hedonic scale for the preparation of squash by the panel of semi trained judges during organoleptic evaluation. The squash were filled into glass and polypet bottles and stored at ambient conditions (20.1-29.4^{0}C), and subjected to chemical and organoleptic evaluation at an interval of 30 days for a period of 150 days (5 months). During the storage period Total Soluble Solids, acidity, reducing sugars and total sugars increased whereas vitamin-A, vitamin-C, non-reducing sugar and organoleptic score decreased with the advancement of storage period. The beverage was organoleptically acceptable upto 5 months of storage in case of both glass and polypet bottles. This study indicated that mango, kagzi lime aloe vera and ginger can be utilized for palatable squash making which can be beneficial for the consumers in terms of taste, colour, flavour and overall acceptability.

Keywords: Squash, development, mango, Kagzi lime, aloe vera, ginger, blend combination, glass and Polypet bottles, storage, organoleptic quality

Introduction
An introduction of blended beverages with using different fruits, vegetables, spices extract and plants of medicinal values as new food products will definitely attract the consumers in the interpretation of sensory and nutritional characteristics. Fruits blended with spices extracts show a better shelf-life that enhances the phenolic and antioxidant potential along with antimicrobial properties has provided great health benefits to human beings.

Mango (*Mangifera indica* L.) is the king among tropical fruits and is greatly relished for its succulence, exotic flavour and delicious taste in most countries of the world (Bhatnagar and Subramanyam, 1973) [7]. Due to ascorbic acid and carotenoids, mango fruit is considered as a source of antioxidants. Mango has strong anti-lipid peroxidation, hypotensive, cardiotonic, immunomodulation, wound healing, antidegenerative and antidileutic activities. On the basis of analysis of different varieties of mango, it is reported that mango fruit contains moisture 73.0 – 86.7%, carbohydrate 11.6 – 24.3%, protein 0.3 – 1.0%, fat 0.1 – 0.8%, fibers 0.8%, minerals 0.3 – 0.7%, Vitamin A 650 – 25940 I.U., Vitamin C 3 – 83 mg/100g, calcium 0.01%, phosphorous 0.02% and iron 4.5 mg/100g (Anon., 1966) [6]. Young and unripe mango fruits are utilized for culinary purposes as well as for preparing pickles, chutney and amchur, because of their acidic taste. Ripe mango fruits are utilized in preparing pulp, juice, syrup, squash, jam, jelly, preserve, nectar, canned slices, dried powder, RTS, baby food, mango leather (Aam Papar), toffee, candy and many other products.

Citrus (*Citrus spp*.) is a genus of flowering trees and shrubs, belonging to the family Rutaceae. Kagzi lime (*Citrus aurantifolia* Swingle) is said to be originated in India.

The importance of the kagzi lime is because of the high amount of vitamins and minerals in its fruits. They are essential ingredients of human diet. Vitamin C content is the maximum in acid lime (15-65 mg/100 g). The fruit is very sour because of high quantity of acid; hence fresh fruits are not consumed whereas, fresh juice mixed with water and sugar makes a delicious drink during summer season. Kagzi lime fruits are used extensively in food processing industry to prepare a wide variety of products such as RTS, squash, syrup, cordial, chutney and pickles.

Aloe vera (*Aloe barbadensis* Miller) is perennial, drought resistant succulent plant commonly known as 'Ghrit-kumari' and 'Gheegwar' belongs to the Asphodelaceae or Liliaceae family, which historically has been used for a variety of medicinal purpose. There are 275 species of aloe vera grown all over the world. The most widely used species of aloe vera are *Aloe barbadensis* Miller and *Aloe aborescens* (Ramachandra and Rao, 2008., Dubick and Michsel, 1983) [30, 14]. Aloe vera gel is colorless, transparent and slippery mucilage containing water and bioactive polysaccharides mainly acemannan and glucomannan. Acemannan is the main component. Glucomannan also plays an important role in wound healing, stimulating the immune system. It has also antibacterial and antiviral effect. It is a desert plant traditionally being used as a very popular herbal treatment of skin and other disorders. It is the rich source of vitamins like B1 (Thaimin), B2 (Riboflavin), B3 (Niacin), B6 (Pyrodoxine), B12 (Cobalamin), C (Ascorbic acid), E (Tocopherol) and Folic acid etc., minerals, enzymes, sugar, anthraquinones of phenolic compounds, lignin, saponins, sterols, amino acids and salicylic acid. In food industry, it has been used as an ingredient for preparation of functional foods and production of gel-containing health drinks, energy drinks and different type of beverages like RTS, squash and syrup.

Ginger (*Zingiber officinale* Rosc.) is an ancient medicinal as well as spicy plant belonging to Zingiberaceae family, and is indigenous to South-Eastern-Asia. Since a very long time ginger is known for its medicinal value as a digestive aid, spiritual beverage, aphrodisiac, antiemetic, anticancer, anti-oxidant, anti-inflammatory and immune stimulating properties (Malhotra and Singh, 2003) [22]. ginger is used in soft drink manufacturing industry, baking industry and meat processing industry up to a great extend but it rarely used for cooking. Protein (2.3%), fat (0.9%), carbohydrates (12.3%), mineral (1.2%), fiber (2.4%) and moisture (80.9%) are the main constituents of fresh ginger. According to Deen and Kumar (2014) [12] ginger contains 1.80% TSS, 0.08% acidity and 1.90mg/100g Vitamin C. The fresh ginger juice is widely used in RTS, squash, syrup and nectar beverages preparation. An acidic beverage was formulated for pregnant women containing carbohydrates, essential vitamins (B6, C & folic acid) and minerals (ammonium iron, citrate, calcium gluconate, calcium lactate, and magnesium carbonate) along with ginger juice so as to maintain the good nutritional state of foetus (Angela *et al.*, 2002) [2]. Ginger drinks provide a cool, refreshing beverage as well as assistance health benefits.

The demands of natural beverages rich in nutrients and having therapeutic as well as medicinal values, are increasing because of changing life style, health consciousness and purchasing capacity of the consumers. The present studies were carried out because the blend beverages of fruits, medicinal plants and spices are rich source of nutrients, medicinal properties and flavors to meet the consumers demand in National and International markets.

Materials and Methods

Raw materials

Mango (var. Dashehari), Kagzi lime purchased from local market, Aloe vera (var. Samsheetal) purchased from National Botanical Research Institute, Lucknow and Ginger (Local variety) purchased from local market were used for the squash preparation.

Extraction of mango pulp, kagzi lime juice, aloe vera gel and ginger juice

The methods applied to extract the mango pulp, kagzi lime juice, aloe vera gel and ginger juice are shown as flow sheets in Fig. 1, Fig. 2, Fig. 3 and Fig. 4, respectively.

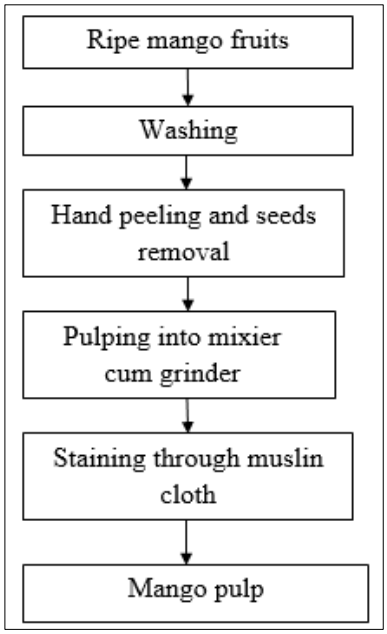

Fig 1: Flow chart for extraction of pulp from mango fruits

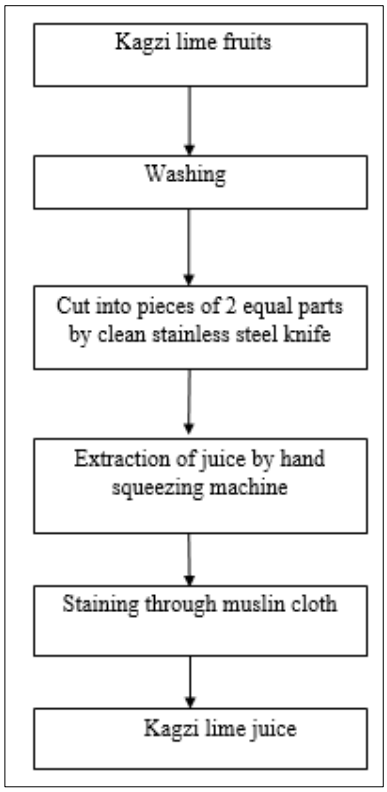

Fig 2: Flow chart for extraction of juice from kagzi lime fruits

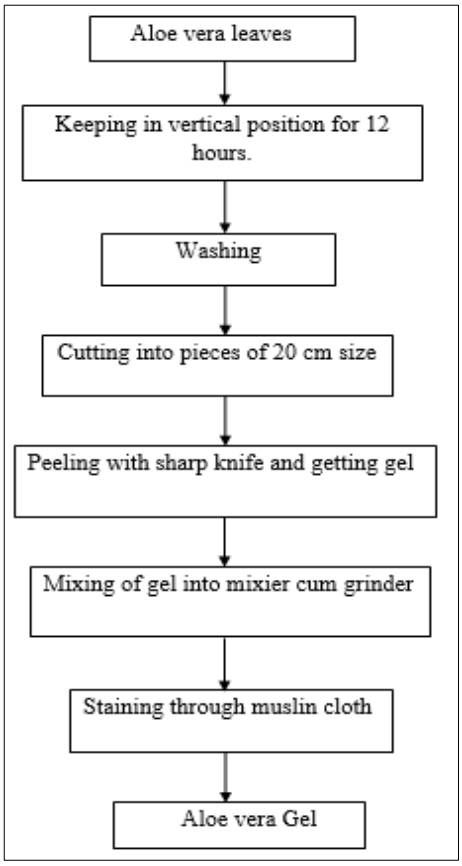

Fig 3: Flow chart for extraction of aloe vera gel

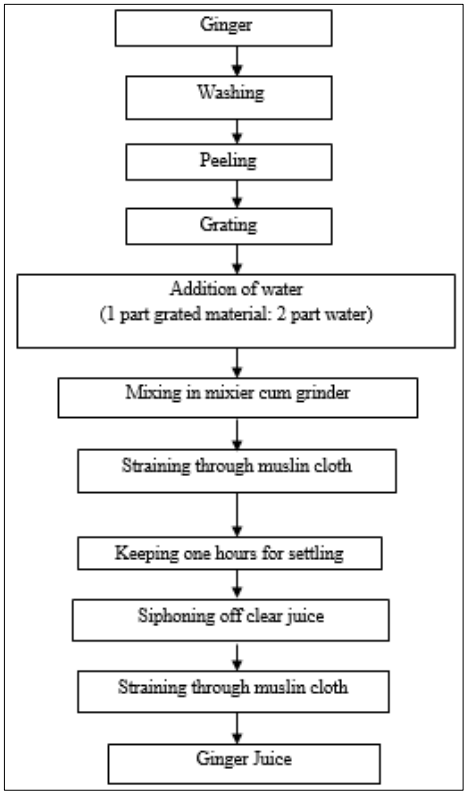

Fig 4: Flow chart for extraction of ginger juice

Standardization of blends for squash

The following combinations of mango pulp, kagzi lime juice, aloe vera gel and ginger juice were evaluated to standardize the blend for the development of palatable and quality squash:

T_1 25% blend comprising 100% mango pulp + 0% kagzi lime juice + 0% aloe vera gel + 0% ginger juice and adjusted to 50% TSS, 1.20% acidity and 350 ppm SO_2.

T_2 25% blend comprising 0% mango pulp +100% kagzi lime juice + 0% aloe vera gel + 0% ginger juice and adjusted to 50% TSS, 1.20% acidity and 350 ppm SO_2.

T_3 25% blend comprising 0% mango pulp + 0% kagzi lime juice + 100% aloe vera gel + 0% ginger juice and adjusted to 50% TSS, 1.20% acidity and 350 ppm SO_2.

T_4 25% blend comprising 0% mango pulp + 0% kagzi lime juice + 0% aloe vera gel + 100% ginger juice and adjusted to 50% TSS, 1.20% acidity and 350 ppm SO_2.

T_5 25% blend comprising 25% mango pulp + 25% kagzi lime juice + 25% aloe vera gel + 25% ginger juice and adjusted to 50% TSS, 1.20% acidity and 350 ppm SO_2.

T_6 25% blend comprising 40% mango pulp + 20% kagzi lime juice + 20% aloe vera gel + 20% ginger juice and adjusted to 50% TSS, 1.20% acidity and 350 ppm SO_2.

T_7 25% blend comprising 70% mango pulp + 10% kagzi lime juice + 10% aloe vera gel + 10% ginger juice and adjusted to 50% TSS, 1.20% acidity and 350 ppm SO_2.

T_8 25% blend comprising 20% mango pulp + 40% kagzi lime juice + 20% aloe vera gel + 20% ginger juice and adjusted to 50% TSS, 1.20% acidity and 350 ppm SO_2.

T_9 25% blend comprising 55% mango pulp + 25% kagzi lime juice + 10% aloe vera gel + 10% ginger juice and adjusted to 50% TSS, 1.20% acidity and 350 ppm SO_2.

T_{10} 25% blend comprising 50% mango pulp + 20% kagzi lime juice + 15% aloe vera gel + 15% ginger juice and adjusted to 50% TSS, 1.20% acidity and 350 ppm SO_2.

Preparation of squash

Squash comprising 25% blend, 50% TSS, 1.20% acidity and 350ppm SO_2 were prepared from different treatments. The prepared squash were organoleptic ally evaluated on 9- point Hedonic scale to find out the best combination of blend for large scale preparation. The technique used for squash making is shown in Fig-5.

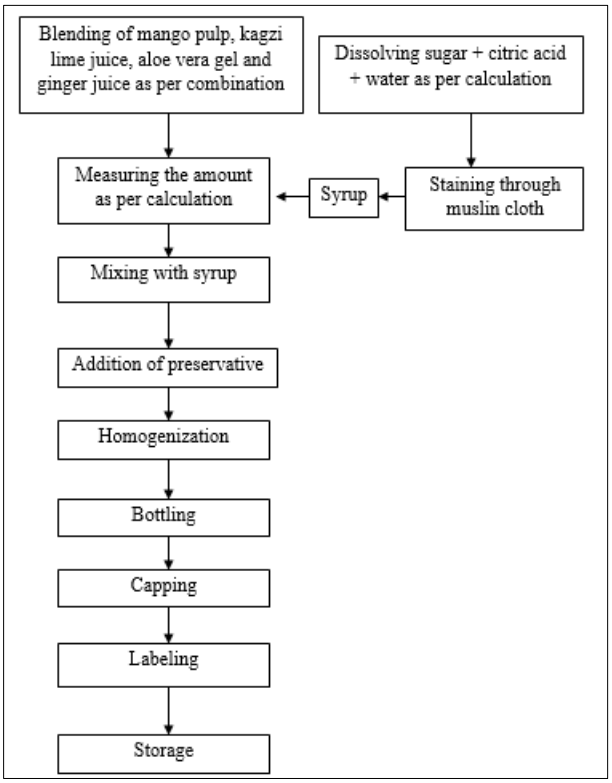

Fig 5: Flow sheet for preparation of mango + kagzi lime + aloe vera + ginger blended squash.

Storage studies

Finally 5 liters squash was prepared from the best combination of mango pulp, kagzi lime juice, aloe vera gel and ginger juice, and filled into 750 ml glass bottles and polypet bottles of 750 ml capacity leaving 2 cm head space, capped and put for storage studies under ambient condition (20.1- 29.4 ^{0}C). During storage observation on changes in TSS, acidity, vitamin-A, vitamin-C, reducing sugars, non-reducing sugar, total sugars and organoleptic quality were recorded at monthly interval. Observations were recorded for changes in TSS, acidity and vitamin-C (Rangana, 2010) [31], vitamin-A (AOAC, 1970) [5], sugars (Lane and Eynone, 1923) [20] and organoleptic quality (Amerine *et al.*, 1965) [1] at monthly intervals during 5 months of storage period and are described as follows.

The Total Soluble Solids of sample was determined with the help of model (ERMA INC. TOKYO JAPAN) hand refractometer (0-32% and 28-62%) in terms of percentage. The value of TSS recorded at ambient temperature were corrected at 20°C with the help of reference table and the mean value was expressed as per cent TSS content of the sample whereas, the acidity was determined by titrating known quantity of sample against 0.1 N sodium hydroxide solution using phenolphthalein as an indicator and expressed in percent anhydrous citric acid. Vitamin-A determined by preparing sample in acetone, then in petroleum ether and thereafter in sodium sulphate till the appearance of dark yellow-greenish colour and measured the optical density (OD) at 452 nm and 503 nm by Spectrophotometer whereas, Vitamin-C content was estimated by preparing sample in 3 percent metaphosphoric acid solution and titrating against 2, 6 dichlorophenol indophenols dye solution till the appearance of light pink colour. The reducing, non-reducing and total sugars were analysed by using Fehling's solution A and B and methylene blue as an indicator. A panel of 9 semi trained judges evaluated squash for its colour, flavour, taste, appearance and overall acceptability on 9-point Hedonic scale.

Statistical analysis

The experiments were conducted in 3 replications and the statistical analysis of the data was done by computer software as the method described by Panse and Sukhatne (1985) [26] for CRD experiment.

Results and Discussion

Chemical attributes of fresh mango pulp, kagzi lime juice, aloe vera gel and ginger juice

The data pertaining to chemical attributes of fresh mango pulp, kagzi lime juice, aloe vera gel and ginger juice is presented in Table-1 revealed that the mango pulp used in RTS making contained 19.00 percent Total Soluble Solids, 1.36 percent acidity, 2650.17 I.U. vitamin-A, 17.33 mg/100g vitamin-C, 4.24 percent reducing sugars, 12.66 percent non-reducing sugar and 16.90 percent total sugars. Similarly Mishra *et al.* (2014) [24] reported 20.00 percent Total Soluble Solids, 0.25 percent acidity, 3.7 µg/100g β-carotene, 19.50 mg/100g vitamin-C, 5.0 percent reducing sugars, 10.20 percent non-reducing sugar and 15.20 percent total sugars in mango fruit. Kagzi lime juice contained 5.00 percent Total Soluble Solids, 7.68 percent acidity, 2.78 I.U. vitamin-A, 59.80 mg/100ml vitamin-C, 1.43 percent reducing sugars, 1.08 percent non-reducing sugar and 2.51 percent total sugars whereas, Waghaye *et al.* (2019) [37] observed 7.0 percent TSS, 7.0 percent acidity and 12.2 mg/100ml vitamin-C in kagzi lime fruits. Aloe vera gel contained 1.88 percent Total Soluble Solids, 0.24 percent acidity, 0.00 I.U. vitamin-A, 2.53 mg/100g vitamin-C, 0.53 percent reducing sugars, 1.18 percent non-reducing sugar and 1.71 percent total sugars whereas, Lavanya *et al.* (2018) [21] observed 2.14 percent TSS, 0.34 percent reducing sugars, 0.29 percent non-reducing sugar, 0.59 percent total sugars, 0.02 percent acidity, 4.00 pH and 2.00 mg/100g vitamin-C in aloe vera gel. Ginger contained 2.20 percent Total Soluble Solids, 0.26 percent acidity, 0.00 I.U. vitamin-A, 1.90 mg/100g vitamin-C, 0.63 percent reducing sugars, 1.12 percent non-reducing sugar and 1.75 percent total sugars similarly Hegde *et al.* (2018) [16] observed 1.50^{0}B TSS, 5.20 pH, 0.24 percent acidity, 2.70 mg/100g vitamin-C, 0.64 percent reducing sugars and 1.60 percent total sugars in ginger.

Standardization of blends for squash

A quality blended squash with 25 percent blend comprising 55 percent mango pulp and 25 percent kagzi lime juice, 10 percent aloe vera gel and 10 percent ginger juice with 50 percent TSS, 1.20 percent acidity and 350 ppm SO_2 (T_9) was organoleptically found best for preparation of blend squash (Table-2). Similarly Punam *et al.* (2012) [29] reported that the combination of 25 percent bael pulp and 75 percent mango pulp was found to be best for prepared squash. Kiranmai *et al.* (2017) [17] revealed that highest acceptability observed in squash prepared with 80 percent tamarind pulp and 20 percent mango pulp.

Biochemical changes during storage

Data pertaining to biochemical changes during storage of squash into glass and polypet bottles is presented in Table-3 and Table-4, respectively which indicates that the Total Soluble Solids of squash increased gradually after one month of storage from 50.00 percent to 51.92 percent into glass bottles whereas, from 50.00 percent to 52.40 percent into polypet bottles. This change might be due to the conversion or hydrolysis of polysaccharides into simple sugars (monosaccharides and oligosaccharides). The conversion rate was comparatively higher in polypet container than glass bottles which might be due to container effects. Similarly increasing trend in TSS during storage was reported in mango-aloe vera blended squash (Chaudhary, 2014) [9], mango squash (Harshita *et al.*, 2016) [15], mango-aloe vera blend squash (Chaudhary *et al.*, 2017) [10], noni fruit juice blended squashes (Thirukumar *et al.*, 2018) [35] and mango-guava blend squash (Noor uddin *et al.*, 2019) [25] which are in agreement of present observations. The acidity of squash increased gradually during storage period. Total acidity was increased from 1.20 percent at initial day to 1.73 percent at final day of storage into glass bottles whereas, from 1.20 percent at initial day to 1.77 percent at final day of storage into polypet bottles. Degradation of pectic substances and formation of organic acid have been reported to increase the acidity of fruit products (Conn and Stumf, 1976) [11]. Similarly increasing trend in acidity during storage was observed by Tiwari and Deen (2014) [24] on bael-aloe Vera blend squash, Shahid *et al.* (2015) [32] on mango-mandarin squash, Kiranmai *et al.* (2017) [17] on tamarind-mango squash and Thirukumar *et al.* (2018) [35] on noni fruit juice blended squashes. Vitamin-A content was continuously decreased from the first day (660.82 I.U.) to the end of storage (657.95 I.U.) throughout the storage period into glass bottles while, from the first day

(660.82 I.U.) to the end of storage (656.85 I.U.) throughout the storage period into polypet bottles. This decrease in vitamin-A content might be due to the auto-oxidative degradation during storage and/or due to oxidative breakdown, isomerization or enzymatic destruction of the pigments. The loss of vitamin-A in squash of different fruits based beverages during storage at ambient temperature was also reported in older studies (Anju *et al.,* 2017; Prabha *et al.*, 2018 and Avhad *et al.,* 2019) [3, 6]. Vitamin-C content was continuously decreased from the first day (21.35 mg/100ml) to the end of storage (19.78 mg/100ml) throughout the storage period into glass bottles whereas, from the first day (21.35 mg/100ml) to the end of storage (19.42 mg/100ml) throughout the storage period into polypet bottles. This decrease in vitamin-C content might be due to the oxidation of ascorbic acid into dehydro-ascorbic acid by oxygen. The loss of vitamin C in squash of different fruits based beverages during storage at ambient temperature was also reported in earlier studies (Harshita *et al.,* 2016; Mishra *et al.*, 2017; Kumar *et al.*, 2018; Thirukumar *et al.*, 2018 and Noor uddin *et al.,* 2019) [15, 23, 19, 35, 25]. The reducing sugars and total sugars of blended squash, increased gradually and it was increased from 1.82 percent to 4.62 percent and 49.26 percent to 50.47 percent, respectively into glass bottles while, from 1.82 percent to 4.75 percent and 49.26 percent to 50.55 percent, respectively into polypet bottles. The increase in total and reducing sugars of processed fruit products could be due to inversion of non-reducing sugar into reducing sugars. These finding were supported by Deen and Singh (2012) [13] in karonda squash, Smitha *et al.* (2012) [34] in avocado based squash blended with sapota and aloe vera, Papade *et al.* (2015) [27] in acid lime squash, Sherzed *et al.* (2017) [33] in strawberry based blended squash, Thirukumar *et al.* (2018) [35] in noni fruit juice blended squashes, Noor uddin *et al.* (2019) [25] in mango-guava blend squash and Prabha *et al.* (2019) [28] in blended squash of papaya-mango. The non-reducing sugar of blended squash decreased continuously throughout the entire period of storage and it was decreased from 47.44 percent to 45.85 percent into glass bottles whereas, from 47.44 percent to 45.80 percent into polypet bottles. The decrease in non-reducing sugar of processed fruit products might be due to inversion of non-reducing sugar. This finding was supported by Tiwari and Deen (2014) [36] in bael and aloe Vera blended squash, Mishra *et al.* (2017) [23] in mango-aloe Vera blend squash, Kumar and Deen (2018) [19] in wood apple squash, Noor uddin *et al.* (2019) [25] in mango-guava blend squash and Prabha *et al.* (2019) [28] in papaya-mango squash. Organoleptic score of blended squash decreased gradually with the storage period at room temperature (20.1-29.4^{0}C). The acceptability of squash was maintained up to five months. The score was significantly decreased from 8.12 at first day to 7.12 at final day of storage into glass bottles whereas, from 8.12 at first day to 7.02 at final day of storage into polypet bottles. The Loss in organoleptic quality of beverages after certain period is obvious because of undesirable changes in the products. Temperature plays an important role in biochemical changes that leads to development of off flavour as well as discolouration in the beverages. Reduction in organoleptic quality are also reported in bael and aloe vera blended squash (Tiwari and Deen, 2014) [36], aloe vera and pineapple blended beverages (Biswas *et al.,* 2016) [8], pumpkin-guava squash (Anju *et al.,* 2017) [3], mango-aloe vera blend squash (Chaudhary *et al.,* 2017) [23], wood apple squash (Kumar and Deen, 2018) [19], prepared squash from different mango varieties (Kumar *et al.,* 2018) [19] and mango-guava blend squash (Noor uddin *et al.,* 2019) [25]**.** These reported observations are in the support of the present findings.

Table 1: Chemical attributes of mango pulp, kagzi lime juice, aloe vera gel and ginger juice.

S. No.	Chemical attributes	Mean value			
		Mango pulp	Kagzi lime juice	Aloe vera gel	Ginger juice
1.	Total soluble solids (%)	19.00	5.00	1.88	2.20
2.	Acidity (%)	1.36	7.68	0.24	0.26
3.	Vitamin-A ((I.U.)	2650.17	2.78	0.00	0.00
4.	Vitamin-C (mg/100 g)	17.33	59.80	2.53	1.90
5.	Reducing sugars (%)	4.24	1.43	0.53	0.63
6.	Non-reducing sugar (%)	12.66	1.08	1.18	1.12
7.	Total sugars (%)	16.90	2.51	1.71	1.75

Table 2: Organoleptic quality of squash prepared from different blends of mango pulp, kagzi lime juice, aloe vera gel and ginger juice.

Treatments (Recipe No.)	Different combination of blends				Organoleptic quality	
	Mango pulp (%)	Kagzi lime juice (%)	Aloe vera gel (%)	Ginger juice (%)	Score	Rating
T_1	100	Nil	Nil	Nil	7.83	Like moderately
T_2	Nil	100	Nil	Nil	7.67	Like moderately
T_3	Nil	Nil	100	Nil	7.41	Like moderately
T_4	Nil	Nil	Nil	100	7.41	Like moderately
T_5	25	25	25	25	7.38	Like moderately
T_6	40	20	20	20	7.77	Like moderately
T_7	70	10	10	10	7.61	Like moderately
T_8	20	40	20	20	7.61	Like moderately
T_9	55	25	10	10	8.12	Like very much
T_{10}	50	20	15	15	7.98	Like moderately
S.E.m±					0.02	
CD at 5%					0.06	

Table 3: Biochemical and organoleptic changes of squash during storage into glass bottles.

Storage period (in months)	TSS (%)	Acidity (%)	Vitamin-A (I.U.)	Vitamin-C (mg/100ml)	Reducing sugars (%)	Non-reducing sugars (%)	Total sugars (%)	Organoleptic	
								Score	Rating
0	50.00	1.20	660.82	21.35	1.82	47.44	49.26	8.12	LVM
1	50.36	1.26	659.97	20.72	2.23	47.21	49.44	8.01	LVM
2	50.74	1.35	659.09	20.40	2.95	46.86	49.81	7.88	LM
3	51.13	1.48	658.77	20.18	3.44	46.53	49.97	7.58	LM
4	51.55	1.64	658.21	20.03	3.90	46.14	50.04	7.27	LM
5	51.92	1.73	657.95	19.78	4.62	45.85	50.47	7.12	LM
S.E.m±	0.03	0.03	0.04	0.03	0.03	0.02	0.02	0.03	
CD at 5%	0.10	0.10	0.13	0.08	0.08	0.07	0.07	0.10	

LVM: Like very much, LM: Like moderately

Table 4: Biochemical and organoleptic changes of squash during storage into polypet bottles.

Storage period (in months)	TSS (%)	Acidity (%)	Vitamin-A (I.U.)	Vitamin-C (mg/100ml)	Reducing sugars (%)	Non-reducing sugars (%)	Total sugars (%)	Organoleptic	
								Score	Rating
0	50.00	1.20	660.82	21.35	1.82	47.44	49.26	8.12	LVM
1	50.43	1.29	659.89	20.64	2.35	47.16	49.51	7.90	LM
2	51.46	1.37	659.00	20.32	3.00	46.82	49.82	7.58	LM
3	51.83	1.51	658.47	20.00	3.58	46.47	50.05	7.30	LM
4	52.10	1.68	657.90	19.76	4.08	46.18	50.26	7.15	LM
5	52.40	1.77	656.85	19.42	4.75	45.80	50.55	7.02	LM
S.Em±	0.02	0.04	0.06	0.02	0.03	0.04	0.03	0.03	
CD at 5%	0.07	0.12	0.19	0.07	0.10	0.11	0.10	0.10	

LVM: Like very much, LM: Like moderately

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Conclusion
It may be concluded from above findings that squash prepared from 25% blend pulp comprising 55% mango pulp, 25% lime juice, 10% aloe vera gel and 10% ginger juice with 50% TSS, 1.20% acidity and 350 ppm SO_2 was found best on 9-point hedonic scale by the panel of semi trained judges during organoleptic evaluation. The TSS, acidity, reducing sugars and total sugars was increased, whereas vitamin-A, vitamin-C, non-reducing sugar and organoleptic quality was decreased during storage when stored into both glass and polypet bottles. The squash can be stored up to 5 months at ambient storage temperature (20.1-29.4 ^{0}C) into glass and polypet bottles with acceptable quality.

References
1. Amerine MA, Pangborn RM, Roessler EB. Principle of sensory evaluation of food. Academic Press, London 1965.
2. Angela M, Petenate AJ, Marques MO, Mayo C, Zancan K. Extraction of Ginger (*Zingiber officinale* Roscoe) oleoresin with CO_2 and co-solvents: A study of the antioxidant of the extracts. The Journal of Supercritical Fluids 2002;24(1):57-76.
3. Anju KD, Babu GN, Surekha A, Preethi R. Development and Standardization of Ripe Pumpkin Based Squash and its Stability during Storage. Int. J Curr. Microbiol. App. Sci 2017;6(10):821-831.
4. Anonymous. Speacial Report Series No. 4, I.C.M.R., New Delhi 1966.
5. AOAC. Official Methods of Analysis. 11th edn., Association of Official Analytical Chemists, Washington, D.C 1970, 769.
6. Avhad BA, Kotecha PM, Lande SB, Chavan UD. Studies on preparation of fruit bar from papaya and guava. J Pharmacogn. Phytochem 2019;8(4):3219-3223.
7. Bhatnagar HC, Subramanyam H. Some aspects of preservation, processing and export of mango and its products. Indian Food Packer 1973;27(4):33-52.
8. Biswas S, Masih D, Singh M, Sonkar C. Development and Quality Evaluation of Aloe Vera and Pineapple Juice Blended Beverage. Int. Res. J Eng. Technol 2016;3(10):214-220.
9. Chaudhary M. Studies on beverages from mango (*Mangifera indica* L.) and aloe vera (*Aloe barbadensis* Miller.) blends. M.Sc. Thesis, N. D. Univ. of Agric. & Tech., Faizabad, (U. P.) 2014.
10. Chaudhary M, Deen B, Gautam DK, Mishra KK. Studies on Development of Squash from Mango (*Mangifera indica* L.) Pulp and Aloe Vera (*Aloe barbadensis* Miller.) Gel Blend. Int. J Curr. Microbiol. App. Sci 2017;6(7):1962-1969.
11. Conn EE, Stumf PK. Outlines of Biochemistry, Wiley Eastern Ltd., New Delhi 1976.
12. Deen B, Kumar A. Development and storage of mango ginger RTS beverages. International Journal of Food, Agriculture and Veterinary Sciences 2014;4(3):15-20.
13. Deen B, Singh IS. Development of Karonda (*Carissa carandas* L.) squash. Beverage and Food World 2012;39(2):37-39.
14. Dubick, Michale A. Dietary supplements and health aids. A critical evaluation: Part 3: Natural Miscellaneous Products. J Nutr. Educ., (USA) 1983;26(6):259-265.
15. Harshitha T, Gehlot R, Siddique S, Rekha. Development and Evaulation of Mango RTS snd Squash. Progress. Res. Int. J 2016;11(3):349-354.
16. Hegde PP, Sodananka GK, Sreenivas KN, Shankarappa TH, Chandan K, Manjula GS *et al.* Conservation, Cultivation and Utilization of medicinal and Aromatic plants. J Pharmacogn. Phytochem 2018;SP3:323-325.
17. Kiranmai E, Uma Maheswari K, Vimala B. Squash from Tamarind Pulp by Blending with Mango Pulp. J Food Process. Technol 2017;8(3):1-4.

18. Kumar A, Deen B. Studies on Post-Harvest Technology of *Limonia acidissima* L. fruits. Germany: Lambert Academic Publishing 2018.
19. Kumar S, Godara RK, Kumar S, Singh J. Studies on Physico-chemical Characteristics in Squash Prepared from Different Mango Cultivars. Int. J Curr. Microbiol. App. Sci 2018;7(1):827-833.
20. Lane, Eyenone L. Determination of reducing sugars by means of Fehling solution with methylene blue indicator as an internal indicator. Journal Soc. Chem. India 1923;42:32.
21. Lavanya T, Raj D, Vaghashiya JM. Standardization of formulation for preparation of health drink by blending Aloe vera, Guava and Jamun. Int. J Chem. Stud 2018;6(4):1715-1721.
22. Malhotra S, Singh PS. Medicinal properties of Ginger *(Zingiber officinale)*, Natural product Radiance 2003, 2(6).
23. Mishra KK, Pathak S, Chaudhary M, Singh V. Studies on preparation of Squash from Mango (Mangifera indica L.) pulp and Aloe vera (Aloe barbadensis Miller.) gel blends. J Pharmacogn. Phytochem 2017;6(6):2409-2412.
24. Mishra PK, Pathak S, Singh RK, Sahay S, Tiwari DK, Srivastava P *et al.* Evaluation of Mango (*Mangifera indica* L.) cultivars for preparation of osmo-dehydrated product. The Bioscan 2014;9(4):1495-1498.
25. Noor uddin M, Wahab S, Muhammad A, Bilal H, Din MU, Nawaz H *et al.* Development and quality evaluation of mango and guava blended squash during storage. Pure Appl. Biol 2019;8(2):1182-1190.
26. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research Publication, 3rd rev. ed 1985.
27. Papade JN, Chandan PM, Sahoo AK. Studies on preparation of acid lime squash. J Crop and Weed 2015;11(1):138-143.
28. Prabha A, Modgil R, Sandal A. Effect of Blending and Storage on the Physicochemical Composition of the Papaya and Mango Squash. Asian J Dairy Food Res 2019;38(2):1-5.
29. Punam R, Singh GR, Siddiqui S. Development and evaluation of bael-mango ready-to-serve drink and squash. Beverage and Food World 2012;39(4):43-45.
30. Ramachandra CT, Rao SP. Processing of Aloe Vera Leaf Gel. Am. J Agric. Biol. Sci 2008;3(2):502-510.
31. Ranganna S. Analysis and quality control for fruit and vegetable products, Tata Mc Graw-Hill Ltd., New Delhi 2010.
32. Shahid U, Hussain S, Nadeem M, Jabbar S, Qureshi TM, Nasir MU *et al.* Quality assessment of the mango-mandarin (kin now) squash during storage. Sci. Lett 2015;3(2):115-121.
33. Sherzad RA, Sreenivas KN, Krishna HC, Tayeebullah HM, Omari MG. Valorization of strawberry (*fragaria ananassa*) based blended squash beverage with muskmelon, grape, ginger and lime. Int. J of Agri. Sci. and Res 2017;7(1):465-474.
34. Smitha NK, Sreeramu BS, Chikkur SS, Parmeshwar AS, Kantharaj K. Standardization of processing technology and sensory evaluation of avocado squash blended with sapota and aloe. Int. J Process. PostHarvest Technol 2012;3(1):94-97.
35. Thirukumar S, Vennila P, Kanchana S. Physico-chemical characteristics of noni fruit juice blended squashes during storage. Int. J Chem. Stud 2018;6(1):449-455.
36. Tiwari DK, Deen B. Studies on Development of squash from Bael (*Aegle marmelos* Correa.) Pulp and Aloe vera (*Aloe Barbadensis* Miller.) Gel Blend. Ann. Agri. Bio. Res 2014;19(3):483-487.
37. Waghye SR, Kshirsagar RB, Sawate AR, Shareef M. Studies on physical and chemical composition of lime (*Citrus aurantifolia* L.). Int. J Chem. Stud 2019;7(2):1098-1100.