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Research Article

Effect of varieties and storage on the quality parameters of nectarine (*Prunus persica*)-based intermediate moisture food (IMF) products

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Abstract
Fruits play an important role in maintaining a healthy life. Nectarine is a hybrid fruit of peach and plum, wherein efforts were made to develop intermediate moisture food products (jam and jelly) from nectarine varieties (May Fire, Snow Queen, and Silver King). The study aimed to determine the effect of storage on the nutritional (TSS, pH, acidity, ascorbic acid, and sugars) and sensory parameters (color, taste, flavor, texture, and overall acceptability) of jam and jelly at different storage intervals. Storage had a nonsignificant effect on the total soluble solids, with reported mean values of 69.67^0 Brix, while the pH content of jam varied significantly from 2.90-2.20 during 6 months of storage. The values for acidity and total sugars increased (P≤0.05) significantly from 1.92-2.03 percent and 57.04 to 56.93 percent, respectively. However, the ascorbic acid content decreased significantly from 4.64 - 1.66 mg/100 g. In the case of jelly, the total soluble solids and pH decreased from 67.78 – 67.440 Brix and 2.70 – 2.48, respectively, during storage for 6 months at ambient temperature. The ascorbic acid content decreased from 4.56-2.10 mg/100 g. Among cultivars, there was a nonsignificant difference in the nutritional parameters of jam, but in the case of jelly, different cultivars had a significant effect on TSS, pH, and ascorbic acid content. Organoleptically, the nectarine jam was rated as 'liked very much', while the jelly 'liked slightly', with good storage acceptance up to 6 months. Being nectarine as a superfood can be explored to develop speciality food products for vulnerable sections of society.

Keywords: Intermediate moisture foods, Nectarine cultivars, Nutritional profiling, Sensory evaluation, Shelf life

INTRODUCTION

The world's most comprehensive report on nutrition highlights the worrisome prevalence of malnutrition in all forms (UNICEF, 2018). Protein-energy malnutrition is the biggest public health concern affecting not only children but also other vulnerable groups of society. Children are the future of any country, and malnourishment during early life affects physiological, psychological, and cognitive development throughout the life cycle. Globally, 149 and 45 million children (under 5 years) are stunted and wasted, of which 45% of the population under five years lost life because of undernutrition, while 38.9 million come in the category of obesity (World Health Organization, 2021). In India, 34.7% of children under five are affected by malnutrition, and the percentage is higher than that in the average region of Asia of 21.8% (Global Health Report, 2021). Diversity in fruits, including pome and stone fruits, contributes to the horticultural economy of India. Approximately 28 thousand ha of area is covered under peach, plum, apricot, almond, and cherry, and the estimated yield of peach and nectarine is 0.50 t/ha in Himachal Pradesh (Ghosh, 2010). Nature has been abundantly generous to Himachal Pradesh in endowing it with conditions conducive for growing a large variety of major, minor and underused fruits. In India, Himachal Pradesh is a state that has made efforts to grow nectarine fruit (a hybrid of plum and peach) by the Horticulture Department in the Palampur area of Kangra district. The major commercial varieties (May Fire, Snow Queen, and Silver King) of nectarine are grown in Himachal Pradesh. Nectarines have yellow or white flesh, red peel, are stone-free, are round in shape, are resistant to handling and shipping, and have a high soluble solids (SS) content (Sortino *et al.,* 2013). Nectarines (*Prunus persica*) belong to the *Rosaceae* family and are described as fuzzless less skin. The nectarine fruits look more like plums than peaches because of the smooth and shiny skin that's why nectarine is also known as "Peach with a plum skin". The major difference between the nectarine and peach is that the nectarine has smooth skin and the peach has hairy or fuzzy skin, which makes the nectarine more attractive and palatable.

Shivani *et al.* (2021) reported that nectarine is a good source of β-carotenes (1.29 mg/100 g), phosphorous (26.07 mg/100 g), and potassium (200 mg/100 g). The enhanced use of nectarine in the form of intermediate moisture food products (jam and jelly) can bring about better nutrition, as these food products are highly popular and acceptable among children. Over the past few years, several programs, such as the National Health Mission, Integrated Child Development Scheme, Mid-Day Meal Programme, Nutrition Mission, *Poshyan Abhiyan,* etc., have been introduced by the government of India (GoI) to tackle the issue of malnutrition. In addition to these schemes, other ways, such as nutrition intervention through the development of energy-dense food products (jam and jelly) from superfruit (nectarine) and promotion of its consumption in the form of value-added products, are attractive options to alleviate malnutrition in developing countries (India) more sustainably. Overcoming the problem of the triple burden of malnutrition under five years is a major challenge not only in India but also globally. Hence, efforts were made to develop energy-dense food products (jam and jelly) from nectarine fruit, as the fruit is a powerhouse of nutrition. Garg et al. (2019) and Pereira et al. (2020) tried to develop a blended jam from blackberry and verified the sensory and commercial acceptance of a cashew jelly with pepper addition, respectively. The study was undertaken to develop and evaluate the nutritional and sensory qualities of jams and jellies prepared from different cultivars of nectarines.

MATERIALS AND METHODS

The three varieties of nectarine fruit viz. Snow Queen, May Fire, and Silver King were procured from the Horticulture Department, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidalya, Palampur (H. P), India. The fruits were kept under running water to remove adhering dirt. The nectarine cultivar pulp was obtained by the hot pulping method (Dhiman et al., 2018), in which fruits were washed, peeled, and destoned manually. Then, 15 ml water/100 g of cut fruit was added and heated in a pressure cooker for 10 minutes. The pulp obtained was sieved and stored in presterilized jars for the development of energy-dense food products (jam and jelly). The graphical overview of the study is given in Fig. 1.

Optimization of products

The IMF products (jam and jelly) from three selected nectarine cultivars were optimized in the Food Science Laboratory to obtain good-quality products in terms of sensory acceptability. The ingredients and quantities used for the development of food products are present-

Table 1. Optimization of jam and jelly from nectarine cultivars

Products	Jam			Jelly		
Varieties / Ingredients and quantity (g/ml)	Snow Queen	May Fire	Silver King	Snow Queen	May Fire	Silver King
Pulp (ml)	1000	1000	1000	1000	1000	1000
Sugar (g)	850	850	850	800	800	800
Citric acid (g)	2.50	2.50	2.50	2.0	2.0	2.0
Water (ml)	-	-	-	750	750	750
Pectin (g)	-	-	-	10.0	10.0	10.0

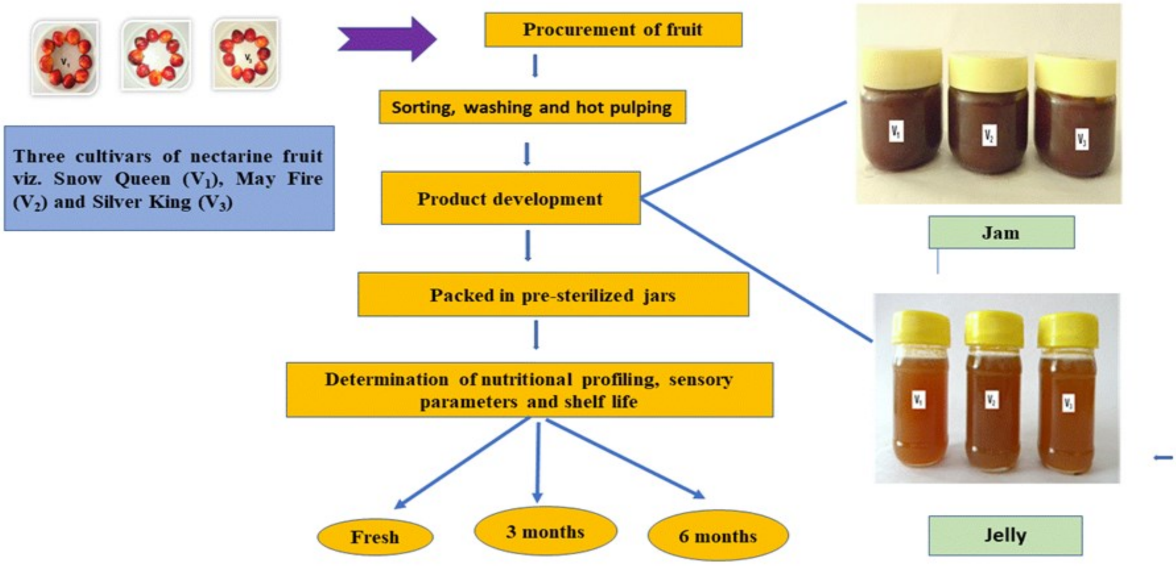

Fig. 1. *Graphical overview of the study*

ed in table 1. The procedure for the development of selected food products is illustrated below:

Preparation of jam

The fruit pulp of all the selected varieties and sugar were taken in a skillet and cooked at 100°C. The mixture was allowed to boil and continuously stirred. The material was cooked until the endpoint was reached (69°Brix). Then, citric acid was added by taking a small amount of cooked material in a bowl, mixing, and finally adding to the whole cooked material and mixing properly. The prepared jam was tested for its total soluble solids (TSS) content as per fruit product order specifications by using a hand refractometer and plate/bowl test. For testing of TSS, a refractometer was used wherein a cooled jam was placed on the prism of the calibrated refractometer, and the value was noted. In the plate/bowl test, a small amount of cooled jam was dropped in a bowl containing water, and displacement of the jam was noted. The jam was considered cooked when it was not flowing/dispersing. Finally, the gas was turned off. The prepared jam was cooled, filled in presterilized jars and capped after cooling. The jars were stored at room temperature.

Preparation of jelly

The fruits were washed, peeled and cut into small pieces. The pieces were then cooked for 20-30 minutes with water. The juice extract was strained with the help of a muslin cloth. The sugar and citric acid were added to the extract and boiled until the endpoint (68^0 Brix). The amount and ingredients used in the preparation of jelly are mentioned in table 1. The endpoint of the jelly was checked by using a hand refractometer. The jelly was cooled, poured into presterilized jars, and then stored at room temperature. To check the wholesomeness of the prepared products, they were analysed for nutritional and sensory parameters at different storage intervals (0, 3, and 6 months).

Nutritional parameters

The prepared intermediate moisture food products were evaluated for various nutritional parameters (TSS, pH, acidity, ascorbic acid, and sugars) at fresh, 3, and 6month storage intervals.

TSS

Total soluble solids were determined by using a hand refractometer. The cooled sample was placed on the prism of the calibrated refractometer, and the values were recorded as TSS ^{0}Brix.

pH

A digital pH meter (CRISON Instrument, Ltd., Spain) was used to analyze the pH of the sample. The pH of the samples was recorded by putting the samples in a glass beaker and a calibrated pH meter probe was placed in the beaker containing the sample, and readings were recorded.

Acidity

The Association of Official Analytical Collaboration (AOAC, 2000) method was followed for the determination of acidity, wherein a 5 ml sample was taken and transferred into a flask. The volume was made up to 50 ml with distilled water. A 5 ml aliquot was taken and titrated with 0.1 N NaOH, and phenolphthalein was used as an indicator. The end point was the development of a faint pink color that persisted for 15 seconds.

Sugars

Estimation of sugars was performed by the method of Ranganna (2017). A total of 25 g of sample was weighed and crushed in water to make a volume of 250 ml in a conical flask. Two millilitres of lead acetate was added to the solution, and after shaking well, it was kept for 10 minutes. A necessary amount of potassium oxalate was added to remove the traces of lead and filter through Whatman No. 1 filter paper. The filtrate was used for the estimation of reducing and total sugars.

For reducing sugars, 5 ml of each of Fehling's A and B solutions was placed in a conical flask. Sugar extract was taken in a burette and titrated against the oiling solution of Fehling's solution using methylene blue as an indicator. The appearance of brick red precipitates indicates the endpoint. For total sugars, 50 ml of sugar extract was transferred to a 100 ml volumetric flask, and 1 ml of concentrated HCL was added to it and kept for hydrolyzation overnight at room temperature. The solution was neutralized with saturated NaOH solution followed by a drop of phenolphthalein. Then, the solution was titrated as the reducing sugars. The nonreducing sugars were calculated by subtracting reducing sugars from total sugars and then multiplying by 0.95.

Ascorbic acid

Ascorbic acid was determined by AOAC (2000). A 5 ml sample was taken and blended with 3% HPO_3, and the volume was brought to 50 ml with HPO_3 and filtered. Then, a 5 ml aliquot was taken and titrated with standard dye to a pink color that persisted for 15 seconds.

Sensory evaluation

Sensory evaluation consists of judging the quality of food by a panel of judges. The evaluation deals with measuring, analysing, and interpreting the qualities of food as they are perceived by the sense of sight, taste, touch and hearing. The 9-Point Hedonic (Larmond, 1977) scale was used for the evaluation of products. The prepared products were subjected to 15 semi trained panellists. The panellists were selected according to the criteria of being free of any disease (cough, cold, etc.), neither being too hungry nor too well fed. Before evaluation, other parameters, such as identical containers, proper light in booth space, the temperature of products, limited numbers of samples for testing, etc., were also considered. As per the scale, panelists were asked to judge the samples (triplicate) for various parameters (colour taste, flavour, consistency, and overall acceptability). The scale was rated as liked extremely to dislike extremely, with scores varying from 9 to 1.

Experimental design and statistical analysis

The data obtained on various parameters were subjected to statistical analysis with the help of a computer using a controlled randomized block design with three replications. The data were analysed statistically by using a two-way analysis of variance at a P value of 0.05.

RESULTS AND DISCUSSION

Nutritional parameters of jam

Table 2 illustrates the effect of cultivar and storage on the nutritional parameters of nectarine jams as affected by variety and storage interval. The mean TSS values of the three varieties of nectarine for jam ranged from 69.56 to 69.89 °Brix. However, the TSS values of the nectarine jam decreased from 69.78 to 69.44 °Brix with the increase in the storage interval of 6 months.

The increase in TSS may be due to the formation of monosaccharides and disaccharides resulting from the hydrolysis of polysaccharides (Satkar *et al.,* 2012). A similar trend was noted in mixed fruit jams by Rana *et al.,* 2021. The same results were observed by Kumari and Sandal (2011) in a whey-mango-based jam during 6 months of storage. However, varieties had a nonsignificant impact on the pH values of nectarine jams. A declining trend in pH values was observed during storage, as the mean pH value on the initial day of storage was recorded as 2.90, which significantly decreased to 2.20 after 6 months of storage. The decrease in the pH values might be due to an increase in acidity and certain chemical reactions taking place during storage, leading to the production of organic acids. Kannan and Thirumaran (2004) reported similar trends in Jamun jam during storage for 6 months. The values for acidity differed nonsignificantly in terms of varieties. The acidity of the nectarine jam increased from 1.50 to 2.22 percent with the increase in the storage period. The increase in acidity might be due to inherited acidity present in nectarine pulp and to the formation of organic acids by degradation of ascorbic acid and utilization of sugars to yield organic acids. Kumari and Dhaliwal (2017) reported a similar trend in crab apple jams.

The variation in the ascorbic acid values among the three varieties of nectarine was found to be significant, as the mean values of ascorbic acid for three varieties of nectarine ranged from 2.80 to 3.39 mg/100 g. However, the mean values of ascorbic acid decreased from 4.64 to 1.66 mg/100 g with the increase in the storage period. The loss of ascorbic acid may be due to the oxidation of ascorbic acid in the stored product. Saravana *et al.* (2004) also observed the loss of ascorbic acid in papaya and whey-based mango jam with the advancement in the storage period. Saravana *et al.* (2004) and Kumari and Sandal (2011) also observed the loss of ascorbic acid in papaya and whey-based mango jam with the advancement in the storage period. Similar observations were reported in crab apple jams by Kumari and Dhaliwal (2017). According to the data,

Table 2. Effect of varieties and storage on the nutritional parameters of nectarine jam

Nectarine cultivars	Storage months			Mean
	0	3	6	
TSS (^{0}B)				
Snow Queen	69.67	69.67	69.33	69.56
May Fire	70.00	70.00	69.67	69.89
Silver King	69.67	69.67	69.33	69.56
Mean	69.78	69.78	69.44	69.67
pH				
Snow Queen	2.87	2.43	2.20	2.50
May Fire	2.90	2.37	2.23	2.50
Silver King	2.93	2.40	2.17	2.50
Mean	2.90	2.40	2.20	2.50
Acidity (% malic acid)				
Snow Queen	1.47	2.19	2.10	1.92
May Fire	1.52	2.14	2.19	1.95
Silver King	1.52	2.19	2.40	2.03
Mean	1.50	2.17	2.22	1.97
Ascorbic acid (mg/100 g)				
Snow Queen	5.13	3.20	1.83	3.39
May Fire	4.40	2.40	1.61	2.80
Silver King	4.40	3.20	1.54	3.05
Mean	4.64	2.93	1.66	3.08
Reducing sugars (%)				
Snow Queen	30.04	33.10	34.38	32.51
May Fire	30.00	32.85	33.84	32.23
Silver King	30.33	32.62	33.94	32.19
Mean	30.03	32.86	34.05	32.31
Nonreducing sugars (%)				
Snow Queen	27.23	22.21	20.54	23.33
May Fire	26.76	23.66	20.31	23.58
Silver King	26.84	23.34	20.33	23.50
Mean	26.94	23.10	20.40	23.47
Total sugars (%)				
Snow Queen	58.71	56.47	55.93	57.04
May Fire	58.28	57.33	55.22	56.94
Silver King	58.26	57.18	55.35	56.93
Mean	58.42	57.00	55.50	56.97

CD(P≤0.05)	TSS	pH	Acidity	Ascorbic acid	Reducing sugars	Nonreducing sugars	Total sugars
Between Varieties (A)	NS	NS	NS	NS	NS	NS	NS
Between Storage (B)	NS	0.08	0.16	1.06	0.89	1.34	0.89
Interaction (AxB)	NS	0.14	0.27	1.84	1.53	2.32	1.54

*CD = Critical difference; *NS = Nonsignificant

the reducing, nonreducing and total sugars increased significantly with the increase in storage period, and the values of all the sugars varied nonsignificantly among the varieties. However, the interaction between storage and variety had a significant impact on all the sugar contents of the nectarine jam. Kannan and Thirumaran (2004) and Kumari and Dhaliwal (2018) reported an increase in reducing sugars during 90 days and 9 months of storage in Jamun and wild peach jam. The decrease in nonreducing sugars might be due to the hydrolysis of nonreducing sugars to reducing sugars during storage. Singh *et al.* (2005) found a reduction in nonreducing sugars in bael jam blended with mango during a storage period of 6 months. Kumari and San-

Table 3. Effect of varieties and storage on the nutritional parameters of nectarine jelly

Nectarine cultivars	Storage months			Mean
	0	3	6	
TSS (^{0}B)				
Snow Queen	68.00	67.67	67.67	67.78
May Fire	67.67	67.33	67.33	67.44
Silver King	67.67	67.67	67.33	67.56
Mean	67.78	67.56	67.44	67.59
pH				
Snow Queen	2.73	2.63	2.53	2.63
May Fire	2.67	2.63	2.47	2.59
Silver King	2.70	2.53	2.43	2.56
Mean	2.70	2.60	2.48	2.59
Acidity(% malic acid)				
Snow Queen	1.48	2.10	2.36	2.00
May Fire	1.34	2.35	2.41	2.03
Silver King	1.39	2.06	2.41	2.00
Mean	1.40	2.17	2.40	2.01
Ascorbic acid (mg/100 g)				
Snow Queen	5.00	3.67	2.24	3.64
May Fire	4.00	2.93	2.00	3.00
Silver King	4.67	3.30	1.95	3.30
Mean	4.56	3.30	2.10	3.32
Reducing sugars (%)				
Snow Queen	30.32	34.89	34.90	33.40
May Fire	31.27	34.62	34.32	33.50
Silver King	30.44	35.19	35.17	33.60
Mean	30.68	34.90	34.90	33.50
Nonreducing sugars (%)				
Snow Queen	27.07	19.67	18.68	21.81
May Fire	26.81	20.90	19.26	22.32
Silver King	27.51	19.70	19.04	22.10
Mean	27.13	20.10	19.00	22.08
Total sugars (%)				
Snow Queen	58.82	55.60	54.56	56.33
May Fire	59.49	56.61	54.88	57.00
Silver King	59.41	55.93	55.21	56.85
Mean	59.24	56.05	54.88	56.73

CD(P≤0.05)	TSS	pH	Acidity	Ascorbic acid	Reducing sugars	Nonreducing sugars	Total sugars
Between Varieties (A)	0.02	0.07	NS	0.08	NS	NS	NS
Between Storage (B)	0.02	0.07	0.13	0.97	0.87	1.17	1.03
Interaction (AxB)	NS	0.12	0.24	1.68	1.53	2.02	1.79

*NS = Nonsignificant

dal (2011) reported a decrease in total sugars of Jamun and whey-based mango jam. These findings give credence to the present results.

Nutritional parameters of jelly

Table 3 indicates the effect of varieties and storage on the nutritional parameters of jelly. From the present data, it has been observed that TSS values varied significantly among the varieties when compared with each other. Storage intervals had a nonsignificant effect ($p \leq 0.05$) on the TSS of nectarine jelly. The slight decline in the TSS might have been due to the conversion of sugars into acid. The reason for the increase in TSS may be due to the formation of monosaccharides and disaccharides resulting from hydrolysis of polysaccharides (Satkar *et al.,* 2012). Similar results were observed by Kumari and Sandal (2011) in the storage of mango jam. The pH values of the nectarine jelly dif-

Table 4. Effect of varieties and storage on the organoleptic scores of nectarine jam

Parameters	Jam storage (months)			Mean	Jam storage (months)			Mean
	0	3	6		0	3	6	
Colour								
Snow Queen	8.20	8.10	8.10	8.13	6.90	6.90	7.00	6.93
May Fire	8.20	8.20	8.10	8.20	7.40	7.30	7.20	7.30
Silver King	8.10	8.00	8.00	8.03	7.40	7.20	7.10	7.23
Mean	8.20	8.10	8.10	8.13	7.23	7.13	7.10	7.15
Taste								
Snow Queen	8.30	8.20	8.10	8.20	7.10	7.00	7.10	7.07
May Fire	8.30	8.10	8.00	8.13	7.20	7.10	7.20	7.17
Silver King	8.20	8.00	8.00	8.10	7.20	7.00	7.10	7.10
Mean	8.30	8.10	8.03	8.14	7.17	7.03	7.13	7.11
Flavour								
Snow Queen	7.30	7.00	7.00	7.10	7.00	6.90	6.70	6.87
May Fire	7.00	7.00	7.00	7.00	7.00	7.00	6.80	6.93
Silver King	7.10	6.90	7.00	7.00	7.10	6.90	6.80	6.93
Mean	7.13	7.00	7.00	7.03	7.03	6.93	6.76	6.91
Consistency								
Snow Queen	8.10	8.00	7.90	8.00	7.20	6.90	6.90	7.00
May Fire	8.00	7.90	7.80	7.90	6.90	6.80	6.80	6.83
Silver King	7.20	7.90	7.50	7.53	6.80	6.60	6.60	6.67
Mean	7.80	8.00	7.73	7.81	6.97	6.77	6.77	6.83
Overall acceptability								
Snow Queen	8.04	7.79	7.79	7.87	6.94	6.92	6.93	6.93
May Fire	7.86	7.82	7.82	7.83	7.13	7.05	7.00	7.06
Silver King	7.71	7.64	7.50	7.62	7.13	6.95	6.90	6.99
Mean	7.87	7.75	7.70	7.77	7.07	6.97	6.94	6.99

CD(P≤0.05)	Colour	Taste	flavour	Consistency	Overall acceptability
Jam					
Between Varieties (A)	NS	NS	NS	0.33	0.22
Between Storage (B)	NS	NS	NS	NS	NS
Interaction (AxB)	NS	NS	NS	NS	NS
Jelly					
Between Varieties (A)	0.31	NS	NS	0.32	NS
Between Storage (B)	NS	NS	NS	NS	NS
Interaction (AxB)	NS	NS	NS	NS	NS

*NS = Nonsignificant

fered significantly with the increase in storage period. A significant impact was seen in the pH values of nectarine jelly among the varieties and interaction between varieties and storage. A declining trend in pH values was observed during storage, as the mean value of pH at the initial day of storage was recorded as 2.70, which significantly (p≤0.05) decreased to 2.48 after 6 months of storage. The decrease in pH values may be because of the formation of hydroxymethylfurfural (HMF) by hydration of sugar during processing and storage, which may lead to the conversion of HMF into levulinic and formic acids (LeBlanc *et al.,* 2009). Similar observations were reported by Kanwal *et al.* 2017 in guava jam. Rubio-Arraez *et al.* 2016 reported a decrease in TSS content during storage in citrus jelly. The percent acidity of nectarine jelly increased significantly with the increase in the storage period. However, the values for acidity differed nonsignificantly in terms of varieties. The increase in acidity might be due to the formation of organic acids by degradation of ascorbic acid and utilization of sugars to yield organic acids (malic acid). The mean values of ascorbic acid content for the three varieties of nectarine ranged from 3.00 to 3.64 mg/100 g. However, the mean values of ascorbic acid decreased from 4.56 to 2.10 mg/100 g with the increase in the storage period. The loss of ascorbic acid may be due to an increase in acidity in the stored product leading to the degradation of ascorbic acid to carbolic acid. Saravana *et al.* (2004) also reported similar findings while studying the storage behavior of papaya jams. Data pertaining to the mean values of reducing, nonreducing, and total sugar (%) content in nectarine jelly as affected by varieties varied nonsignificantly. However, the interaction between storage and varieties had a significant ($p \leq 0.05$) impact on the reducing, nonreducing, and total sugar content of the nectarine jelly. The mean values of reducing sugars increased from 30.68 to 34.90% from 0 to 6 months of storage. The increase in reducing sugars might have been due to the breakdown or conversion of carbohydrates to reducing sugars. The mean values of the three varieties of nectarine jelly for nonreducing and total sugars ranged from 21.81 to 22.32 percent and 56.33 to 57.00 percent, respectively. However, the mean values of nonreducing and total sugars decreased significantly from 27.13 to 19.00 and 59.24 to 54.88%, respectively, with the increase in the storage period.

Organoleptic scores of jam and jelly

The mean values of organoleptic scores of nectarine jam and jelly as affected by varieties and storage intervals are presented in Table 4**.** From the results obtained, it was observed that the organoleptic scores for colour, taste and flavour decreased nonsignificantly with the increase in the storage period. However, the interaction between varieties and storage also had a nonsignificant effect on the sensory scores for colour, taste and flavour of nectarine jelly. Varieties had a significant effect on the sensory scores of jelly color, but the values for taste and flavor differed nonsignificantly ($p \leq 0.05$). The mean scores for consistency and overall acceptability decreased from 6.97 to 6.77 and 7.07 to 6.94, respectively, with the increase in the storage period. A decrease in colour might be due to an increase in tannins, which lead to browning. However, the decreased taste and flavour scores might be due to the degradation of volatile flavouring. Kumari and Sandal (2011) and Kumari *et al.* 2013 observed a decreasing trend in the overall acceptability of whey-based mango jam and quince jam with increasing storage period. Banas *et al.* (2018) reported a decrease in sensory scores during storage in gooseberry jams enriched with plant ingredients with health properties.

Conclusion

The study revealed that nectarine is a powerhouse for the nutrition and development of functional food products such as jam and jelly, a popular food item among children that can mitigate the triple burden of malnutrition in developed and developing countries. The results revealed that storage intervals and varieties significantly affected nutritional parameters viz., pH, acidity, ascorbic acid, reducing, nonreducing and total sugars of jam and jelly. The sensory scores for the color of jam and jelly slightly declined during storage for 6 months, with mean values ranging from 8.20-8.10 and 7.23-7.10, respectively. Similar observations were recorded for taste, flavor, and consistency in both products. Organoleptically, nectarine jam was rated as 'liked very much. The overall acceptability of nectarine jelly decreased with increasing storage period and was rated as 'liked slightly'. Among the three varieties of nectarine used for value addition, the variety Snow Queen was best suited for preparing jam, whereas the variety May Fire was best suited for jelly.

Conflict of interest

The authors declare that they have no conflict of interest.

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