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Preparation and Evaluation of Pear and Grapes Blended Leather

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Abstract. Pear pulp and grapes juice were used in different ratios (100:0, 90:10, 80:20, 70:30, 60:40, 50:50) for the preparation of leather. The treatments were prepared with different concentration of pulp and constant level of sucrose and preservatives. The experiment was laid out in a complete randomized design (CRD). The effects of storage and treatments were studied for three months of storage with an interval of 15 days. Various parameters such as moisture, percent acidity, total soluble solids, water activity, ascorbic acid content, reducing sugar, non-reducing sugar and sensory attributes i.e. colour, taste, texture and overall acceptability were studied. Significant differences were observed in all the studied parameters. A decrease was recorded in moisture (16.02 to 13.76%), ascorbic acid content (13.21 to 6.64 mg/100g), non-reducing sugar (67.02 to 64.76%) and water activity (0.50 to 0.45), while an increase was recorded in titratable acidity (0.88 to 1.01%), TSS (76.68 to 79.05 °brix) and reducing sugar (11.43 to 11.85%). Base on organoleptic evaluation T_3 was found most acceptable during storage. The combination of 70% pear pulp and 30% grapes juice for leather preparation proved to be the best combination in terms of extending the shelf life and improving the quality of pear and grapes blended leather during storage.

Keywords: pear, grapes, leather, storage time, physico-chemical properties, sensory properties

Introduction

Pear fruit belonging to family Rosaceous and known as a close colleague of apple but then some differences and gentle aroma makes this fruit distinctive. The pear is chiefly used in patties, cubes, associated solid cheese or carpaccio, risotto, jams, and ice emulsions and is an abundant fruit to be used up in foods because of its little caloric rate. It has great dietetic value with sensible quantities of vitamins A, B1, B2, B3, and C and reserves like sodium, potassium, phosphorus, calcium, magnesium, and iron. It has a low amount of fiber, charitable outstanding results in dealing of constipation and intestine inflammation. Many mention pears as a treatment for abnormalities such as cystitis and kidney stones. (Gonsalves, 2002)

The most important species of the family Vitaveae are the European grapes (*Vitis vinifera*). Other two important commercial species are *Vitis rotundifolia* (muscadine grape) and *Vitis labrusca* (American grapes). In mild subtropical condition the European grapes are grown, while in temperate conditions the other two species grow well. Attached to the thick skin Vinifera grapes have sweet pulp. Mascadine grapes and American grapes have large seeds and small bunches. The grapes have strong musky flavour and fall frequently from bunches. (Chaudhary *et al*., 1999). Grapes juice product has been used in health research studies, has shown to be beneficial against cancer of early stage (Jung *et al*., 2006). Damage bodily act and psychological keenness during elderly (Shukitt *et al*., 2006). During grapes growth the weather plays important role for grapes maturity, ripening, change in physical and chemical character of grape quality such as size, aroma, colour and buildup of anthocyanin (Jackson and Lombard, 1993). For the table grape industry, the quantity and the quality of grapes is totally dependent on climate. (White *et al*., 2009)

Fruit bar and fruit slab are also the name used for fruit leather, and it is the dehydration of fruit juice and pulp with the addition of some confectionery and usually taken as a snack food (Raab and Oehler, 1976). It is full of flavour and chewable, naturally fruit leather are low in fat and carbohydrate fiber are in high amount. Due to its light weight they are easy to store and packed. (Ayotte, 1980) Fruit leather consumption is commercial nowadays suitable substitute is also added to the fruit leather for maintaining natural food flavor and various nutritional elements. Other snack food have high Kcal then the fruit leather, which is less than the 100 Kcal per serving (Huang and Hsieh, 2005). Specific fruit

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were used for the formation of fruit leather. Fruit leathers are mostly made from fruit juice with pulp and other ingredients and a complex method which have dehydration step (Maskan *et al*., 2002). In the current growing market of fruit leathers, commercial packaging is necessary. Packaging material of the fruit leather should gave long shelf life to the product and normally, relate to the stability of water activity, microbiological stability, sensory properties, and physico-chemical characteristics (Irwandi *et al*., 1998).

In terrestrial plant the primary cell wall has structural hetero polysaccharide substance known as pectin (from ancient Greek "congealed curdled"). Pectin was first insulated and describe in 1825 by Henri Braconnot (Braconnot, 1825). Pectin are commercially produced as white to brown color powder, and extracted from citrus fruit and used as a gelling agent in food processing specially in jams and jellies. It is also used in pudding filling, medicine and confectioneries are used as chemical addition in fruit juices and milk drinks and as dietary fiber. In the cell wall of plant tissue, pectin is present and act like intercellular cement, and give rigidity to the plant. In fruit, vegetable, legumes and nuts the concentration of pectin compound is about to 15% to 30% (Marlett, 1992). In the root of most plant pectin are also found (Liu and Krishnan, 1999). In food industry pectin are used to give structure and quality to jams and sweets jellies and other gummy foodstuffs.

Keeping in view the above facts, the present research work was conducted to develop a value added product from pear and grapes fruit and to study its response to the storage.

Materials and Methods

Selection of fruit and preparation of juice. ***Selection of fruit.*** Pear and grapes fruit was purchased from local market and carried to Food Technology Research Institute of Agriculture Tarnab Peshawar. Sorting was done to eliminate unhealthy, injured and unripens fruit. Grapes were washed with tap water to eliminate dirt, dust and chemical residues. Destoning was done properly before processing. Fruit pulper was used to obtain the pear pulp.

Leather preparation. For leather preparation, pear pulp and grapes juice was taken at different proportions as given in plan of work. Dehydrator (Mitchell dryer, model 7230/60) was used to dry the leather sheet at a temperature of 50 °C for 24 h (Che Man and Sin, 1997).

Plan of work. T_o = 100% pear + 0% grapes + 2% pectin + 10% sucrose; T_1 = 90% pear + 10% grapes + 2% pectin + 10% sucrose; T_2 = 80% pear + 20% grapes + 2% pectin + 10% sucrose; T_3 = 70% pear + 30% grapes + 2% pectin + 10% sucrose; T_4 = 60% pear + 40% grapes + 2% pectin + 10% sucrose; T_5 = 50% pear + 50% grapes + 2% pectin + 10% sucrose.

Physio-chemical analysis. Physio-chemically the treatments were analyzed for pH, non-reducing sugar, ascorbic acid, TSS, moisture content, reducing sugar, and % acidity.

Oragano-laptic evaluation. The osmotic dried plum slices were assessed organo-laptically for texture, flavour, colour, and overall acceptability by the panel judges. The assessment was carried out using 9 point hedonic scale of Larmond (1977).

Statistical analysis. The data was analyzed using analysis of variance technique as outlined for CRD two factorial according to Steel and Torrie (1997). Means were separated by applying LSD test at 0.05% significant level as described.

Result and Discussion

Physio-chemical results. ***Total soluble solids (°brix).*** In this research, gradual increase in total soluble solids was recorded of all sample throughout the storage period. The mean value of pear and grapes blended leather for total soluble solids increase from (76.68%) to (79.05%) during the storage period. Highest mean value for treatment was found in PGL_5 (80.24%) followed by PGL_4 (79.74%) and on other hand the lowest mean value were seen in PGL_o (71.90%) followed by PGL_1 (77.66%). Highest raise in TSS during storage was notice in PGL_o (3.55%) followed by PGL_1 (3.30%), while lowest raise was recoded in PGL_2 (2.16) during three month of storage as shown in Table 1. Statistically both the treatments and storage had a significant ($p<0.05$) effect on pear and grapes blended leather. The increase in TSS might be due to the makeover of starch and other insoluble carbohydrates into sugars and also due to the loss of moisture content that tend to increase in total soluble solids. Similar result Kaleem *et al*. (2016) reported that increase in the TSS of strawberry leather (80.96 to 83.04 °brix). The increase in the TSS was also reported in guava leather during storage time by Chavan and Shaik (2015) and Shakoor *et al*. (2015) also reported the increase in the total soluble solids of guava bar (61.85 to 63.70). Majid *et al*. (2014) also revealed that the increase in the TSS (74.6 to 76.5 ºbrix) of guava bar during storage.

Ascorbic acid (mg/100g). During storage the ascorbic acid content decreases due to the oxidation in the ascorbic acid into hydro ascorbic acid followed by hydrolysis. In the pear and grapes blended leather the ascorbic acid was affected by both treatment and storage. Higher ascorbic acid content mean data observed on PGL_5 (12.05%) and lower ascorbic acid content observed in PGL_o (7.75%). From the data presented here showed that sample PGL_5 (54.09%) has loss more ascorbic acid as compare to the remaining pear and grapes blended leather during three months of storage as shown in Table 2. Statistically both the treatments and storage had a significant ($P<0.05$) effect on pear and grapes blended leather. Similar result were found by Shakoor *et al.* (2015) they observed that there was a decrease in the ascorbic acid content of the guava bars during the three months of storage (3.87 to 3.69). Ascorbic acid content decrease in the range of 92.34 to 74.42 mg/100 g at room temperature. The decrease in the ascorbic acid content is due to the heat treatment and long storage time by Safdar *et al*. (2014). Majid *et al*. (2014) also reported the decrease in the ascorbic acid of guava bar from (92.75 to 77.82 mg/100 g), Decrease in the ascorbic acid content was also reported in strawberry leather (34.41 to 25.53) by Kaleem *et al*. (2016).

Moisture (%). In this research work there was gradual decrease in moisture was recorded of all sample throughout the storage period. Both storage and treatment has significant effect on the moisture content of pear and grapes blended leather. Higher moisture content was observed in sample PGL_5 (16.36%) and sample PGL_o contains the lowest moisture content (9.78%). The maximum moisture content decrease during storage was observed in sample PGL_o (20.81%) and the minimum moisture content decrease was reported in sample PGL_3 (11.83%) during three month of storage as shown in Table 3. Statistically both the treatments and storage had a significant ($P<0.05$) effect on pear and grapes blended leather. However below this moisture content range the microbial growth and activity are inhibited beside the Europhilic mold and osmophilic yeast (Jay *et al*., 2005). On other hand Chavan and Shaik (2015) described the decrease in moisture content of guava leather during the period of storage decrease (15.85 to 14.67%). They also mention that at room temperature the decrease in moisture content of guava leather in high. Irwandi *et al*. (1998) also reported the reduction in the moisture content of durian fruit leather (15.82 to 14.36%) respectfully. Majid *et al*. (2014) also reported the decrease in the moisture content from (18.17 to 13.53%).

Water activity (a_w). Mean value of a_w decreased from (0.50 to 0.45) during the period of storage. Maximum mean value for treatment was observed in PGL_5 (0.52) followed by PGL_4 (0.51). On other hand minimum mean value were noted in PGL_o (0.41) followed by PGL_1 (0.44) respectively. During storage, maximum fall of a_w was observed in PGL_o (13.33%) followed by PGL_1 (10.87%). On other hand minimum fall was observed in PGL_3 (5.77%) followed by PGL_5 (7.41%) during three month of storage as shown in Table 4. Statistically both the treatments and storage had a significant ($P<0.05$) effect on pear and grapes blended leather. The decrease in a_w is due to the association of added sucrose and water by hydrogen bonding. The water passage of the product at surface is slow because invert sugar acts as bonding agent. Babalola *et al*. (2002) observed the decrease in a_w of guava leather (0.64 to

Table 1. Effect of storage and treatment on TSS (°brix) of pear and grapes blended leather

Treatment	Storage intervals							% Inc	Means
	Initial	15	30	45	60	75	90		
	Total soluble solids (°brix)								
PGL_o	70.6	70.9	71.4	71.9	72.4	72.9	73.2	3.55	71.90e
PGL_1	76.3	76.7	77.2	77.7	78.2	78.6	78.9	3.30	77.66d
PGL_2	77.1	77.3	77.5	77.8	78.2	78.6	78.8	2.16	77.90c
PGL_3	78.5	78.7	79.3	79.8	80.2	80.7	80.9	2.97	79.73b
PGL_o	78.5	78.7	79.2	79.7	80.2	80.8	81.1	3.21	79.74b
PGL_o	79.1	79.3	79.8	80.2	80.7	81.2	81.4	2.83	80.24a
Means	76.68g	76.93f	77.40e	77.85d	78.32c	78.80b	79.05a		

The different small alphabets show statistical difference ($P<0.05$) from each other.

Table 2. Effect of storage and treatment on Ascorbic acid (mg/100g) of pear and grapes blended leather

Treatment	Storage intervals							% Dec	Means
	0	15	30	45	60	75	90		
	Ascorbic acid (mg/100 g)								
PGL_o	10.56	9.13	8.58	7.48	6.6	6.38	5.5	47.92	7.75d
PGL_1	11.22	9.68	9.02	8.45	7.04	6.85	5.7	49.20	8.28d
PGL_2	12.1	11.44	10.56	9.14	8.36	7.21	6.11	49.50	9.27c
PGL_3	13.94	12.57	11.1	9.67	8.56	7.86	7.51	46.13	10.17b
PGL_4	14.08	12.98	11.67	10.13	9.24	8.15	7.05	49.93	10.47b
PGL_5	17.38	15.84	12.76	10.91	10.17	9.34	7.98	54.09	12.05a
Means	13.21a	11.94b	10.62c	9.30d	8.33e	7.63e	6.64f		

The different small alphabets show statistical difference (P<0.05) from each other.

Table 3. Effect of storage and treatment on moisture (%) of pear and grapes blended leather

Treatment	Storage intervals							% Dec	Means
	0	15	30	45	60	75	90		
	Moisture (%)								
PGL_o	11.07	10.28	10.01	9.78	9.45	9.12	8.76	20.87	9.78e
PGL_1	16.57	16.34	16.01	15.78	15.45	15.05	14.12	14.79	15.62d
PGL_2	16.77	16.45	16.21	15.87	15.55	15.12	14.67	12.52	15.81c
PGL_3	17.57	17.32	16.98	16.65	16.12	15.89	15.45	12.07	16.57a
PGL_4	16.77	16.51	16.12	15.76	15.34	14.95	14.45	13.83	15.70cd
PGL_5	17.39	17	16.76	16.41	16.11	15.76	15.12	13.05	16.36b
Means	16.02a	15.65b	15.35c	15.04d	14.67e	14.32f	13.76g		

The different small alphabets show statistical difference (P<0.05) from each other.

Table 4. Effect of storage and treatment on water activity (a_w) of pear and grapes blended leather

Treatment	Storage intervals							% Dec	Means
	0	15	30	45	60	75	90		
	Water activity (a_w)								
PGL_o	0.45	0.42	0.42	0.41	0.40	0.39	0.39	13.33	0.41f
PGL_1	0.46	0.45	0.45	0.44	0.43	0.42	0.41	10.87	0.44e
PGL_2	0.47	0.47	0.46	0.45	0.44	0.43	0.43	8.51	0.45d
PGL_3	0.52	0.51	0.51	0.50	0.50	0.49	0.49	5.77	0.50c
PGL_4	0.53	0.53	0.52	0.51	0.50	0.49	0.49	7.55	0.51b
PGL_5	0.54	0.53	0.52	0.51	0.51	0.50	0.50	7.41	0.52a
Means	0.50a	0.49b	0.48c	0.47d	0.46e	0.45f	0.45f		

The different small alphabets show statistical difference (P<0.05) from each other.

0.61). Similar, result was also reported and showed that decrease in water activity in pear fruit leather (0.44 to 0.37) and Irwandi *et al*. (1998) studied the decrease in a_w of durian fruit leather (0.597 to 0.573). Shakoor *et al.* (2015) also reported the decrease in the water activity of guava bar during storage (from 0.68 to 0.62).

Reducing sugar (%). The reducing sugar content of the pear and grapes blended leather was affected during storage. During storage the maximum reducing sugar content was observed (11.85%) at 90 days of storage and minimum reducing sugar content was observed (11.43%) at day first storage. This is revealed from the mean data that sample PGL_5 (13.71%) has high reducing sugar content and sample PGL_o (10.33%) has lower reducing sugar content. So, from presented data here showed that sample PGL_1 (3.92%) has loss more reducing content as compare to the remaining pear and grapes blended leather during three month of storage as shown in Table 5. Statistically both the treatments and storage had a significant (P<0.05) effect on pear and grapes blended leather. Similar result showed by Chavan and Shaik (2015) stated that reducing sugar content increase with the increase in progress of storage period. The reducing sugar increase in the guava leather sample during storage period because it might be the inversion of sugar into its monomers. The formation of monosaccharide from the polysaccharide is the main cause of increasing in the reducing sugar. Sharma *et al*. (2013) observed the reducing sugar which increases from (43.1 to 49.8). Similar result of increasing reducing sugar was observed in pineapple leather by Phimpharian *et al*. (2011). Majid *et al*. (2014) reported the increase in reducing sugar (10.52 to 10.70%) during storage. Increase in the reducing sugar (from 14.16 to 14.41) of guava bar during storage was also reported by Shakoor *et al.* (2015).

Titratable acidity (%). The total acidity of the pear and grapes blended leather was affected significantly during treatment and storage. The highest titratable acidity was recorded in sample PGL_5 (1.02%) and lowest titratable acidity was observed in sample PGL_o (0.89%). The maximum total acidity (1.01%) during the period of storage was recorded at initial day. And minimum total acidity (0.88%) was revealed after ninety days. However, data showed that sample PGL_o revealed maximum increased in titratable acidity (16.33%) then the remaining pear and grapes blended leather during three month of storage as shown in Table 6. Statistically both the treatments and storage had a significant (P<0.05) effect on pear and grapes blended leather. Acidity of the pear and grapes blended leather increase down the treatment because of the grapes juice. Down the treatment the ratio of grapes juice increase which result increase in acidity. Oxidation of reducing sugar causes the increase in weak ionized acid and their salt which result the increase in the acidity of the product by Iqbal *et al*. (2001). Same result was revealed by Chavan and Shaik (2015), they stated the increase in the total acidity in the leather of guava as a whole. At room temperature it increase (0.476 to 0.518%), while at low temperature it increase (0.476 to 0.506%) during the 3 month of storage period. Similar result was observed by Jain and Nema (2007) in guava leather, whose acidity increase from 0.42 to 0.48 and in mongo bar which increase from 0.37 to 0.44 Effah-manu *et al*. (2013).

Non-reducing sugar (%). The non-reducing sugar content of pear and grapes blended leather was affected significantly during storage. This is revealed from the mean data that higher non reducing sugar content was observed in sample PGL_3 (67.57%) and lower non reducing sugar content was observed in sample PGL_o (60.78%). During storage maximum non reducing sugar content was observed (67.02%) at day first, while minimum non reducing sugar content was observed (64.76%) during three month of storage as shown in Table 7. Statistically both the treatments and storage had a significant (P<0.05) effect on pear and grapes blended leather. However, from the given data here displayed that sample PGL_o has lost more non reducing sugar content (3.72) as compare to the remaining pear and grapes blended leather. Similarly Hussain *et al.* (2004) also conduct research work and they noticed that the decrease in non-reducing sugar range from (8.82 to 7.3). Same result was also found by rao and roy (1980) mango leather. Similar result was reported in guava leather by Chavan and Shaik (2015). Majid *et al*. (2014) also reported the degradation in non-reducing sugar (from 3.78 to 3.60) in guava bar during storage.

Sensory evaluation. ***Colour.*** The colour of pear and grapes blended leather was affected significantly during storage. The higher colour from the mean data was recorded in sample PGL_3 (7.27%) and lower colour content were recorded in sample PGL_o (5.13%). During storage on day one maximum colour (8.10%) was observed, while minimum colour (5.20%) was observed after 90 days of storage. However, from the given data it indicated that sample PGL_o has lost more colour (44.78%) then the rest of the pear and grapes blended leather during three month of storage as shown in Table 8. Statistically both the treatments and storage had a significant (P<0.05) effect on pear and grapes blended leather. By the increasing of dry time and temp in leather formation, the colour also affected by Korkida *et al*. (1998). Same result were originated by Chavan and Shaik (2015) they described that there was regular decrease in colour range from 8.35 to 7.45 at ambient temperature, while in refrigerated temperature 8.35 to 7.80 was recorded at 3 month storage. Similar result of decreasing of colour score from 8.10 to 7.12 observed by Jain and Nema (2007). Kaleem *et al*. (2016) also reported the decrease in colour score of strawberry leather (8.17 to 5.10).

Table 5. Effect of storage and treatment on reducing sugar (%) of pear and grapes blended leather

Treatment	Storage intervals							% Inc	Means
	0	15	30	45	60	75	90		
	Reducing sugar (%)								
PGL_o	10.10	10.19	10.27	10.35	10.41	10.48	10.51	3.90	10.33f
PGL_1	10.30	10.38	10.45	10.51	10.58	10.65	10.72	3.92	10.51e
PGL_2	10.90	10.95	11.01	11.12	11.18	11.24	11.3	3.54	11.10d
PGL_3	11.50	11.57	11.62	11.69	11.75	11.81	11.88	3.20	11.69c
PGL_4	12.30	12.37	12.45	12.53	12.59	12.67	12.76	3.61	12.52b
PGL_5	13.48	13.57	13.65	13.71	13.76	13.84	13.94	3.30	13.71a
Means	11.43g	11.51f	11.58e	11.65d	11.71c	11.78b	11.85a		

The different small alphabets show statistical difference (P<0.05) from each other.

Table 6. Effect of storage and treatment on acidity (%) of pear and grapes blended leather

Treatment	Storage intervals							% Inc	Means
	0	15	30	45	60	75	90		
	Acidity (%)								
PGL_o	0.82	0.85	0.86	0.89	0.91	0.95	0.98	16.33	0.89e
PGL_1	0.83	0.86	0.87	0.88	0.91	0.94	0.96	13.96	0.89e
PGL_2	0.87	0.89	0.92	0.94	0.95	0.97	0.99	12.12	0.93d
PGL_3	0.89	0.92	0.93	0.95	0.96	0.98	1.01	11.98	0.95c
PGL_4	0.91	0.94	0.96	0.98	1.02	1.04	1.05	13.33	0.99b
PGL_5	0.95	0.97	0.99	1.02	1.05	1.07	1.09	13.30	1.02a
Means	0.88g	0.91f	0.92e	0.94d	0.97c	0.99b	1.01a		

The different small alphabets show statistical difference (P<0.05) from each other.

Table 7. Effect of storage and treatment on non-reducing sugar (%) of pear and grapes blended leather

Treatment	Storage intervals							% Dec	Means
	0	15	30	45	60	75	90		
	Non-reducing sugar (%)								
PGL_o	62.07	61.28	61.01	60.78	60.45	60.12	59.76	3.72	60.78e
PGL_1	67.57	67.34	67.01	66.78	66.45	66.05	65.12	3.63	66.62d
PGL_2	67.77	67.45	67.21	66.87	66.55	66.12	65.67	3.10	66.81c
PGL_3	68.57	68.32	67.98	67.65	67.12	66.89	66.45	3.09	67.57a
PGL_4	67.77	67.51	67.12	66.76	66.34	65.95	65.45	3.42	66.70cd
PGL_5	68.39	68.00	67.76	67.41	67.11	66.76	66.12	3.32	67.36b
Means	67.02a	66.65b	66.35c	66.04d	65.67e	65.32f	64.76g		

The different small alphabets show statistical difference (P<0.05) from each other.

Texture. During storage the texture of pear and grapes blended leather was affected significantly (P<0.05). From the mean data this is revealed that greater texture score percent was observed in sample PGL_3 (7.70%) and sample PGL_o hold the lower texture content (5.26%). The maximum texture (8.30%) during storage was observed at day one, while minimum texture (5.52%) was observed after three months of storage interval. However, from the given data presented here exposed that sample PGL_o has loss more texture (52.70%) as compare to the remaining pear and grapes blended leather samples during three month of storage as shown in Table 9. Statistically both the treatments and storage had a significant (P<0.05) effect on pear and grapes blended leather. Different genetic setup of fruit, the speed of water uptake and protein content might be the factor which is responsible for variation in leather texture by Babalola *et al*. (2000). The decrease in texture was also found by Chavan and Shaik (2015) in guava bar. At room temperature the texture of the leather decreases with the range of (8.27 to 7.56), whereas in refrigerated temperature the texture of leather decreases in the range of 8.27 to 7.80. Similar result was observed in the reduction of texture score from 7 to 6 by Jain and Nema (2007).

Taste. During storage the taste of pear and grapes blended leather affected significantly (P<0.05). This is discovered from the mean data that higher taste was observed in sample PGL_3 (7.70%) and lower taste content was observed in sample PGL_o (5.66%). Maximum taste was observed during storage in sample (8.05%) at day one, and minimum taste was observed in sample (5.10%) after 90 days of storage. However, data presented here showed that sample PGL_o has loss more taste (48.00%) as compare to the remaining pear and grapes blended leather during three months of storage as shown in Table 10.

Statistically both the treatments and storage had a significant (P<0.05) effect on pear and grapes blended leather. Increase in acidity and increase in total sugar are responsible for the product taste degradation by Che-Man and Sanny (1996). Related outcome was described by Chavan and Shaik (2015) that showed the regular decrease in the score of taste for guava leather 8.30 to 7.49 at ambient temperature and from 8.30 to 7.98 at refrigerated temperature. In guava leather the decrease in the taste score was more at ambient temperature as compare to the refrigerated temperature. Similar result was also observed in guava leather from 7.42 to 5.37 by Shakoor *et al*. (2015). Kaleem *et al*. (2016) also reported the decrease in taste score of strawberry leather (8.37 to 6.04) during storage.

Overall acceptability. During storage the overall acceptability of pear and grapes blended leather was affected significantly (P<0.05). High overall acceptability from the mean data was observed in sample PGL_3 (7.56%) and sample PGL_o (5.35%) contains lower overall acceptability. Maximum overall acceptability during storage was observed in sample (8.15%) at initial day, while lowest overall acceptability (5.27%) was documented after ninety days of storage. However, sample PGL_o (48.61%) loss more overall acceptability as compare to other pear and grapes blended leather from the presented data during three month of storage as shown in Table 11. Statistically both the treatments and storage had a significant (P<0.05) effect on pear and grapes blended leather. Overall acceptability related to all sensory characteristics. Alike outcome was found by Chavan and Shaik (2015) they stated that there was regular decline in the score of overall acceptability from (8.38 to 7.53) at room temperature and at refrigerated temperature the overall acceptability score 8.38 to 7.78. It was observed that decrease in overall acceptability was faster at ambient temperature as compare to refrigerated temperature. Karmas and Harris (1998) observed that overall acceptability of vegetable and fruit are greatly affected by their flavour. Similar decline in the overall acceptability was observed in guava leather from 7.53 to 5.48 Shakoor *et al*. (2015).

Table 8. Effect of storage and treatment on mean score of judges for colour of pear and grapes blended leather

Treatment	Storage intervals							% Dec	Means
	0	15	30	45	60	75	90		
	Color score								
PGL_o	6.7	6.2	5	5.4	4.1	4.8	3.7	44.78	5.13d
PGL_1	8.6	7.4	6.8	6.5	6	5.6	4.8	44.19	6.53c
PGL_2	8.5	7.4	6.5	6.3	6	5.5	5.1	40.00	6.47c
PGL_3	8.4	7.9	7.5	7.1	6.4	6.7	6.9	17.86	7.27a
PGL_4	8.4	7.6	7.4	7	6.7	6.5	5.2	38.10	6.97ab
PGL_5	8	7.7	7.1	6.5	6.3	5.8	5.5	31.25	6.70bc
Means	8.10a	7.37b	6.72c	6.47c	5.92d	5.82d	5.20e		

The different small alphabets show statistical difference (P<0.05) from each other.

Table 9. Effect of storage and treatment on mean score of judges for texture of pear and grapes blended leather

Treatment	Storage intervals							% Dec	Means
	0	15	30	45	60	75	90		
	Texture score								
PGL_o	7.4	6.6	5.4	5.7	4.5	3.7	3.5	52.70	5.26d
PGL1	8.5	7.6	6.9	6.4	5	5.4	4.6	45.88	6.34c
PGL2	8.5	8.1	7.8	7.7	7.2	6.8	6.5	23.53	7.51a
PGL3	8.6	8.4	7.9	7.8	7.6	6.9	6.7	22.09	7.70a
PGL4	8.4	7.7	7.3	6.8	6.6	6.3	6.2	26.19	7.04b
PGL5	8.4	7.6	7.2	6.7	6.4	6.1	5.6	33.33	6.86b
Means	8.30a	7.67b	7.08c	6.85c	6.22d	5.87de	5.52e		

The different small alphabets show statistical difference (P<0.05) from each other.

Table 10. Effect of storage and treatment on mean score of judges for taste of pear and grapes blended leather

Treatment	Storage intervals							% Dec	Means
	0	15	30	45	60	75	90		
	Taste score								
PGL_o	7.5	6.7	6.2	5.9	5	4.4	3.9	48.00	5.66d
PGL_1	7.4	7.2	6.8	6.3	5.7	5.8	4.3	41.89	6.21c
PGL_2	8.4	8.3	7.6	7.4	6	6.4	5.1	39.29	7.03b
PGL_3	8.5	8.4	8	7.9	7.5	7	6.6	22.35	7.70a
PGL_4	8.5	7.8	7.5	7	6.8	6.4	5.5	35.29	7.07b
PGL_5	8	7.5	6.8	6.6	6.1	5.5	5.2	35.00	6.53c
Means	8.05a	7.65b	7.15c	6.85c	6.18d	5.92d	5.10e		

The different small alphabets show statistical difference (P<0.05) from each other.

Table 11. Effect of storage and treatment on mean score of judges for overall acceptability of pear and grapes blended leather

Treatment	Storage intervals							% Dec	Means
	Initial	15	30	45	60	75	90		
	Overall acceptability score								
PGL_o	7.2	6.5	5.5	5.7	4.5	4.3	3.7	48.61	5.35e
PGL_1	8.2	7.4	6.8	6.4	5.6	5.6	4.6	44.08	6.36d
PGL_2	8.5	7.9	7.3	7.1	6.4	6.2	5.6	34.25	7.00b
PGL_3	8.5	8.2	7.8	7.6	7.2	6.9	6.7	20.78	7.56a
PGL_4	8.4	7.7	7.4	6.9	6.7	6.4	5.6	33.20	7.03b
PGL_5	8.1	7.6	7.0	6.6	6.3	5.8	5.4	33.20	6.70c
Means	8.15a	7.56b	6.98c	6.72c	6.11d	5.87d	5.27e		

The different small alphabets show statistical difference (P<0.05) from each other.

Conclusion and Recommendation

It is concluded from the present study that pear and grapes can be blended to prepare a nutritious fruit leather. The treatment PGL_5 secure the highest score in term of physiochemical analysis whereas PGL_3 was best regarding to sensory evaluation. Therefore, the ratio, 70% pear pulp and 30% grape juice can be used to prepare good quality leather having a higher acceptability as well as storage stability. It is recommended to study the effect of other thickening agents and packaging materials, to used different ratio of pectin, and to improve the quality by standardizing the thickness of the leather sheet.

Conflict of Interest. The authors declare no conflict of interest.

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