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Plum Drying Optimization: An Assessment Through Osmo-Dehydration

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The aim of the study was to formulate the stable combination of osmotic agent for dehydration/drying of plum fruit based on physiochemical parameters, moisture, water activity and microbial load. The treatments were made DP_0 (control), DP_1 (40% glucose), DP_2 (40% sucrose), DP_3 (40% honey), DP_4 (20% glucose + 20% sucrose), DP_5 (20% glucose + 20% honey), DP_6 (20% sucrose + 20% honey), DP_7 (13.3% glucose + 13.3% sucrose +13.3% honey). The plum slices were immersed in these treatments for 24 hrs and were dried in cabinet drier at 60^0C. Results indicated that a significant increase (P≤0.01) was observed in TSS (from 54.38-65.68), acidity (from 1.12-1.58%) and reducing sugar (from 51.47-61.49%). A significant decrease (P≤0.01) was examined in pH (from 3.70-2.94), ascorbic acid (from 11.62-8.34mg/100g), moisture (from 13.17 – 10.12 %), and non-reducing sugar (from 28.73-24.18%). The mean score of 10 judges showed a significant decrease (P≤0.01) in color (from 7.28-6.06), flavor (from 7.29-5.26), texture (from 7.76-7.24) and overall acceptability (from 6.98-5.92). the microbial load and water activity significant decreased from 2.19- 1.79 log cfu/g and 0.56- 0.50 respectively. Statistical analysis shows that storage interval and treatment had a significant (P≤0.01) effect on physicochemical and sensory properties of dried plum slices. The results indicated that simple drying process is not adequate and that the addition of osmotic agent and preservative would be an additional method to ensure safety, stability and quality of force dried fruit especially plum. The current study found DP_1 followed by DP_4 were of best quality and stable according to microbial load among treatments

Keywords: Plum fruit, Dehydrated agents, storage, physiochemical analysis, a_w, microbial count

INTRODUCTION

The intermediate moisture food having a water activity (aw) of 0.65 to 0.90 and moisture content from 15 to 50% also include high moisture dried fruit (HMDF) are shelf stable at room/ambient temperature for long period of time. Developing countries where suitable storage condition is very rare are very much appropriate for IMF (Li et al. 2014).

Plum *(Prunes domestica L.)* is very important temperate zone fruit crop that belongs to the genus Prunus of subfamily *Prunoidae.* About 77 species of plum within the genus prunes exists (Watkins, 1976). Plum fruit comes in different shapes and color depends on the variety. Some have firm and yellow flesh, while some have green, white or red flesh. Worldwide production of plum is approximately 8 million tons, out of which

70% is covered by Japanese plum alone, while the European plum (*Prunus domestica)* covers approximately 20% of production (Grzyb, 2003). Pakistan produces 56.00 thousand tons of plum annually covering an area of about 6.8 thousand hectare and rank 17th among worldwide production. Most prominent provinces producing plums are Baluchistan and Khyber Pakhtunkhwa. Khyber Pakhtunkhwa produces 47% of the country production (Agric. Stat. of Pak, 2013).

The nutritive value of plum fruit rises as it ripens. Phenolics compounds are presents abundantly, characterized by high antioxidant activity i.e. higher than strawberries, apples and oranges (Kayano et al. 2002; Ieong and Shui, 2002). Plum has a moisture content of more than 80%, which shows its high perishability. Free water contained in the fruit is the main cause of fruit deterioration, and dehydration techniques are used to minimize the water content of fresh fruit and aid in the extension of shelf life (Araujo et al. 2014). Fruits are normally dried under sunlight, which are prone to microbial contamination and are weather dependable (Mathioulakis et al. 1998), or can be dried in hot air oven dryer, which cause nutrients destructions. Therefore, new methods need to be developed to assist in eliminating theses hurdles while drying the products (Goyal et al. 2007).

A method of dehydration of fruits called osmotic dehydration was proposed by (Ponting, 1973). Osmotic dehydration is normally used a pre-treatment for partial removal of water from foods, prior to subjecting to drying in order to maintain natural color and improve its chemical composition of the fruits. Removals of water from food minimize the risk of microbial contamination and inhibit the growth of microorganism (Park et al. 2002; Charles et al. 2002).

MATERIALS AND METHODS

Fresh mature plum variety Fazle Manani were purchased from the local market of Peshawar and brought to the laboratory of Food Technology Section ARI Tarnab Peshawar. Fruit was sorted, washed and cut into halves using a stainless-steel knife. The fruit was then treated with 0.1% potassium metabisulphite (KMS) and 0.1% citric acid prior to dipping in osmotic solution to prevent enzymatic browning and deterioration. Different solutions were prepared according to plan of study and plum slices were dipped for 24 hrs. The pretreated plum slices were then kept in aluminum trays and transferred to dryer till moisture content reduced up to 20%. The dried plums were then packed and sealed in transparent packaging materials and stored. The chemical analysis was conducted on the initial day of drying and then after 15 days interval till completion of the experiment. The analysis was conducted using CRD 2 factorial design using statistic 8.1.

Physicochemical analysis

Physicochemical properties were examined for pH, non-reducing sugar, ascorbic acid, TSS, moisture content, reducing sugar, water activity, and % acidity according to AOAC (2012) methods.

Total microbial count

The sample was analyzed for the total microbial count by the total plate count method as describe (Dilliello, 1982).

Organoleptic evaluation

The osmotic dried plum slices was assessed organoleptically for texture, flavor, color, and overall acceptability by the panel judges. The assessment was carried out using 9 point hedonic scale of Larmond (1977).

RESULTS AND DISCUSSION

Total Soluble Solids (ºBrix)

The statistical results showed significant ($P \leq 0.01$) increased to the response of different treatments on TSS of osmo-dried plum slices. It can be observed from statistical data that treatment and storage significantly affected the TSS value of osmo dried plum samples. TSS shows an increasing trend during total period of storage from 0 to 90 days. On initial day of storage, mean value for TSS gradually increased in all the treatment (DPo to DP7) 47.9, 78.93, 69.2, 59.45, 74.08, 70.2, 67.2, 64.1 to 59.96, 87.89, 82.93, 71.79, 83.82, 80.97, 78.98, 75.16 respectively. The table 01 shows that the 40% glucose treatment recoded high TSS value throughout storage. The increase in TSS is due to the immersion in osmotic solution which gives rise to solid gain while the increase during storage might be due to the loss of moisture content that tends to increase total soluble solid. Osmotic agents having lower molecular weight and if cell permeability is in favorable condition, will tend to penetrate more effectively; hence the TSS of the product will be slightly higher as compare to other osmotic agents having higher molecular weight. However, explained by (El- Gharably et al. 2003), who mentioned that, solid uptake during osmotic dehydration (OD), may not necessarily be a function of cell permeability alone but may also depend on the type of chemical and structural changes caused by the pretreatments. Glucose a monosaccharide shows higher TSS, which might be due to its smaller molecular size than sucrose and honey resulting in higher mass transfer, hence higher in TSS (Phisut et al. 2013).

Ascorbic acid (mg/100g)

Fruits and vegetables are key sources of ascorbic acid. Means values of ascorbic acid of osmo-dried plum slices are mentioned in table 01. The ascorbic acid content decreased during storage, which may be attributed to the oxidation of ascorbic acid to dehydro-ascorbic acid. Statistical data shows that treatments and storage had significant ($P \leq 0.01$) effect on ascorbic acid content of osmo dried plum slices. Maximum retention in ascorbic acid was recorded in T_2 having mean value of 11.26 while maximum loss in ascorbic acid was recorded in control which shows that osmotic dehydration process can assist in retention of vitamin C. After drying the ascorbic acid content of all treatments was lower than fresh plum which can be explained by 2 ways; leaching with water diffusion due to high solubility of vitamin C and chemical degradation which was additionally enhanced by drying temperature. Results suggested that an increase water loss cause higher loss of vitamin C during osmotic dehydration process (Devic et al. 2010). The stabilization of ascorbic acid during processing is of importance, not only from the nutritional point of view but also because ascorbic acid degradation accelerates non enzymatic browning reaction, which does not only cause changes in color but can adversely affect flavor (Paakkomen and Mattila, 1991). According to El-Gharably et al. (2003) the main mechanism of the loss in vitamin C appears to be due to water solubility, mass transfer, heat sensitivity and enzymatic oxidation. Loss of ascorbic acid is inversely related with the rise in temperature. The ascorbic acid content decreased during storage. Loss of ascorbic acid might also be due to its oxidation to dehydro ascorbic acid pursued by more degradation to 2, 3 - diketogulonic acid and as a final point to furfural complexes which go in browning reactions. These results coincide with the findings of El- Gharably et al. (2003), who reported a reduction in ascorbic acid content in osmotic dehydrated cherries during the first four months and further decreases were found during next two months of storage.

pH

pH is defined as the –ve log of [H] ion concentration. Analysis of variance showed that treatment and storage significantly ($P \leq 0.01$) affected the pH of osmo dried plum samples. It is obvious form table 01 that means value for pH gradually decreased. Highest treatment mean value was recorded in control treatment, which was 3.86, may be due natural acid present in it. The natural organic acids present in the fruit might have leached out during the osmotic dehydration process resulting in higher pH value. The changes in pH values can also be due to increase in acidity during storage. The results are in line with Angelini (2002) who find out that the osmotic dehydrated kiwi fruit shows higher pH values than the fresh fruit. The present findings are supported by Shakoor et al. (2015) who observed a decreasing trend in pH from 3.87 to 3.69 during total storage period of 90 days in preparation of guava bar. Roselene et al. (2014) also find that a slight decrease in pH value of guava happen in which the initial pH of guava was 3.87 which decrease to 3.76 after submission to osmotic dehydration.

Titratable acidity (%)

Statistical analysis showed that both treatment and storage interval had substantial effect ($P \leq 0.01$) on titratable acidity of osmo dried plum slices. Mean value for titratable acidity was 1.28, 1.1, 1.09, 1.05, 1.07, 1.12, 1.14, 1.16 on first day, which gradually increased to 1.99, 1.47, 1.49, 1.5, 1.41, 1.55, 1.6, 1.63 respectively during storage period. Increase in acidity during storage might be due to development of acidic substances by the degradation or breakdown of pectin bodies and also featured to the hydrolysis of polysaccharides and non-reducing sugars through utilization of acids for converting them to hexose sugar. Rao and Roy, (1980) found a boost up in acidity during storage of mango sheet from 0.3-0.75. Manu and Oduro, (2013) noticed rise in acidity during storage of mango leather from 0.37 and 0.44. Similarly, Jain and Nema, (2007) also observed an increase in acidity during study of guava leather (from 0.42-0.48). However, the results differ in all osmo-dried cantaloupes compared to fresh cantaloupe in which a reduction in total acidity was observed. This can be due to his use of different osmotic agents i.e. calcium chloride and calcium lactate (Phisut et al. 2013).

Table 1: Physiochemical and microbial analysis of osmo-dehydrated plum slices

Treatment	Storage Interval	pH	Acidity (%)	TSS (^{0}B)	Vit C (mg/100g)	Red sugar (%)	Non Red Sugar (%)	Microbial log cfu/g	water activity (aw)
DP0 (Control)	0	3.91	1.28	47.90	8.41	25.24	19.01	2.48	0.54
	30	3.88	1.47	49.95	7.67	29.32	17.83	2.40	0.53
	60	3.85	1.77	54.69	7.08	33.78	16.88	2.34	0.50
	90	3.80	1.99	59.96	5.05	36.12	15.44	2.28	0.48
	Mean	3.86a	1.63a	53.13f	7.05e	31.12f	17.29e	2.37a	0.51e
DP1 (40 % Glucose)	0	3.61	1.10	78.93	12.11	57.54	26.34	2.15	0.56
	30	3.58	1.24	81.18	12.13	61.76	25.37	1.95	0.54
	60	3.54	1.34	83.94	10.84	64.32	24.63	1.85	0.51
	90	3.49	1.47	87.89	9.08	66.65	23.19	1.70	0.49
	Mean	3.56g	1.29d	82.99a	11.04ab	62.57a	24.88d	1.91cd	0.53cd
DP2 (40% Sucrose)	0	3.81	1.09	69.20	12.98	54.33	33.21	2.11	0.57
	30	3.78	1.19	74.03	12.17	58.21	31.43	2.00	0.55
	60	3.76	1.35	79.86	10.66	61.76	29.32	1.78	0.53
	90	3.70	1.49	82.93	9.75	64.33	27.82	1.48	0.51
	Mean	3.76c	1.28d	76.51c	11.39a	59.66cd	30.45a	1.84d	0.54a
DP3 (40% Honey)	0	3.61	1.05	59.45	11.21	55.23	32.76	2.11	0.55
	30	3.57	1.21	65.17	11.99	57.83	31.06	1.95	0.54
	60	3.53	1.44	68.99	10.73	62.78	28.21	1.78	0.53
	90	3.49	1.50	71.79	8.21	64.43	26.86	1.60	0.52
	Mean	3.55g	1.30cd	66.35e	10.54 bcd	60.07c	29.72a	1.86d	0.54ab
DP4 (20% glucose + 20% sucrose)	0	3.89	1.07	74.08	12.72	56.22	28.01	2.15	0.56
	30	3.86	1.14	77.69	11.03	60.31	27.12	2.00	0.54
	60	3.81	1.36	79.99	10.14	64.67	25.97	1.90	0.52
	90	3.75	1.41	83.82	9.15	67.78	24.00	1.78	0.50
	Mean	3.83b	1.25d	78.90b	10.76abc	62.25a	26.28c	1.96bc	0.53bc
DP5 (20% glucose + 20% honey)	0	3.72	1.12	70.20	11.17	53.21	27.35	2.18	0.56
	30	3.67	1.35	72.70	10.87	57.67	26.14	2.04	0.55
	60	3.62	1.49	76.88	10.61	59.51	25.18	1.95	0.53
	90	3.58	1.55	80.97	8.04	62.29	23.11	1.85	0.51
	Mean	3.65f	1.38bc	75.19c	10.17cd	58.17e	25.45d	2.00bc	0.54ab
DP6 (20% sucrose + 20% honey)	0	3.72	1.14	67.20	11.77	53.65	32.32	2.18	0.55
	30	3.68	1.36	75.80	10.97	57.34	30.68	1.95	0.53
	60	3.64	1.41	77.95	9.23	60.31	28.79	1.85	0.50
	90	3.61	1.60	78.98	8.32	63.84	26.97	1.70	0.49
	Mean	3.66e	1.38bc	74.98c	10.07d	58.79de	29.69a	1.92cd	0.52de
DP7 (13.3% glucose + 13.3% sucrose + 13.3% honey)	0	3.73	1.16	64.10	12.61	56.36	30.89	2.18	0.56
	30	3.69	1.38	67.29	11.78	59.11	29.06	2.11	0.55
	60	3.67	1.51	71.65	10.03	63.21	28.03	1.95	0.53
	90	3.62	1.63	75.16	9.12	66.54	26.12	1.90	0.51
	Mean	3.68d	1.42b	69.55d	10.89ab	61.31b	28.53b	2.04b	0.54ab

Reducing Sugar (%)

Statistical analysis revealed that treatment and storage had significantly affected the reducing sugar of osmo dried plum slices. The reducing sugar gradually increased in all treatments during total period of storage as shown in table 01.The result showed that treatment with glucose have high reducing sugar value as compared to the other treatment. Due to the transposition of non-reducing sugars into reducing sugars and the modification of polysaccharides to monosaccharide the reducing sugar is increased. This is in reference with that of Kumar et al. (2016) who did the same analysis in pineapple. These results are also in line with the results reported by (Torreggiani and Bertolo, 2001). Same results were also reported by Manal and Gendy, (2014) who also performed similar work on figs and find out the reducing sugar of figs increase after treated with different osmotic date syrup.

Non reducing sugar

Analysis of variance regarding effect of osmo dehydrating agents on non-reducing sugar revealed that treatment and storage significantly (P≤0.01) reduced the non-reducing sugar of osmo dried plum slices. During the total period of storage, the non-reducing sugar gradually decreased as shown in table 02. Due to the transposition of non-reducing sugars into reducing sugars and the modification of polysaccharides to monosaccharide’s the non- reducing decreased.

The treatment along with storage significantly affects the non-reducing sugar of dried plum slices. The results are in line with Ayub et al. (2005) who conducted their research work on guava and find out that non reducing sugar decrease on storage. Manal and Gendy, (2014) also recorded a decreasing trend in non-reducing sugar of osmo dried figs.

Moisture (%)

A significant (P≤0.01) decrease in moisture content was noticed in all treatments with increase in storage. The average moisture content of dried plum slices immediately after treatment with osmotic solution of treatments from DP_0 to DP_7 were 13.04, 12.67, 13.88, 13.29, 12.95, 12.89, 13.17, 13.45which gradually decreased to 9.61, 10.5, 10.04, 10.03, 10.21, 10, 10.09, 10.45 respectively. The result revealed that the osmotic solution reduced the moisture content of dried plum slices. The untreated control plum DP_0 always had moisture content higher than those of all other osmotic dried plum treatments during storage. Although same syrup concentrations were used in all treatments having different osmotic agents, DP_1 cause higher reduction in moisture content. The moisture content in the sample reduces due to evaporation during storage. The variation in the rate of loss of moisture was due to treatment effect. Hannadige, (2006) reported the moisture content of banana slices decreases from 18.5 per cent to 17.5 per cent during four month storage. Chavan et al., (2010) reported the decrease in moisture content of osmo-dried banana slices from 18.32 to 17.32 per cent during six month storage.

Water activity (a_w) (logcfu/g)

The water activity of all the treatment decreased significantly during storage as shown in the table 01. The initial a_w of osmo-dehydrated plum slices of DPo to DP7 was 0.54, 0.56, 0.57, 0.55, 0.56, 0.56, 0.55, 0.56 which was gradually decreased to 0.48, 0.49, 0.51, 0.52, 0.5, 0.51, 0.49, 0.51 logcfu/g respectively during storage. The a_w values of all the treatment are lower than the ideal range of microbes. The decreased in water activity of the sample are due to the bounding of free water by adding osmo-dehydrating agents. This action delays the formation of sugar recrystallization on the product surface during storage (Guagmal et al., 2009). Similar results of decreasing in water activity (0.64-0.61) were also found in guava and pawpaw leather by [0], pear fruit leather (0.44-0.37) by Huang and Fu-Hung (2005) and Durian Fruit Leather (0.597-0.573) by (Irwandi et al. 1998)

Color

Color was evaluated by visual observation. The color of control treatment was lowest among all treatments. Initially the mean score of judges for color of osmo-dried plum slices from DP_0 to DP_7 was 6.50, 7.08, 7.65, 7.48, 7.55, 6.95, 7.50, and 7.57 which gradually decrease to 3.00, 6.88, 6.40, 6.66, 6.75, 6.3, 6.7 and 6.89 during total storage of 90 days (Table 02). The mean values for color substantially (P≤0.01) reduced from 7.28 to 6.06 during storage period of 90 days. Highest treatment mean value was observed in DP_2 (7.27) followed by DP_4 (7.19), while the lowest treatment mean value was observed in DP_0 (4.21) followed by DP_5 (6.64). The difference was shown immediately after processing (initial period) and after 90 days of storage. The difference depends on the pre-treatment used. Treatment DP_2 having 40% sucrose showed the highest ability to give quality color attributes. Plum treated with honey had a dark brown appearance and got comparatively lesser score as compare to other treatments. A study conducted by Gurumeenakshi et al. (2005) reported that the color and appearance score gradually decreased during storage in case of osmo-dried mango and papaya. Nearly similar results were also reported by Singh et al. (2008) for bittergourd slices wherein they reported that sodium chloride (NaCl) osmotic diffused sample had beneficial effect on maintaining color and appearance of product. A decrease in color and appearance of osmo-dried banana slices from 8.75 to 8.35 during six month storage (Chavan et al. 2010).

Flavor

Flavor is one of the most important sensory attributes related to the attraction of consumer towards the product. Mean values regarding the response of different osmotic solutions on flavor of plum slices are mentioned in table 02. The mean score of judges for flavor of osmo-dried plum significantly reduced from 7.35 to 5.39 during total period of 90 days. The highest treatment mean value was noted in DP_1 (6.97), closely tailed by DP_4 (6.94), while the lowest treatment mean value was observed in DP_0 (5.21), followed by DP_5 (5.80). Treatments having 40% glucose i.e. DP_1 and 40% honey (DP_3) got high score from judges at initial stage followed by DP_2 (40% sucrose). The mean score of judges for flavor showed a decreasing trend throughout storage period of 90 days. Similar results reported by Pagare, (2006) in osmo-dried anola candy that flavor of osmo dried candy decreased significantly during storage. Taste score of osmo- dried banana slices decrease from 8.32 to 7.55 significantly during six month storage (Chavan et al. 2010).

Texture

The results of changes in texture score of osmo- dried plum during storage are presented in Table 02. The overall mean of all treatment significantly (P≤0.01) decreased from 7.76 to 7.24 during storage period of 90 days. Maximum mean value for treatment was recorded in DP_3 (8.03) followed by DP_4 (7.88), while the lowest value was observed in DP_0 (6.90) followed by DP_7 (7.12). During storage the highest fall was observed in DP_0 (8.48%) followed by DP_6 (7.70%), while the lowest percent decline was observed in DP_3 (5.25%) followed by DP_4 (6.35%). The texture of osmo dried products is mostly affected by their moisture content and drying temperatures. High temperatures and long drying times are related with lower moisture content and rigid texture. Differences in texture of osmo dried plum slices might also be due to variations in treatments, and rate of water loss and solid gain from the surroundings.

Table 2: Organoleptic analysis of osmo-dehydrated plum slices.

Treatments	**Storage interval**				**% Dec**	**Means**
	Initial	**30**	**60**	**90**		
Color Score						
DP_0	6.5	5.2	3.5	3	53.85	4.644 h
DP_1	7.08	6.75	6.58	6.4	9.6	6.708 f
DP_2	7.65	7.5	7.05	6.88	10.07	7.272 a
DP_3	6.95	6.71	6.54	6.3	9.35	6.642 g
DP_4	7.55	7.45	7	6.75	10.6	7.191 b
DP_5	7.48	7	6.69	6.6	11.76	6.929 e
DP_6	7.5	7.21	6.82	6.7	10.67	7.024 d
DP_7	7.57	7.29	7.02	6.89	8.98	7.180 c
Means	7.287 a	6.888 c	6.363 e	6.064 g		
Flavor Score						
DP_0	6.5	5.5	5	4	38.46	5.214 h
DP_1	8	7.3	6.6	6	25	6.971 a
DP_2	7.62	7.3	6.5	5.8	23.88	6.861 c
DP_3	8	7	6.5	6	25	6.942 b
DP_4	7.7	7.4	6	5.3	31.17	6.485 d
DP_5	7	6.3	5.3	4.7	32.86	5.814 g
DP_6	7	6.8	5.8	4.9	30	6.071 e
DP_7	7.05	6.74	5.24	5	29.08	5.94 f
Means	7.358 a	6.792 c	6.03 e	5.390 g		
Texture Score						
DP_0	7.19	7	6.84	6.58	8.48	6.909 h
DP_1	8.31	8.23	7.93	7.7	7.34	8.030 a
DP_2	8.03	7.83	7.69	7.52	6.35	7.763 c
DP_3	7.81	7.7	7.53	7.4	5.25	7.613 d
DP_4	8.19	7.92	7.75	7.68	6.23	7.886 b
DP_5	7.68	7.56	7.41	7.26	5.47	7.470 e
DP_6	7.53	7.36	7.14	6.95	7.7	7.250 f
DP_7	7.37	7.18	7.03	6.9	6.38	7.122 g
Means	7.765 a	7.597 c	7.415 e	7.248 g		
Overall Acceptability						
DP_0	6.91	6	5	4	42.11	5.501 h
DP_1	7.5	7.22	6.82	6.61	11.87	7.031 a
DP_2	6.83	6.68	6.49	6.28	8.05	6.554 d
DP_3	7.03	6.7	6.61	6.41	8.82	6.672 c
DP_4	7.05	6.85	6.68	6.45	8.51	6.735 b
DP_5	6.85	6.56	6.29	6.25	8.76	6.491 f
DP_6	6.83	6.62	6.33	6.2	9.22	6.475 g
DP_7	6.86	6.6	6.37	6.23	9.18	6.512 e
Means	6.981 a	6.591 c	6.191 e	5.922 g		

Singh et al. (2008) reported that osmo-dried bittergourd slices having significantly better texture over control sample.

Chavan et al. (2010) reported that texture of osmo-dried banana slices decreases from 8.32 to 7.53 significantly during six month storage.

Overall acceptability

Overall acceptability in general is associated to all sensory attributes. Primarily the mean score of juries for overall acceptability of plum slices from DP_0 to DP_7 was 5.91, 7.5, 7.03, 6.83, 7.05, 6.85, 6.83, and 6.86 which gradually decreased to 1, 6.61, 6.41, 6.28, 6.45, 6.25, 6.2 and 6.23 during keeping time of 90 days. The mean values for intervals were significantly decreased from 6.98 to 5.67 for total period of storage. The highest treatment mean value (7.05) was noted in DP_1, closely followed by DP_4 (6.70), but in contrast, the lower mean value (3.93) was noted in DP_0, followed by DP_6 (6.45). Highest fall in overall acceptability was recorded in DP_0 (83.08%), followed by DP_7 (12.54%), while minimum decrease was noted in DP_1 (10.27%), followed by DP_4 (11.63%). Hannadige, (2006) reported that Sulphur fumigated osmo-dried banana slices showed better overall acceptability than ascorbic acid treated banana slices and decrease during storage. Singh et al., (2008) reported that osmo-dried bitter gourd slices having more overall acceptability than control sample. Chavan et al. (2010) reported that a gradual decrease in overall acceptability score from 8.40 to 7.80 during six month storage may be due to reduction in score of color and appearance texture, taste of osmo-dried banana slices.

CONCLUSION

In the current study osmo dried plum slices were prepared using different osmotic agents i.e. glucose, sucrose, and honey and the samples were stored in plastic jars at room temperature for 3 months duration. The measurement of physicochemical characteristics and sensory attributes of osmo dried plum slices has been carried out after 30 days. The study revealed an increase in TSS, reducing sugar, and acidity, while a decrease was noted in vitamin C, moisture content, and pH. All the sensory attributes showed a decreasing trend in their quality with increase in time of storage. Considering the outcome noted from this study we can conclude that DP_1 (40% glucose) was most acceptable for both physicochemical and sensory evaluation, followed by sample DP_4 (20% glucose + 20% sucrose) which achieved second number after DP_1.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

MZ, AK, SU, SAK designed and performleed the experiments and also wrote the manuscript. MK, ASS, SZ, IJ, AK performed treatments analysis and MAK, SS, GRK reviewed the manuscript. All authors read and approved the final version.

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