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Effect of Post-harvest Application of Salicylic Acid on the Storage Stability of Peach Fruit

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Abstract. Post-harvest storage stability of peach fruit was studied at 4 ± 1 °C for five weeks with different concentration of salicylic acid (1.5 mM, 2.0 mM, 2.5 mM, 3.0 mM). Peach fruit dipped in distilled water are considered as control. The fruits were packed in Styrofoam boxes and stored for five weeks. All the treatments were analyzed physio-chemically *i.e*. weight loss, firmness, TSS, pH, titratable acidity, sugar acid ratio, ascorbic acid and chilling injury and organoleptically *i.e*. flavour, colour, texture and overall acceptability at every 7 days interval during 5 weeks of storage. Overall results showed a continuous decrease in fruit firmness (from 74.61-35.37 N), titratable acidity (from 0.82-0.52%), ascorbic acid (from 7.34-4.85 mg/100 g), colour (from 8.8-3.7), flavour (from 8.5-5.2), texture (from 8.2-4.6) and overall acceptability (from 8.5-4.5), while an increase in weight loss (from 0-16.92%), TSS (from 7.84-10.18 °Brix), pH (from 3.84-4.29), sugar acid ratio (from 9.58-19.72) and chilling injury index (from 0-2.30) noted throughout storage period. The maximum mean value for fruit firmness was recorded in 2.5 mM dipped treatment was (64.63 N), weight loss in 0 mM dipped treatment was (9.81), TSS in 2.5 mM dipped treatment was (9.24), pH in 0 mM dipped treatment was (13.95), acidity in 2.5 mM dipped treatment was (0.69), sugar acid ratio in 0 mM dipped treatment was (13.95), ascorbic acid in 2.5 mM dipped treatment was (6.69), chilling injury in 0 mM dipped treatment was (1.17), colour in 2.5 mM dipped treatment (7.7), flavour in 2.5 mM dipped treatment (7.7), texture in 2.5 mM dipped treatment (7.7) and overall acceptability in 2.5 mM dipped treatment (7.7). It was evident from statistical analysis that storage and treatments had a significant effect on the storage stability of peach fruits. On the basis of overall physio-chemical and sensory analysis, it was concluded that 2.5 mM dipped treatment showed the best results followed by 3.5 mM dipped treatment.

Keywords: peach fruit, salicylic acid, temperature, storage

Introduction

Peach (*Prunus persica* L.) is an important edible fruit belongs to rosacea family, ranked second after plum in the group of stone fruits (Chaudhary, 1994). Number of early, mid and late varieties of peach is grown successfully in Pakistan among the farming community. Cultivars of peach fruit suitable for peach growing regions *i.e*. Peshawar and Swat in Pakistan are Early Grand, Florida King, Shireen, Golden Early, Shah Pasand, Carmon and Indian Blood elaborating the range of peach fruit available in the country (Meitei *et al*., 2013). In Pakistan Peach is grown on an area of 15032 hectares and produces 87864 tonnes of fruit. In Khyber Pakhtunkhwa contributes 9818-hectare area and produces 71580 tons (Data for Agricultural, 2018-2019). In Khyber Pakhtunkhwa (KP), peach is one of the most widely grown fruit. Peshawar region and Swat valley are paramount in KP for providing superior quality peach fruits (Khalil *et al*., 2011). Fresh peach fruits are very much fascinating, luscious and of high nutritional value as a 100 g of single fruit is composed of proteins (0.9 g), fat (0.3 g), carbohydrates (1.5 g dietary fibre and 8.4 g sugars), potassium (190 mg), iron (0.25 mg), niacin, vitamin A (16 µg), vitamin C (0.25 mg) and folate (4 µg) in abundance as compare to other fruits (Kaushal and Sharma, 2012).

Peach has a fast ripening process and high rate of respiration at post-harvest stage as a result of which it has a short shelf life at room temperature. The fruit turn into inferior quality due to reduction in firmness and decay after harvesting (Kluge *et al*., 1997). Shelf life of the fruits can be improved by the application of post harvest treatments which in turn may reduce the damages that most packaging houses face. (Lurie, 1998; Couey, 1989). It has been the top priority of the processors to promote the storage quality in the post harvest stage of

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fruits. (Robert *et al*., 2003). Salicylic acid (SA) is expressed as a plant hormone and is disseminated in plant domain universally. It interrupts the senescence of fruits by restraining the production of ethylene. Salicylic acid is contained in the group of plant hormones (Raskin, 1992). Several investigations supported the claim that post-harvest treatment of salicylic acid is effective in improving the storage life and the post-harvest quality of fruits. (Zhang *et al*., 2003). SA is consider as environmental friendly and safe signaling molecule, have potential in delaying ripening, enhancing quality and attenuating biotic and abiotic strees of fruit (Asghari and Aghdam, 2010; Hodges *et al*., 2004). The present study was aimed to investigate the effect of post-harvest application of salicylic acid at lower temperature storage in shelf life extension of peach fruits.

Materials and Methods

Selection of fruits. Peach fruits were harvested at physiological mature stage from the orchads of Horticulture Section, Agriculture Research Institute (ARI), Tarnab Peshawar. The fruits were packed in corrugated cardboard boxes and transferred to Food Technology Laboratory (ARI).

Preparation of fruit samples. The peach fruits were sorted on the basis of their colour, size and shape. The defaced and damaged or injured fruits were discarded. The sorted fruits were washed with distilled water in order to remove dust, dirt or any other extraneous material from the outer surface of the peach fruits.

Plan of study. SP_0 = Peaches without treatment (control); SP_1 = Peaches treated with 1.5 mM salicylic acid; SP_2 = Peaches treated with 2.0 mM salicylic acid; SP_3 = Peaches treated with 2.5 mM salicylic acid; SP_4 = Peaches treated with 3.0 mM salicylic acid.

The fruits were partitioned into five (5) groups for different treatments. One group of fruits (control) were dipped in distilled water, while the remaining four groups (SP_1, SP_2, SP_3 and SP_4) fruits were immersed in four different concentrations (1.5, 2, 2.5 and 3 mM salicylic acid solution respectively) for 10 min and stored for five weeks at 4 ± 1 °C with 80-90% RH.

Data collection. Fruits of all the treatments were analyzed for various quality parameters. The data was recorded on the 1st day and then at every 7 days interval up to five weeks of storage.

Physico-chemical analysis. All the treatments were analyzed physio-chemically for weight loss (%), fruit firmness, total soluble solids (TSS), pH, titratable acidity (%), sugar acid ratio, ascorbic acid (mg/100 g) and chilling injury (CI) Index by standard method of AOAC (2012).

Sensory evaluation. A panel of trained judges examined the peach fruits for the sensory attributes including colour, flavour, texture and overall acceptability by using the 9-point hedonic scale described by Larmond (1977), where 9 for extreme like and 1 for extreme dislike.

Statistical analysis. Statistical analysis of all the data was done by using completely randomized design (CRD) with two factorial arrangement. The comparison between the means was done by least significant difference (LSD) test at 5% significance level (Steel and Torrie, 1997).

Results and Discussion

Physico-chemical analysis. ***Weight loss (%).*** The percent weight loss of peach fruit treated with different concentration of salicylic acid decreased significantly in total period of storage as shown in the Table 1. The highest decreased in weight loss was observed in treatment SP_0 (8.5 to 2.3%), while lowest decreased was found in treatment SP_3 (8.5 to 6.6%). Treatments and storage indicated a significant effect on the weight loss of all fruit samples through the storage. The phenomena of weight loss is mostly brought about by the respiration process and also by the loss of water in transpiration. The treatment of salicylic acid helps in lowering weight loss by closing stomatal openings which causes a decrease in respiration reported by (Zheng and Zhang, 2004). The salicylic acid reduced the weight loss percentage in apricot fruits during cold storage reported by Moradinezhad and Jahani (2016). It was concluded that the lowest weight loss was observed in fruits dipped in salicylic acid (0.5 mM) as compared to other treatments *i.e*. calcium chloride and sodium bicarbonate. The findings are in conformity with Abbasi *et al*. (2010) who also suggested less weight-loss in peaches treated with salicylic acid.

Fruit firmness (N). Fruit firmness relates to the degree of softness or crispness. The fruit firmness decreases with storage due enzymatic change. The present study revealed that highest decreased in fruit firmness was observed in treatment SP_0 (74.32-19.5 N), while lowest

decreased was found in treatment SP_3 (74.83-48.07). Secondly, lower dose of salicylic acid is effective than high dose as observed by Fariduddin *et al*. (2013). Because low dose of salicylic acid accumulates more dry matter, while high dose has inhibitory effect in Brassica. Salicylic acid acts as an ethylene inhibitor (Babalar *et al*., 2007) and restrict the enzymes which are responsible for deterioration of the membrane that leads to softened fruits (Asghari and Aghdam, 2010). Bal (2016) explained the effectiveness of salicylic acid in maintaining higher firmness in nectarine fruit during cold storage. The fruits were dipped in salicylic acid at different concentrations and stored in both unpacked and Modified Atmosphere Packaging. Highest firmness was observed in the fruits which were dipped in 1 mM salicylic acid and stored in modified atmosphere package. Similar feature of salicylic acid is also illustrated in kiwifruit (Kazemi *et al*., 2011; Zhang *et al*., 2003), apricot fruit (Moradinezhad and Jahani, 2016) and grapes (Peyro *et al*., 2017).

Total soluble solids (TSS). The total soluble solids increased progressively during total period of storage. The TSS content of control fruit SP_0 increased from 7.86 to 10.71. With the increased in concentration of salicylic acid, the increasing trend in TSS delays. SA treatment can delay the fruit ripening during storage and also enhance fruit quality attributes (Asghari and Aghdam., 2010). The increased amounts of TSS may be happening due to lowering of juice content or weight-loss (Moreno *et al*., 2008). An experiment by dipping guava in salicylic acid at different concentrations and found out that fruits treated with salicylic acid contained higher TSS, it is reported by Amanullah *et al*. (2017). Salicylic acid at 600 µmol had the highest TSS content. Peyro *et al*. (2017) also suggested that table grapes treated with salicylic acid had highest amount of total soluble solids. Similar results have been found by Tareen *et al*. (2012), who also suggested that peach fruits treated with SA showed a higher TSS as compared to the untreated fruits.

pH. Mean results for the pH of control and treated peaches were SP_0 (4.19), SP_1 (4.10), SP_2 (4.06), SP_3 (3.94) and SP_4 (3.98). pH values of all the treatments increased during the storage period however, salicylic acid treatment at the higher concentrations assisted in maintaining pH values. Peak mean value (4.19) was observed in SP_0 and SP_1 (4.10). Least value (3.94) was recorded in SP_3 and SP_4 (3.98). During storage greatest rise (14.51%) was in SP_0, while lowest rise (6.81) was in SP_3. Treatments as well as storage intervals provided

Table 1. Effect of salicylic acid treatment on the weight loss (%) of peach fruits during storage intervals

Salicylic acid	Storage period (days)							
	Initial	7	14	21	28	35	% Increase	Means
0 mM	0	3.26	5.63	11.27	16.22	22.47	22.47	9.81a
1.5 mM	0	2.94	4.88	9.93	14.33	19.36	19.36	8.57ab
2.0 mM	0	2.38	3.92	7.81	11.43	15.73	15.73	6.88bc
2.5 mM	0	1.83	3.27	6.26	10.38	13.18	13.18	5.82c
3.0 mM	0	2.07	3.56	6.83	10.82	13.85	13.85	6.19c
Means	0e	2.50d	4.25d	8.42c	12.64b	16.92a		

Mean values followed by same letters are not significantly (P<0.05) different from each other.

Table 2. Effect of salicylic acid treatment on the fruit firmness (N) of peach fruits during storage intervals

Salicylic acid	Storage period (days)							
	Initial	7	14	21	28	35	% Decrease	Means
~~0 mM~~	~~74.32~~	~~67.7~~	~~56.67~~	~~43.28~~	~~31.57~~	~~19.50~~	~~73.76~~	~~48.84d~~
1.5 mM	74.66	69.33	60.3	49.72	38	26.36	64.69	53.06cd
2.0 mM	74.41	70.40	63.24	54.33	46.42	36.10	51.49	7.48bc
2.5 mM	74.83	73.36	70.66	63.00	57.85	48.07	35.76	64.63a
3.0 mM	74.82	73.25	68.89	60.44	54.08	46.82	37.42	63.05ab
Means	74.61a	70.81a	63.95b	54.15c	45.58d	35.37e		

Mean values followed by same letters are not significantly (P<0.05) different from each other.

a statistically significant effect on pH of peach fruits. Results regarding fruit pH are in agreement with Al-Qurashi (2012), who also identified that the pear fruits treated with salicylic acid had lower pH. Al-Qurashi (2012) investigated the effectiveness of salicylic acid (2, 3 and 4 mM), calcium chloride (2, 3 and 4%) and 2, 4 dichloro-phenoxyacetic acid (100, 150 and 200 ppm) dipping on the stability of pear fruit during cold storage. The final results concluded that pH of the fruits treated with salicylic acid was lower as compared to other treatments. The results regarding pH of peach fruits are also in agreement with Alijo *et al*. (2015).

Titratable acidity. Mean values for TA during storage of peach fruits were SP_0 (0.68), SP_1 (0.68), SP_2 (0.69), SP_3 (0.69) and SP_4 (0.69). Results showed titratable acidity decreased with all the treatments throughout storage, while treatments had no significant effect on acidity. There was a continuous decrease (from 0.82-0.52) throughout the storage duration. Mean values of all the treatments were very similar and the difference between their values was very little. Statistical results revealed that treatments had no effect on acidity (%), while storage had significantly effected. When fruits respire, the acids disintegrate the sugar content causing a decrease in acidity of fruits (Ball, 1997). Similar results are also declared by Khademi and Ershadi (2013) stated that application of salicylic acid had no such significant effect on acidity of peach fruits stored at

Table 3. Effect of salicylic acid treatment on the TSS (°Brix) of peach fruits during storage intervals

Salicylic acid	Storage period (days)							
	Initial	7	14	21	28	35	% Increase	Means
0 mM	7.83	8.15	8.44	8.95	9.52	9.81	33.00	8.78b
1.5 mM	7.83	8.11	8.47	8.99	9.55	9.88	34.17	8.81b
2.0 mM	7.85	8.14	8.47	9.04	9.63	10.01	36.00	8.86b
2.5 mM	7.86	8.27	8.73	9.58	10.27	10.71	47.50	9.24a
3.0 mM	7.82	8.22	8.60	9.33	10.04	10.48	44.33	9.08a
Means	7.84f	8.18e	8.54d	9.18c	9.80b	10.18a		

Mean values followed by same letters are not significantly (P<0.05) different from each other.

Table 4. Effect of salicylic acid treatment on the pH of peach fruits during storage intervals

Salicylic acid	Storage period (days)							
	Initial	7	14	21	28	35	% Increase	Means
0 mM	3.83	3.96	4.18	4.3	4.39	4.48	14.51	4.19a
1.5 mM	3.88	3.91	3.97	4.19	4.28	4.37	11.21	4.10b
2.0 mM	3.86	3.88	3.93	4.17	4.24	4.30	10.23	4.06b
2.5 mM	3.83	3.85	3.86	3.95	4.06	4.11	6.81	3.94c
3.0 mM	3.81	3.85	3.91	4.03	4.1	4.18	8.85	3.98c
Means	3.84d	3.89cd	3.97c	4.13b	4.21a	4.29a		

Mean values followed by same letters are not significantly (P<0.05) different from each other.

Table 5. Effect of salicylic acid treatment on the titratable acidity (%) of peach fruits during storage intervals

Salicylic acid	Storage period (days)							
	Initial	7	14	21	28	35	% Decrease	Means
0 mM	0.82	0.78	0.74	0.65	0.60	0.51	37.80	0.68a
1.5 mM	0.81	0.78	0.75	0.65	0.59	0.52	35.80	0.68a
2.0 mM	0.82	0.79	0.76	0.66	0.59	0.51	37.80	0.69a
2.5 mM	0.82	0.78	0.76	0.67	0.60	0.52	36.59	0.69a
3.0 mM	0.81	0.78	0.75	0.68	0.60	0.52	35.80	0.69a
Means	0.82a	0.78b	0.75c	0.66d	0.60e	0.52f		

Mean values followed by same letters are not significantly (P<0.05) different from each other.

low temperature. The fruits were dipped in 1.0, 2.0 and 4.0 mM salicylic acid. The results showed a gradual decrease in titratable acidity regardless of treatments with not much difference amongst the values of treated and untreated fruits. Ezzat *et al*. (2017) and Sayyari *et al*. (2009) also reported that the effect of salicylic acid on the acidity of apricots was not significant.

Sugar acid ratio. Mean values of sugar-acid ratio were SP_0 (13.34), SP_1 (13.44), SP_2 (13.44), SP_3 (13.95) and SP_4 (13.71). Results indicated a gradual rise in the values of sugar acid ratio from 9.61-19.72 during the whole duration of storage. Highest mean (13.95) was recorded in SP_3, while lowest mean value (13.34) was recorded in sample SP_0. Greatest increase percentage (53.45%) was obtained in SP_3 lowest increase (49.74%) was in SP_o. Treatments as well as storage intervals provided a statistically significant effect on sugar acid ratio of fruit samples. These results resemble the findings of Ezzat *et al*. (2017) about the function of salicylic on sugar acid ratio in Apricots. The fruits were treated with 2 mM salicylic acid, 0.2 mM methyl-jasmonate, while control fruits were dipped in distilled water. The results showed that 2 mM salicylic acid maintained a higher values of sugar acid ratio as compared to methyl jasmonate and control fruits. Similar results are also reported in apple fruits by Shirzadeh and Kazemi (2012) and in guava by Amanullah *et al*. (2017).

Ascorbic acid (mg/100 g). Mean value for vitamin C content were SP_0 (5.73), SP_1 (6.09), SP_2 (6.31), SP_3 (6.69) and SP_4 (6.58). Ascorbic acid content decreased throughout this period in all samples irrespective of treatments, however the fruits treated with higher concentrations of salicylic acid maintained greater level of vitamin-C content as compared to untreated fruits. Greatest mean value (6.69) was obtained in SP_3 closely followed by SP_4 (6.58), while lowest (5.73) was in SP_0. Biggest fall in the ascorbic acid content (48.02%) existed in SP_0, while lowest (21.51%) was in sample SP_3. Statistical analysis declared a significant($P<0.05$) impact of treatments and storage durations ascorbic acid (mg/100 g) of peach fruits throughout storage. As compared to other nutrients Vitamin-C is more susceptible to deterioration during storage and processing (Akhtar *et al*., 2010). These results regarding ascorbic acid content are in agreement with Amanullah *et al*. (2017) who suggested that salicylic acid maintained greater content of ascorbic acid in guava. Kalarani *et al*. (2002) declared that the treatment of tomatoes with salicylic acid assisted in maintain highest Vit-C content. The conclusions are also in agreement with Tareen *et al*. (2012) who revealed that SA supported in maintaining higher ascorbic acid in peach fruits.

Chilling injury index. Mean results for the chilling injury index of control and treated peaches were SP_0

Table 6. Effect of salicylic acid treatment on the sugar acid ratio (TSS/TA) of peach fruits during storage intervals

Salicylic acid	Storage period (days)							
	Initial	7	14	21	28	35	% Increase	Means
0 mM	9.55	10.45	11.41	13.77	15.87	19.00	49.74	13.34c
1.5 mM	9.67	10.40	11.29	13.83	16.19	19.24	49.74	13.44bc
2.0 mM	9.57	10.30	11.14	13.70	16.32	19.63	51.25	13.44bc
2.5 mM	9.59	10.60	11.49	14.30	17.12	20.60	53.45	13.95a
3.0 mM	9.65	10.54	11.47	13.72	16.73	20.15	52.11	13.71ab
Means	9.61f	10.46e	11.36d	13.86c	16.45b	19.72a		

Mean values followed by same letters are not significantly ($P<0.05$) different from each other.

Table 7. Effect of salicylic acid treatment on the ascorbic acid (mg/100 g) of peach fruits during storage intervals

Salicylic acid	Storage period (days)							
	Initial	7	14	21	28	35	% Decrease	Means
0 mM	7.33	6.95	6.26	5.37	4.63	3.81	48.02	5.73d
1.5 mM	7.38	7.13	6.5	5.78	5.29	4.45	39.70	6.09c
2.0 mM	7.37	7.22	6.88	6.13	5.41	4.84	34.33	6.31bc
2.5 mM	7.30	7.27	7.03	6.61	6.18	5.73	21.51	6.69a
3.0 mM	7.33	7.29	6.97	6.52	5.95	5.42	26.06	6.58ab
Means	7.34a	7.17a	6.73b	6.08c	5.49d	4.85e		

Mean values followed by same letters are not significantly ($P<0.05$) different from each other.

(1.17), SP_1 (0.90), SP_2 (0.57), SP_3 (0.26) and SP_4 (0.27). Data revealed that Chilling Injury gradually increased from 0-2.30 during storage. Initially there was no indication of chilling injury up to 7 days of storage however, slight symptoms of chilling injury started to appear in SP_0 and SP_1 at 14 days. In treatments SP_2, SP_3 and SP_4 chilling injury occurred after 21 days. Highest mean value (1.17) existed in SP_0, while least value (0.26) was recorded in sample SP_3 (2.5 mM salicylic acid) closely followed by SP_4 (0.27). Statistical analysis revealed that chilling injury index was significantly ($P<0.05$) effected by both storage and treatment parameters. Baninaiem *et al*. (2016) suggested that application of salicylic acid at higher concentration was proved to be effective in reduction of chilling injury in tomatoes. It revealed an increasing trend in chilling injury of tomatoes during storage. However, fruits treated with salicylic acid showed resistance to the onset of chilling injury. The results showed that 4 mM salicylic dipping was most efficient in tackling chilling injury symptoms. This role of salicylic acid in decreasing chilling injury is also described by Sayyari *et al*. (2009) in peach fruits.

Colour. Mean results for the colour of control and treated peaches were SP_0 (5.5), SP_1 (5.8), SP_2 (6.5), SP_3 (7.7) and SP_4 (7.6). Results indicated a successive decrease in colour score in all treatments throughout storage days. A gradual decrease in score was observed in all treatments but salicylic acid assisted in maintaining higher score for colour. The treatments SP_3 and SP_4 revealed higher mean score over a period of 35 days storage, whereas lower colour scores observed in SP_o and SP_1. Statistical analysis presented a significant effect of both treatments and storage intervals on the colour score. The change in the colour of peach fruits from green colour to a yellowish colour is mainly observed due to a decrease in chlorophyll content and also carotenoid content increases as fruit matures. Shafiee *et al*. (2010) indicated that strawberry fruits treated with salicylic acid maintained their colour as compared to untreated fruits. Similar findings have also been reported by Baninaiem *et al*. (2016) by treatments of salicylic acid (SA) on the colour of tomatoes. Amanullah *et al*. (2017) also reported that guava fruits treated with salicylic acid maintained their color as compared to other treatments.

Flavour. Flavour score continuously decreased from 8.5 to 5.2 but salicylic acid was proved to be effective in retaining higher scores. Highest mean value (7.7) was obtained in SP_3 (7.6) although it was not significantly higher than SP_4, while lowest value (6.4) was in SP_0. Highest decrease (58.82%) in flavour score was noted

Table 8. Effect of salicylic acid treatment on the chilling injury index of peach fruits during storage intervals

Salicylic acid	Storage period (days)						
	Initial	7	14	21	28	35	Means
0 mM	0.00	0.00	0.28	0.77	2.14	3.83	1.17a
1.5 mM	0.00	0.00	0.22	0.45	1.58	3.17	0.90ab
2.0 mM	0.00	0.00	0.00	0.26	0.91	2.24	0.57bc
2.5 mM	0.00	0.00	0.00	0.10	0.35	1.11	0.26c
3.0 mM	0.00	0.00	0.00	0.10	0.38	1.16	0.27c
Means	0c	0c	0.1c	0.34c	1.07b	2.30a	

Mean values followed by same letters are not significantly ($P<0.05$) different from each other.

Table 9. Effect of salicylic acid treatment on the color of peach fruits during storage intervals

Salicylic acid	Storage period (days)							
	Initial	7	14	21	28	35	% Decrease	Means
0 mM	8.8	8.2	6.7	4.8	3.2	1.1	87.5	5.5b
1.5 mM	8.7	8.3	7.0	5.2	3.8	1.8	79.31	5.8b
2.0 mM	8.8	8.3	7.5	6.1	4.9	3.3	62.50	6.5b
2.5 mM	8.8	8.6	8.1	7.6	6.8	6.3	28.41	7.7a
3.0 mM	8.8	8.5	8.0	7.6	6.7	6.2	29.55	7.6a
Means	8.8a	8.4ab	7.5bc	6.3cd	5.1d	3.7e		

Mean values followed by same letters are not significantly ($P<0.05$) different from each other.

in SP_0, while lowest decrease (21.18%) was observed in SP_3. Statistical analysis displayed a significant effect of both treatments and storage intervals on the flavor score. The decrease in the flavour scores for peach fruits might occur because of a decline in conversion of organic acids and starches into sugar content. At the later stages of storage of fruits, degradation of polysaccharides and carbohydrates occur which causes the flavour of fruits to decline. Ali *et al*. (2013) suggested that apricots treatment with salicylic acid maintained their flavour as compared to untreated fruits. Similarly, Ezzat *et al*. (2017) also described the role of salicylic acid in maintaining the flavour of fruits.

Texture. Texture is one of the physical parameters to monitor the fruit ripening quality. Data revealed that texture score progressively decreased from 8.2-4.6 throughout this period. Highest mean value (7.7) was achieved in SP_3, while least value (5.5) in SP_0. During storage highest percent decrease (72.84) was obtained in SP_0, while lowest (18.07%) in SP_3. Statistical analysis unveiled a significant effect of both treatments and storage intervals on the texture score. It has been reported that application of salicylic acid helps to maintain the firmness of fruits which in turn prevents the degradation of fruits texture during storage. Asghari and Aghdam (2010) reported that salicylic acid causes inhibition of enzymes which are responsible for decreased texture firmness of fruits. Ali *et al.* (2013) also recommended that salicylic acid facilitated in maintaining the texture of apricot fruits.

Overall acceptability. Data disclosed that overall acceptability score gradually lessened from 8.5-4.5. Highest mean value (7.7) was obtained in SP_3 closely followed by SP_4 (7.6), while least value (5.8) was noted in SP_0. Greatest %decrease (73.20) was appeared in SP_0, while lowest percent decrease (22.63) was in SP_3. Treatments as well as storage intervals provided a statistically significant effect on overall-acceptability of fruit samples. Overall acceptability scores of peach fruits decreased throughout the storage because other sensory parameters *i.e*. colour, flavour and texture degraded. As salicylic acid treatment was most effective in maintaining the scores of all of these sensory parameters so that's why overall acceptability score of peach fruits treated with salicylic acid was better as compared to control. The results are in agreement with Sharma and Sharma (2017) who recommended that salicylic acid assisted in maintaining overall acceptability of Japanese plum as compared to untreated fruits. Ali *et al*. (2013) also reported that apricot fruits treated with salicylic acid had higher mean scores for overall acceptability.

Table 10. Effect of salicylic acid treatment on the flavour of peach fruits during storage intervals

Salicylic acid	Storage period (days)							
	Initial	7	14	21	28	35	% Decrease	Means
0 mM	8.5	7.9	7.2	6.3	5.1	3.5	58.82	6.4d
1.5 mM	8.5	7.9	7.4	6.4	5.4	4.2	50.59	6.6cd
2.0 mM	8.5	8.1	7.7	6.9	6.0	5.4	36.47	7.1bc
2.5 mM	8.5	8.3	8.1	7.6	7.2	6.7	21.18	7.7a
3.0 mM	8.5	8.3	8.0	7.4	7.0	6.3	25.88	7.6ab
Means	8.5a	8.1ab	7.7b	6.9c	6.1d	5.2e		

Mean values followed by same letters are not significantly (P<0.05) different from each other.

Table 11. Effect of salicylic acid treatment on the texture of peach fruits during storage intervals

Salicylic acid	Storage period (days)							
	Initial	7	14	21	28	35	% Decrease	Means
0 mM	8.1	7.5	6.5	5.1	3.7	2.2	72.84	5.5c
1.5 mM	8.2	7.7	6.8	5.4	4.1	2.7	67.07	5.8bc
2.0 mM	8.3	8.0	7.2	6.6	5.8	4.7	43.37	6.8ab
2.5 mM	8.3	8.2	8.0	7.7	7.3	6.8	18.07	7.7a
3.0 mM	8.3	8.1	7.8	7.5	7.0	6.5	21.69	7.5a
Means	8.2a	7.9a	7.3ab	6.5bc	5.6cd	4.6d		

Mean values followed by same letters are not significantly (P<0.05) different from each other.

Table 12. Effect of salicylic acid treatment on the overall acceptability of peach fruits during storage intervals

Salicylic acid	Storage period (days)							
	Initial	7	14	21	28	35	% Decrease	Means
0 mM	8.5	7.9	6.8	5.4	4.0	2.3	73.20	5.8d
1.5 mM	8.5	8.0	7.1	5.7	4.4	2.9	65.76	6.1cd
2.0 mM	8.5	8.1	7.5	6.5	5.6	4.5	47.60	6.8bc
2.5 mM	8.5	8.4	8.1	7.6	7.1	6.6	22.63	7.7a
3.0 mM	8.5	8.3	7.9	7.5	6.9	6.3	25.79	7.6ab
Means	8.5a	8.1ab	7.5bc	6.5cd	5.6d	4.5e		

Mean values followed by same letters are not significantly ($P<0.05$) different from each other.

Conclusion

Peach fruits were treated with salicylic acid at different concentrations to investigate the effect of salicylic acid on the storage stability of peach fruits. The results of this research work showed that salicylic acid was effective in minimizing weight loss and chilling injury and also maintained fruit firmness, ascorbic acid, TSS, pH as well as sensory characteristics of peach fruits during storage period. On the basis of physico-chemical and sensory evaluation, it is concluded that 2.5 mM salicylic acid showed best performance in terms of enhancing the shelf life and the storage stability of peach fruits.

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

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