Research Article

Physico-chemicals and sensory quality of Peaches treated with hot water during the cold storage

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Abstract

The objectives of this study were to investigate and compare the effects of hot water treatments on the physico-chemical and sensory quality of peach fruit during cold storage. Peach fruit were harvested at physiological mature stage and were treated with hot water at 35°C, 40°C, 45°C, 50°C, 55°C, 60°C and control with tap water (20°C) for 2 minutes to evaluate the effects of hot water. Peach fruit were stored at 0°C ± 1°C with 90% ± 5% RH for 30 days during the period of analysis. Hot water treatments have significant effect on moisture loss, TSS, pH, acidity, sugar acid ratio, reducing sugar, non-reducing sugar, vitamin C, firmness and organoleptic evaluation of peaches. There was no significant effect of these treatments on the ash content of fruits. Hot water treatment at 50°C for 2 min reduced moisture loss and delay in the increase of TSS, pH, sugar acid ratio, reducing sugar, and decrease in acidity, non-reducing sugar, vitamin C and firmness. Overall, the results indicate that hot water treatment at 50°C has tremendous potential for maintaining physico-chemical and sensory quality of peach during cold storage.

Keywords: Hot water treatment; Peaches; Physico chemicals and sensory attribute; Storage life

Introduction

Peach [1] is climacteric fruit and is one of the most important stone fruit grown in temperate zones of the world. Peaches contain high amount of vitamins, minerals, carotenoids, phenolic compounds (catechin, neochlorogenic acid, chlorogenic acid, caffeic acid), and anti-oxidant which are very important for human health [2]. Besides

Northern areas peach is also grown in Peshawar region, Swat, South Waziristan Hazara and Malakad division [3]. Post-harvest losses in peaches is very high due to its perishable nature and lack of post-harvest techniques. Round about 50% losses occur from production to the consumption [2]. Due to very high perishable nature, the postharvest life of fresh peach is very short

and is a main hurdle in supplying the fruit to national and international markets [4].

Numerous techniques, including physical (such as heat and UV-C pretreatments, modified atmosphere packaging,) and chemical methods (such as Calcium chloride, salicylic acid, methyl jasmonate (MJ)) and 1 MCP), have been applied to peach fruit to control post-harvest losses that occurs during low temperature storage [5, 6]. [7] reported that hot water treatment is most effective techniques to reduce the post-harvest losses of fruits. Hot water treatments delay ripening and respiration processes and increase the storage life of fruits [8, 9].

Keeping the above facts in view present research was conducted to study the effect of post-harvest hot water treatments on physicochemical and sensory attribute of peach fruits during the storage.

Materials and methods

This research work was conducted in Food Technology Section, Agricultural Research Institute Tarnab, Peshawar. The late maturing variety Indian Blood "Swat No. 8" was selected for the research.

Preparation of sample

Peach fruits of homogeneous size and color were divided into different lots for various treatments. The fruits were stored at 0°C $\pm$ 1°C with 90% $\pm$ 5% RH during the period of analysis. The data regarding various parameters were recorded at 10 days interval i.e. 0, 10, 20 and 30 days and so on until 50% of fruit samples were spoiled.

Experimental plan

Peaches were treated with hot water for three minutes. Hot water treatments were applied as follows:

T₀ = peaches with no treatment (control)

T₁ = peaches with hot water treatment at 35°C

T₂ = peaches with hot water treatment at 40°C

T₃ = peaches with hot water treatment at 45°C

T₄ = peaches with hot water treatment at 50°C

T₅ = peaches with hot water treatment at 55°C

T₆ = peaches with hot water treatment at 60°C

Moisture content of peach fruit was determined using the standard method AOAC (2000). The TSS, pH, acidity, sugar acid ratio, reducing sugar, non-reducing sugar, ash, and vitamin C content of peach samples were determined by standard method of AOAC (2000).

Fruit firmness was observed on two pared sides of 5 fruits from each replicate using a penetrometer (Wagner Fruit Firmness Tester model FT-327) [10]. Sensory evaluation was carried out by 9 point hedonic scale as described by [11].

Statistical analysis

The data were analyzed statistically by using completely randomized design, and means were separated by applying LSD test as illustrated by [12]. Analysis of variance (ANOVA) was performed on the results for every variable to measure the significance of the effects of temperature and storage period. Means were separated by the LSD test at P<0.05 level using Software (2006) Statistix Version 8.1.

Result and discussions

Moisture content/ Water loss

A significant variation of moisture content was observed in all the treatments (Figure 1). Both the treatments and storage intervals have significant effects on the moisture content. Maximum percent decline in moisture content was found in control (7.12%) followed by T₂ while minimum percent decrease in moisture was observed in T₄ (2.17%) followed by T₅ after 30 days of storage. The moisture loss might be due to metabolic activities, transpiration and respiration process in fruits. A decrease of the moisture losses was observed in hot water treated fruits. Our findings are in confirmation with previous work of [13, 2].

Figure 1. Effect of hot water treatment and storage intervals on the moisture content (%) of peach fruits.

Total soluble solid content

In all treatments total soluble solid content slightly increased during the 30 days of storage intervals (Figure 2). In hot water treated samples slow increase of TSS was

observed as compare to control. Similar observations have also been reported by [14, 3]. This slow increase of TSS in treated samples might be due to slow down the ripening process and inactivation of enzyme.

Figure 2. Effect of hot water treatment and storage intervals on the TSS ($^{\circ}$ Brix) of peach fruits

Titrateable acidity

The treatments have a non-significant effect on the titrateable acidity (Figure 3). But storage interval have significant effect on acidity. These results are in agreement with the findings of [14, 2, 3] who also observed

that hot water treatment had no significant effect on titrateable acidity in peaches and nectarines. The decrease in acid contents might be due to ripening and respiration process.

Figure 3. Effect of hot water treatment and storage intervals on the acidity (%) of peach fruits

pH

A non-significant difference of pH content was observed in hot water treated samples along with control (Figure 4). However, the effect of storage intervals was significant. A gradual increase in pH was recorded with

increase in storage period. The pH content increased from 3.95 on 0-day to 4.14 on 30-days. Similar explanation have also been found by [2, 3]. Due to decrease in acidity pH was increased.

Figure 4. Effect of hot water treatment and storage intervals on the pH of peach fruit

Sugar acid ratio

A significant increase in sugar acid ratio was found during storage (Figure 5). Maximum mean sugar acid ratio (14.69) was noticed in T₀ followed by T₂; whereas minimum was found in T₄. The sugar acid ratio increase

from 10.95 on 0-day to 15.42 on 30-days. The increase in sugar acid ratio might be due to increase in simple sugars concentration. Similar observations have also been reported by [14, 2, 15].

Figure 5. Effect of hot water treatment and storage intervals on the sugar acid ratio of peach fruits

Reducing sugar (%)

Both the treatments and storage intervals have significant effect on the reducing sugar (Figure 6). Maximum mean value (2.11) was recorded in T₀ followed by T₂ and minimum in T₆. The reducing sugar content increased significantly with the increase of storage

period. The value of 1.35 was obtained on 0-day which increased to 2.24 at the end of storage period. The result is also in accordance with the reports of [16, 17] who also observed the similar trend of reducing sugar in peaches.

Figure 6. Effect of hot water treatment and storage intervals on the reducing sugar (%) of peach fruit

Non-reducing sugar (%)

Both the treatments and storage intervals have significant effect on the non-reducing sugar (Figure 7). Maximum mean value (5.45) was recorded in T₀ followed by T₃ and minimum in T₀. The reducing sugar content decreased significantly with the

increase of storage period. The value of 5.60 was obtained on 0-day which increased to 5.01 at the end of storage period. The result is also in accordance with the reports of [16, 17] who also observed the similar trend of non-reducing sugar in peaches.

Figure 7. Effect of hot water treatment and storage intervals on the non-reducing sugar (%) of peach fruits

Ascorbic acid

A significant decrease of ascorbic acid was evaluated in all the samples. The data showed that highest ascorbic acid (8.25) was observed in T₄ followed by T₃ while minimum (7.34) was noted in T₀. Similarly, ascorbic acid was maximum (9.6) at day zero to (6.27) with a continuous loss up to 30 days storage. These results are in agreement with the findings of [14, 3] who found that hot water treatment reduce the ascorbic acid losses during storage of peaches.

Ash (%)

Both the treatments and storage intervals have non-significant effect on the ash (%) content of peaches.

Fruit flesh firmness (kg/cm²)

Fruit flesh firmness significantly decreased during 30 days of storage at 0°C in all the treatments (Figure 9). Maximum mean score for flesh firmness (6.28) was noticed in T₃ followed by T₄; whereas minimum was found in T₀. A significant decline in peach flesh firmness was observed during storage. The flesh firmness decreased from 6.46 on 0-day to 5.52 on 30-days. Decrease in fruit flesh firmness might be due to the enzymatic activities on the cell wall or might be due to respiration. These results are in agreement with the findings of [14, 17] who also observed that fruits treated with 50°C of hot water were firmer than untreated fruits.

Figure 8. Effect of hot water treatment and storage intervals on vitamin C (mg/100g) of peach fruits

Figure 9. Effect of hot water treatment and storage intervals on firmness (Kg/cm²) of peach fruits

Sensory evaluation

For sensory evaluation, fruits were analysed through colour, flavour, texture, juiciness and over all acceptability (Figure 10). A significant variation for over all

acceptability was found in all the treatments. Maximum mean score for overall acceptability (6.7) was noticed in T₄ followed by T₃; whereas minimum was found in T₀. A significant decline in overall

acceptability score was observed during storage. The overall acceptability score was decreased from (6.69) at day zero to (5.83) up to 30 days storage. These results are in

agreement with the findings of [3, 2] that hot water treated fruits at 50 °C have maximum score for overall acceptability as compare to control and other treated fruits.

Figure 10. Effect of hot water treatment and storage intervals on overall acceptability of peach fruits

Conclusion

The aim of this research was to evaluate effects of hot water treatment on physico-chemicals and sensory quality of peaches. Hot water treatment at 50°C (T₄) were found most effective in maintaining peach fruit quality in terms moisture loss, TSS, pH, acidity, sugar acid ratio, reducing sugar, non-reducing sugar, vitamin C, firmness and sensory evaluation.

Authors' contributions

Conceived and designed the experiments: AS Shah & S Wahab Performed the experiments: AS Shah, S Rani, Z Rahman, IURahman, A Basir & SAM Shah, Analyzed the data: AS Shah, MM Hashim & MFA Malik, Contributed reagents/ materials/ analysis tools: AS Shah, S Wahab, MM Hashim, MFA Malik, Wrote the paper: AS Shah, MM Hashim & MFA Malik.

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