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Enhancement of Postharvest Life of Persimmon Fruit Through Botanical Extracts

*Abdul Haseeb[1], Gohar Ayub[1], Tanveer Ali Sial[2], Sikandar Hayat[2], Husain Ahmad[3], Fayaz Ali[2], Zhilong Lan[2] and Muhammad Numan Khan[2,4]**

[1]*Department of Horticulture, Faculty of Crop Production Sciences, The University of Agriculture, Peshawar-Pakistan*

[2]*College of Natural Resources & Environment, Northwest A & F University, Yangling, Shaanxi-712100, China*

[3]*College of Horticulture, Northwest A & F University, Yangling, Shaanxi-712100, China*

[4]*National Engineering Laboratory for Improving Quality of Arable Land, Institute of Agricultural Resources and Regional Planning, Chinese Academy of Agricultural Sciences, Beijing 100081, China*

Abstract

The aim of this study was to evaluate the effect of different plant extracts on the post-harvest of Persimmon fruit. The experiment was laid out in CRD (complete randomized design) with two factors keeping 12 fruits per treatment and replicated three times. Factor A was Plant Extracts i.e. (moringa, garlic, marigold and lemon grass) while factor B was storage durations i.e. (0,7,14,21 and 28) days. The data were recorded for Percent fruit weight loss, Fruit volume, Fruit firmness, Decaying percentage, Fruit juice contents, pH, Total Soluble Solids (TSS), Percent acidity, TSS/Acidity and Ascorbic acid contents. The application of various plant leaves extracts significantly influenced the quality parameters of persimmon fruits after harvest. Maximum data for fruit volume (46.00), fruit firmness (2.79), fruit juice contents (60.82), percent acidity (0.23) and ascorbic acid contents (30.69), while minimum data for percent fruit weight loss (3.29%), pH (5.67), Total soluble solids (18.13), sugar acid ratio (86.15) and decay incidence (11.67) was recorded in fruits treated with moringa leaves extracts. While the moringa leaf extract have best results among storage durations. It was concluded from the study that the application of Moringa leaves extracts was much effective on all quality parameters of Persimmon fruits. Among the storage periods, Persimmon fruits, maintained the quality attributes up to 28 days of the storage at the room temperature (25 ± 5 ℃).

Keywords

Post-harvest, Plant extracts, Different storage durations, Persimmon fruit

Introduction

Persimmon (*Diospyros kaki*) (Var. Seed less Persimmon) is the primary fruit plant in Pakistan, mostly cultivated in Chakwal, Hazara and Malakand division [1]. Persimmon is well known for its good taste, attractive texture and color [2]. The origin of persimmon is China and is the national fruit of Japan [3]. Persimmon is an attractive fruit with yellow to orange and deep red skin color. It is a good source of B- carotene, potassium and vitamin C that provide energy [4]. China, Japan and Korea are the major producing countries of persimmon. The cultivated area of persimmon 762.5 thousand ha with an average production of 2.5 million tons worldwide. In Pakistan it was cultivated on an area of 2.94 thousand hectare with production of 21.828 thousand tons [5].

Immature fruits of persimmon contain more amount of tannin concentration which causes astringency. When the fruit develops towards its maturity, the amount of tannin in the fruits decreases. The persimmon fruit could be consumed when it's become fully mature. Fruit of Persimmon contains Vitamins (A), carotenoid sand dietary fibers [6,2]. Persimmon fruit have different amount of glucose, Ascorbic acid, Amino acids and water-soluble tannins [7] and have a very good effect on human health because it contains beneficial nutrients

***Corresponding author:** Muhammad Numan Khan, College of Natural Resources & Environment, Northwest A & F University, Yangling, Shaanxi-712100, National Engineering Laboratory for Improving Quality of Arable Land, Institute of Agricultural Resources and Regional Planning, Chinese Academy of Agricultural Sciences, Beijing 100081, China, Tel: +861-851-692-6602

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and achieved a great market value. Due to these properties peoples and scientist take keen interest in cultivation of persimmon fruit. Scientists related to the field of research are mostly interested on the work related to its shelf life and storage quality parameters like sugar, phenolic compounds and ascorbic acid [8].

As persimmon is a very perishable in nature and the use of chemicals for the extension of its shelf life, has a hazardous effect on human health, many plant parts are used as an edible coating material such as seed extracts, leaf extracts and whole plant part which is mostly contain polysaccharides, proteins and lipids [9]. These coatings have natural qualities that couldn't be synthesized artificially [10]. Several post-harvest methods like chemical application, oil coating, wax emulsion, edible coating, PGRs, low temperature techniques, calcium treatment, application of different fungicides and many varieties of packaging materials used as post-harvest techniques, to improve the shelf life of fruits. Edible coatings have a great effect on the storage of fruits after harvest and control losses of fruit [4,11], but there is little information available regarding the treatment of persimmon fruit with different plant extracts and their effect on the post-harvest of persimmon fruit, therefore the objectives the current study were 1) to investigate the best plant extract for storing persimmon fruits and to find out the best storage duration on the shelf life of persimmon fruit. 2) to evaluate the interactive effect of different plant extracts.

Material and Methods

The persimmon fruits were collected form the Horticulture farm, The university of Agriculture Peshawar. The fruits were then washed with tap water to remove the dust and dried with a tissue paper. The experiment was carried out in a complete randomize design (CRD) having two factors 1) 4 plants extracts T_0 (control), T_1 (Moringa), T_2 (Garlic), T_3 (Marigold) and T_4 (lemon grass) and 2) 4-time duration D_0 (0 days), D_1 (7 days), D_2 (14 days), D_3 (21 days) and D_4 (28 days) with three replications.

Extraction of plant extracts

Leaf of Moringa, Garlic, Marigold and lemon grass were collected form the Horticulture research form of The University of Agriculture Peshawar, Pakistan and bring it into the laboratory. All the leaf samples were washed 2 to 3 time with tap water. Then the samples were dried with soft cloth and put in laboratory for 3 to 4 days at room temperature (± 25℃) to keep the samples air dried [3]. After drying the samples were then ground through mechanical grinder to make fine powder. From each sample, 200 g of powder was soaked in one-liter distilled water for six hours. The solution was then filter and the filtrate (100% of stock solution which could be further diluted) obtained was used as a coating solution for the treatment of persimmon fruit [12].

Composition of leaf extract of different plants (Moringa, Garlic, Marigold and lemon grass)

The chemical composition of each plant leaf extract consists of the following chemicals a) Moringa leaves contains zeatin, which is a type of hormone called cytokinin, The Moringaceae family plant also consist of many nutrients like Fe, Ca, nitrogen, magnesium, and potassium, also the moringa leaves contains 2271 kcal/kg of metabolizable energy, 25.1% crude proteins and 0.50% methionine, b) Garlic leaves is actually rich in Allicin, selenium and organo Sulphur compounds, which have pronounced antioxidant activity, antifungal and antibacterial properties, c) Marigold contains high percentage of carotenoids such as flavaxanthin, lutein, rubixanthin, lycopene b-carotene and g-carotene, these carotenoids have the power and value of antioxidant, anti-proliferative and antimicrobial, d) Lemon grass leaves is a well source of cellulose and also works in the preparation of papers and cardboard, helps in decrease of root-knot nematode. It is used externally as a poultice to relieve pain, arthritis and also efficient next to storage pests, lemon grass oil has fungicide value for both plants and humans.

Dip technique

Sample from each plant extract i.e., Moringa, Garlic, Marigold and lemon grass with a volume of 1000 ml were used for dipping the Persimmon fruits. The fruits were dipped for each treatment in the proposed plants extracts for 5 minutes and placed with a gentle care in the specified portion for further analysis [13].

Percent fruit weight loss

Percent fruit weight loss was measured by the difference in initial and final weight by digital balance taken after every 7 days during storage [14].

$$\text{Weight loss (\%)} = \frac{\text{Initial reading} - \text{Final reading}}{\text{Initial reading}} \times 100$$

Fruit volume (cm^3)

The fruit volume was determined by the liquid/water displacement method based on Archimedes' Principle at room temperature by putting each fruit sample in the beaker (1000 ml) half filled with distilled water and the reading was noted examining that how much water is being displaced [15].

Fruit Firmness ($kg\ cm^{-2}$)

Firmness of the fruits was determined with texture analyzing instrument known as penetrometer (Model-Wanger FT-327) with a capacity of 28 lbs [14].

Fruit juice contents (%)

It was extracted by fruit juice extractor and was weighed and calculated as percentage of fruit weight for each treatment [14].

TSS (°Brix)

Total soluble sugar (TSS) was measured by using hand refractometer model "SP-05A" (SIPCON, Japan) having range of 0 to 32% by putting the small sample of fruit juice on the prism of the instrument and analyzed with naked eye [16].

TSS/Acidity

The ratio between TSS and percent acidity or citric acid contents of the fruit samples were calculated by dividing the values of TSS over percent acidity [14].

Percent acidity

It was determined as a citric acid in fruit by titrating 10 ml sample (taking 10 ml juice in graduated cylinder and making 10% of solution by adding distilled water proceeding the volume to 100 ml) of fruit juice against 0.1 M normal solution of NaOH and calculation was done with the prescribed formula by AOAC 2000 [16].

pH

pH was determined by putting the rod of electric pH meter into the juice contents of the samples.

Ascorbic acid contents (mg $100g^{-1}$)

Ascorbic acid content was determined as vitamin C contents in fruits samples by titrating 10 ml (10%) fruit sample against dichloro phenol indo phenol solution (already prepared stock solution) till the appearance of the pink color and was calculated on the prescribed formula [16].

Decaying percentage (%)

Number of fruits decayed both pathologically or physiologically were counted and were expressed as a percentage of initial fruit samples in each treatment [14].

Statistical analysis

The calculated data was then measured through a proper procedure which will be suitable for Completely Randomized Design (CRD) having two factors. For the analysis of recorded data STATISTICS 8.1 (statistical software) was used with least significant difference at 5% level of probability.

Results

Effect of different plant extract on the fruit weight loss, volume, firmness and juice content of persimmon fruit under different storage durations

The results revealed that both the treatments plant extracts and storage duration had a significant effect on the percent fruit weight loss (Figure 1a). The maximum percent fruit weight loss (4.69%) was recorded in control (the fruits remained uncoated), while minimum percent fruit weight loss (3.29%) was recorded in the fruits treated with moringa leaves extracts. Among the storage durations, maximum mean value for percent fruit weight loss (5.64%) was recorded in the fruit stored for 28 days, whereas minimum percent fruit weight loss (0.00%) was recorded in control. Moreover, according to Table 1 the interaction of storage durations and plant extract showed significant results at ($P > 0.01$).

Fruit volume of persimmon showed significant difference for both plant extract and storage duration (Figure 1b). Fruits treated with moringa leaves extract showed maximum fruit volume (46.00 cm^3) followed by garlic leaves extract (42.20) where as the minimum fruit volume (39.80) was recorded for control. In case of storage durations, the maximum fruit volume was recorded for zero days and the minimum fruit volume was observed in the fruits stored at 28 days of interval. In case of fruit volume, the treatment (various plant extracts) and storage durations showed non-significant results Table 1, while the treatments and storage durations showed significant results when it was alone.

In the present study firmness of the persimmon fruits significantly increased by both the treatments (Figure 1c). The highest mean value for fruit firmness (2.79) was recorded in fruits treated with moringa leaves extracts followed by the fruits (2.61) treated with garlic leaves extracts, whereas the lowest fruit firmness (2.17) was recorded in control. With respect to time duration the maximum fruit firmness (3.21) was observed for the fruits that were stored at 0 days, while the minimum was recorded for 28 days of storage. However, in case of interaction of both time durations and treatments showed significant results (Table 1).

The maximum fruit juice contents (60.82) were recorded in fruits treated with moringa leaves extracts followed by the fruit juice contents (60.36) in the fruit treated with garlic leaves extracts whereas minimum fruit juice contents (59.09) were recorded in control. In case of storage durations, maximum mean value for fruit juice contents (82.50) was recorded in the fruits stored on 0 days of storage interval whereas minimum fruit juice contents (35.20) were recorded on the 28 days of storage (Figure 1d). Furthermore, both the treatments had a significant effect on the fruit juice contents,

Table 1: Analysis of variance (ANOVA) for different post-harvest traits affected by plant extracts and storage durations.

SOV	Rep (df = 02)	Treatments (df = 04)	Days (df = 04)	T × D (df = 16)	Error (df = 48)
Fruit weight loss	0.03	3.93**	77.94**	0.41**	0.03
Fruit volume	11.85	83.88*	3952.31**	14.06NS	16.30
Fruit firmness	0.05	0.92**	5.83**	0.11**	0.02
Fruit juice contents	1.42	7.21**	5742.09**	1.28**	0.07
Sugar acid ratio	996.31	3121.61*	55349.59**	1799.76*	672.63
Total soluble sugar	1.78	4.748*	115.80**	1.17NS	1.27
PH	0.05	0.13*	1.14**	0.01NS	0.03
Acidity	0.00	0.001NS	0.08**	0.001NS	0.00
Ascorbic acid contents	3.90	113.15**	3406.53**	20.02**	3.38
Decay incidence	4.00	1223.56**	9739.03**	206.31**	7.76

**/* significant at 0.01 and 0.05 respectively.

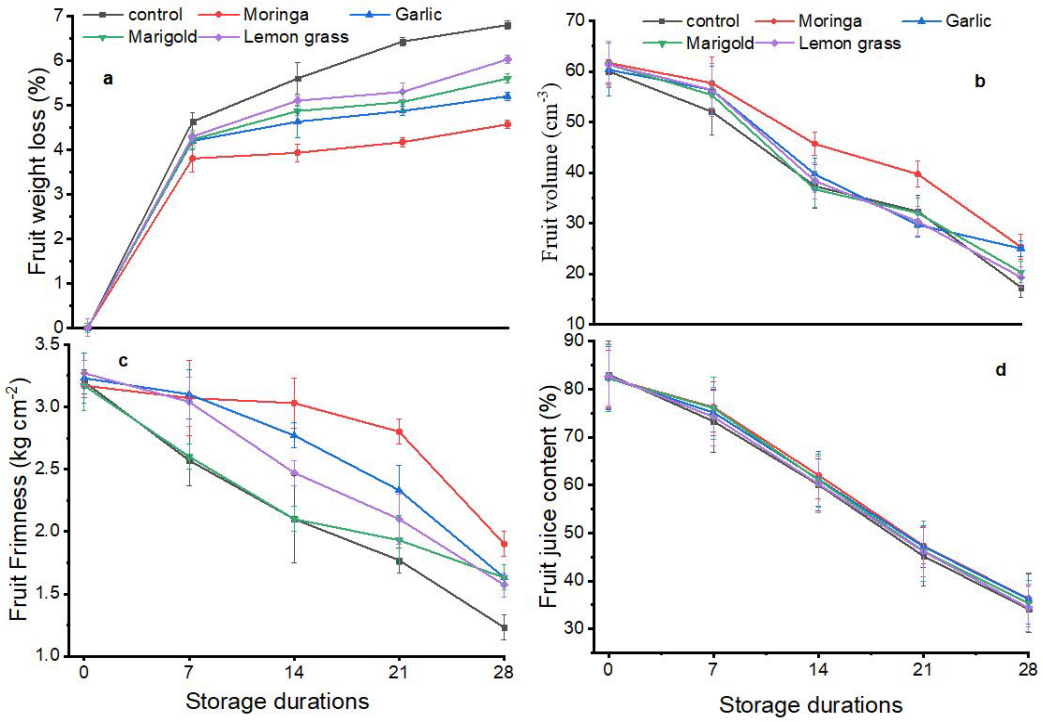

Figure 1: The effect of different plant extract on the post-harvest of persimmon fruit. Note: the 0,7,14 and 28 represent the storage durations in days.

and also the interaction of these two (treatments and storage durations) also showed significant results (Table 1).

The impact of moringa, garlic, marigold and lemongrass leaves extract on the sugar acid ratio, total soluble sugar, pH and acidity after different time durations

The results revealed that both the treatments (various plant leaves extracts) and storage intervals had a significant effect on the sugar acid ratio (Figure 2a). The maximum sugar acid ratio (119.50) was recorded in control (the fruits remained uncoated) while minimum sugar acid ratio (86.15) was recorded in fruits treated with moringa leaves extracts. However, within the storage durations the highest sugar acid ratio (204.60) was recorded in the fruit stored for 28 days of storage interval whereas minimum sugar acid ratio (55.90) was recorded on the initial day of storage, while the interaction of plant extract and time durations showed significant results at $p > 0.05$.

The results showed that TSS showed significant differences within both the treatments (Figure 2b). The maximum TSS (19.70) was recorded in control (the fruits remained uncoated) while minimum TSS (18.13) was recorded in fruits treated with moringa leaves extracts followed by TSS (18.91) found in fruits coated with garlic leaves extracts. Whereas, in case of storage durations, maximum value for TSS (22.46) was recorded in the fruit stored for 28 days of storage interval and minimum TSS (16.28) was recorded on the initial day of storage. In case of interactions between the different plant extracts and storage durations it showed non-significant results (Table 1).

In present study both the treatment showed significant results either in coating of fruits with different plant extracts or within in the storage duration (Figure 2c). The highest pH value was recorded in control (5.91), while the lowest pH value (5.67) was observed in the fruits treated with moringa leaves. With respect to storage durations, maximum value for pH (6.09) was recorded in the fruit stored for 28 days, whereas minimum pH (5.39) was recorded on the initial day of storage. In case of pH the also showed non-significant interactions between the time durations and plant extracts while, the various plants extract and time duration showed significant effect when it was alone.

Percent acidity showed significant differences within both treatments either with the application of different plant extracts or storage time interval (Figure 2d). The highest percent acidity was recorded in fruits treated with moringa leaves extracts followed by marigold leaves extract, whereas garlic and lemon grass leaves extracts showed no significant differences between each other while showed significant difference with moringa and control. In case of storage durations, the maximum percent acidity (0.29) was recorded in the fruits stored on 0 days of storage interval whereas minimum percent acidity (0.12) was recorded on the 28 days of storage. The percent acidity also showed non-significant results when we find the interaction between time durations and plant extracts.

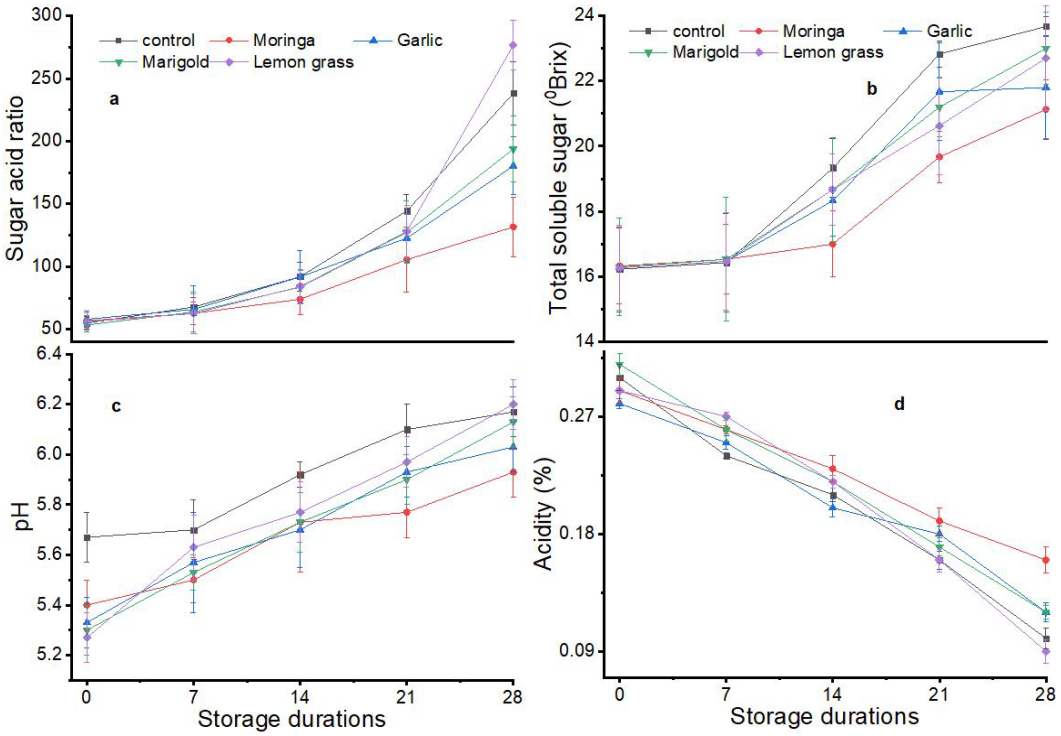

Figure 2: The effect of various plant extracts on sugar acid ratio, total soluble sugar, pH and acidity after different time durations. Note: the 0,7,14 and 28 represent the storage durations in days.

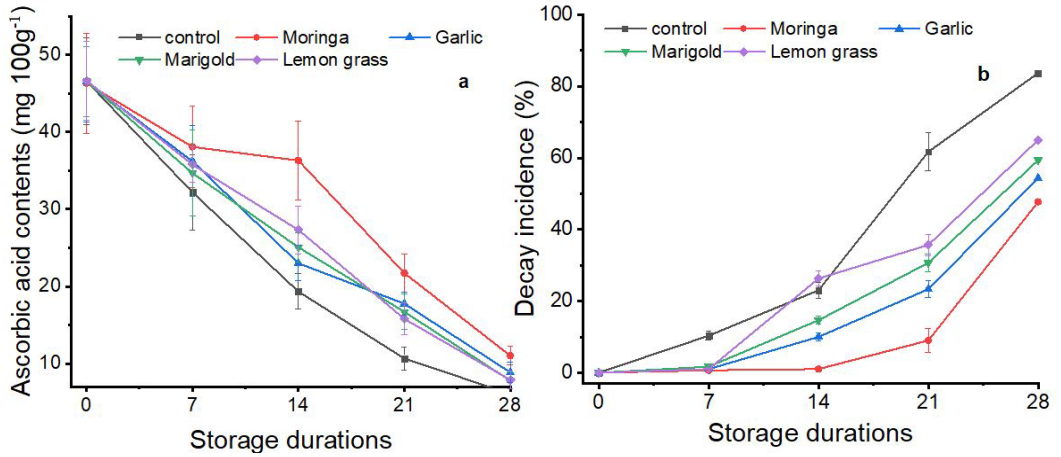

Figure 3: The impact different plant extracts on the ascorbic acid and decay incidence under 4 storage time durations.

Effect of various plant extract on the ascorbic acid and decay incidence under different time durations

Our results showed that both the treatments (various plant leaves extracts) and storage intervals had a significant effect on the ascorbic acid contents (Figure 3a). The maximum ascorbic acid contents (30.69) were recorded in fruits treated with moringa leaves extracts whereas minimum ascorbic acid contents (22.96) were recorded in control. Moreover, the storage durations also showed significant results, and the maximum ascorbic acid contents (a46.51) was recorded in the fruits stored on 0 days of storage interval whereas minimum ascorbic acid contents (8.33) were recorded on the 28th day of persimmon storage. In case of interaction analysis the ascorbic acid content showed significant effect (Table 1).

In present study the maximum decay incidence (35.73) was recorded in control (the fruits remained uncoated) while minimum decay incidence (11.67) was observed in fruits treated with moringa leaves extracts followed by decay incidence (17.73) found in fruits treated with garlic leaves extracts (Figure 3b). With respect to storage durations, highest decay incidence (62.00) was recorded in the fruit stored for 28 days of storage interval whereas the lowest

decay incidence (0.00) was noticed on the initial day of storage. The decay incidence showed significant interaction results when time duration and plant extract was analyzed (Table 1).

Discussion

Effect of different plant extract on the fruit weight loss, volume, firmness and juice content of persimmon fruit under different storage durations

The loss of moisture is much responsible for the percent fruit weight loss. The loss in moisture contents at the surface of fruits affects the percent fruit weight loss adversely [17] have also confirmed that plant leaves extracts suppressed, the weight loss in 'Starking' 'cherries. Plant leaves extracts reduced the respiration, transpiration rate and other metabolic activities in fruits. [18] is also agreed with the statement that plant leaves extracts blocked the moisture loss in table grapes and retained the weight. During the post-harvest storage period of the fruits, the rate of respiration increases when not treated with post-harvest application. Plant leaves extracts are beneficial and not hazardous to human health and play a vital role in the bio preservation of fruits. Due to the application of various plant leaves extracts the rate of respiration, the storage period reduced by the moringa leaves extracts as it blocked most of the surface pores of the fruits for the exchange of gases. The reduced rate of respiration and transpiration extends the shelf life of persimmon fruits and reduced the percent fruit weight loss [19].

The moisture loss from the surface of persimmon fruits reduces the fruit volume in addition to the loss in weight during storage durations. The rate of respiration and other metabolic activities enhances the reduction in fruit volume. This is confirmed by [17,18] while working on bio preservation of cherries and table grapes using plant extracts. As the loss of moisture contents from the surface of the fruits reduces the percent fruit biomass, it also reduces the fruit volume. The moisture loss of the fruits during the storage life is directly related with the percent loss of fruit biomass as well as the reduction of fruit volume. In storage duration, the fruits treated with plant leaves extracts considerably extend the shelf life of persimmon and all its quality attributes [19]. The same reason was also revealed by [14] stating that the application of plant leaves extracts as a post-harvest treatment increased the shelf life of oranges and maintained all the quality attributes of stored fruits including fruit volume. The reduction in fruit volume is maintained by the application of plant leaves extracts and hence the fruit volume of the stored fruits is not reduced much as compared to the control. The same phenomenon was also explained by [1] experimenting on the persimmon to extend its shelf life without deteriorating the quality attributes of persimmon fruit.

The rate of respiration is reduced by the plant leaves extracts during storage and thus maintained the fruit firmness of persimmon fruit [18]. In this regard the extracts decreased the undergoing catabolic reaction within the fruits and maintained firmness of the persimmon. Application of plant leaves extracts decreased activation associated with ripening and rate of respiration [20] and this is the reason to retaining firmness of 'persimmon'. The same order of study was also claimed by [21] working on orange's treating with plant leaves extracts and stated that coating of plant leaves extracts around fruits'-maintained fruit's firmness [18] have also confirmed same sort of results regarding fruit's firmness during post-harvest duration using plant leaves extracts.

During the post-harvest or storage life of fruits the rate of respiration increase with the increase storage duration so that the fruit undergo various biological reaction such as catabolic reactions which become the reason for softening of the fruits and reduction of fruit firmness. The application of post-harvest treatment reduces all the biological reactions within the fruits, hence maintained the fruit hardening characteristics and extend the shelf life of fruits [20]. Plants leaves extracts are the major bio preservative which helps in maintaining the fruit quality during storage periods [14]. The results of the present study are also in lined with the results of [19].

With increase in storage intervals, a decrease trend in the juice contents was observed. Our results are in line with [22] who stated that during the storage of fruits, the fruit juice contents decreased. The decrease in the juice contents maybe due to the loss of moisture from the fruit. Plant leaves extracts retained' juice contents by reducing the respiration's rate and water losses. During storage periods the fruit juice contents decreases. The reduction of fruit juice contents is mainly associated with the moisture loss from the surface of the fruits [23]. The coating of plant leaves extract reduced the moisture loss from the surface of the fruits hence maintained the quality attributes of the fruits keeping higher fruit juice contents [14]. The results of the present study are also in agreement with the previous findings [18,21,23]. Most of the researchers are agreed with the statement that plant leaves extracts could be used as a bio preservative agent to extend the shelf life of persimmon fruits during storage, without deteriorating the quality attributes of the fruits.

The impact of moringa, garlic, marigold and lemongrass leaves extract on the sugar acid ratio, total soluble sugar, pH and acidity after different time durations

The sugar acid ratio of stored persimmon fruits showed an increased order during storage durations. The consumption of organic acids was decreased in respiration by plants leaves extracts, decreasing the acidity [24]. With the decreasing of acidity, TSS was increased in persimmon. This could be because of the accumulation and synthesis of 'photosynthates' [25]. The reduction in water content of fruit and conversion of cell wall components such as starch, protein, pectin and hemicelluloses into simple soluble sugars during storage is responsible for increasing TSS content [26]. Soluble solid's catabolism that is of organic acids and sugars in respiration process were also decreased by leaves extracts becoming the reason for maintaining the acidity. The same order of concluded results been formulated by [24,27].

Application of plant leaves extracts significantly affected fruit TSS with increase in storage duration. TSS increases during fruit ripening due to the action of enzyme for biosynthesis (sucrose-phosphate synthesis) [28]. The reduction occurs in water contents of the fruits and the conversion of cell wall components' such as hemicelluloses, pectin, protein and starches into simple soluble sugars during storage which may increase TSS content [26]. With the decreasing of acidity, TSS was increased in persimmon. This could be because of the accumulation and synthesis of 'photosynthates' [25]. On the other hand, loss occur in acidity is prefer due to conversion of metabolites and the process of respiration in stored fruits [29]. The increasing trend in the post-harvest life of persimmon fruits was reduced by the plant leaves extracts and hence maintained the TSS of persimmon fruits. With loss in moisture contents from the surface of the fruits and increased rate of respiration the acidity of the fruits decreased due to which the TSS of fruits increases. This was maintained by plant leaves extracts. The results of the present study are also confirmed by [29,30] performing experiments on the post-harvest life and storage of the fruits.

pH of persimmon fruits increased during storage. Plant leaves extracts helped to delay the fruit's ripening and to slow down the respiration rate. Our results are consistent with [27] who applied the plant leaves extracts on Apple's reported that pH was decreased during the storage period, is because of the organic acids that were consumed with reducing rate of respiration. As plant leaves extracts are greatly related with fruit ripening, it reduces the rate of respiration in fruits during storage periods and ultimately slows down the consumptions of various acids which appeared to be the main and prominent purpose for the pH decreasing. Same was also claimed by [31] studied that the consumption of different acids during the storage periods of the fruits reduced, because of the post-harvest application. Plant leaves extracts act as a bio preservative agent during the storage duration maintaining the loss of moisture contents from the surface of the fruits, reducing the consumption of acids in fruits and maintain the pH of the fruits [32]. The increasing pH of fruits during the storage period and quality attributes of the persimmon fruits after the application of different plants leaves extract were supported by the previous studies [1,23,32].

The application of plant leaves extracts decreased the respiration rate and loss in moisture. The consumption of organic acids was decreased in respiration by plants leaves extracts, decreasing the acidity [24]. Soluble solid's catabolism that is of organic acids and sugars in respiration process were also decreased by leaves extracts becoming the reason for maintaining the acidity. The same order of concluded results been formulated by [24,27]. Acidity of the fruits decreases with the increase in storage periods. This decrease in the percent acidity also termed as titratable acidity comes due to the high rate of respiration during storage periods, which ultimately increases the consumption of organic acids responsible for keeping the acidity of the fruit of quality maintenance. The use of plant leaves extracts as a post-harvest application agent, decreased the rate of respiration of persimmon fruits during storage and therefore the consumption of organic acids reduced which ultimately became the reason for minimum decrease in the titratable acidity of the persimmon fruits. The results of the present study are also previously confirmed by [29,30].

Effect of various plant extract on the ascorbic acid and decay incidence under different time durations

During storage condition, increase in biological processes along with the chemical processes lead to fruit ripening and increase in ascorbic acids occur. Oxidase enzymes along with phenolic activities are also responsible for such loss in ascorbic acids [33]. This loss encounter in contents of ascorbic acid is maintained with the application of plants' leaves extracts. The same order of study on the post-harvest was also claimed by [34] mostly in lined with the current study of research work on using plants leaves extracts. The application of extracts from plants leaves, reduced the action of enzymes and prevent ascorbic acids' oxidation. Such study was reported previous by [1] stating that such cellular process affects the fruit's quality.

Fruits of persimmon applied with plants leaves extracts have reduced decay in some fruits significantly. The antimicrobial characteristics along with the anti-fungal properties of the extracts of plant leaves could be the better reason for the reducing nature decay incidence of fruits [35]. The microbes or the organism responsible for occurring decay in stored fruits received non-favorable environment for incidence of decay in fruits due the applied extracts of plants leave [36]. This applied extract of plant leaves leads to slowing down the respiration rate, activates and growth of microbes which ultimately reduced decay and disease incidence in treated fruits with extracts of plant leaves [37].

Conclusion

According to the results observed it was concluded that post-harvest application of Plant extracts significantly affected the quality parameters of Persimmon fruits and maintained the fruit weight, pH, acidity, fruit firmness, ascorbic acid, TSS and TSS-acid ratio. The application of Moringa leaves extracts was much effective on all quality parameters of Persimmon fruits. Among the storage periods, Persimmon maintained fruits quality attributes up to 28 days of the storage at the room temperature (25 ± 5℃). Based on the stated conclusions, the given recommendations are formulated; 'Persimmon fruits' can be applied/treated with Moringa leaves extracts (200 g/100 ml water) for maintaining the quality of Persimmon fruits. Storage of Persimmon up to 28 days can be better at room temperature (25 ± 5 ℃).

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