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Scientific Research

Effect of post-harvest salicylic acid treatment on storage life and quality of Cornelian cherry (*Cornus mas* L) fruit

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ABSTRACT

Cornelian cherry (*Cornus mas* L) fruit is very perishable and needs proper post-harvest management to reduce waste. This study was performed as a factorial experiment in a completely randomized design with three replications with the aim of increasing postharvest life and maintaining fruit quality of two Cornelian cherry genotypes KKP2 and Hir. Factors included three salicylic acid immersion treatments (0, 1 and 2 mM), four storage times (0, 10, 20 and 30 days) and two Cornelian cherry genotypes. Fruits were harvested at maturity (more than 90% redness of the skin) and healthy and uniform fruits were subjected to immersion treatments and stored for 30 days at 4 ° C. During and at the end of experiment, different physicochemical traits of fruits including soluble solids (TSS), firmness, total phenol, anthocyanin, ascorbic acid, pH and weight loss were examined at 10-day intervals. The results showed that KKP2 genotype had less firmness and TSS and more weight loss than Hir genotype. There was no significant difference between the two genotypes in terms of total acidity. The highest of pH, soluble solids and weight loss were observed in the control or distilled water treatment and salicylic acid treatment prevented the increase of these parameters. The highest levels of ascorbic acid, anthocyanin and firmness were observed in the treatment of 1 mM salicylic acid. The amount of fruit phenol in distilled water treatment was further reduced and the treatments of salicylic acid 1 and 2 mM prevented further reduction of phenol during storage. Salicylic acid treatments can be used as a promising method for increasing the firmness and extending the shelf life of cornelian cherry fruits.

1-Introduction

Cornelian cherry with the scientific name *Cornus mas* L. belongs to the Cornaceae family, a large genus that originates from central and southern Europe and part of Western Asia. Cornelian cherry fruit is rich in iron, calcium, anthocyanin, vitamins C, B1, B2, E, folic acid, flavonoids, oxalic acid and antioxidants [1]. Fruits can be used fresh or as syrup, fruit juice, jam and other traditional products [2]. According to the statistics of the Ministry of Agriculture in 2018, the total cultivated area of Cornelian cherry in Iran is about 1045 hectares, most of which is located in Qazvin province with 707 hectares. The amount of Cornelian cherry production in the country and Qazvin province is 5271 and 3250 tons, respectively [3]. Cornelian cherry yield in Qazvin province is about 4597 kg per hectare.

Alamut and Koohin regions in Qazvin province are the most important Cornelian cherry growing areas in Iran and more than 80% of Cornelian cherry in Qazvin province are grown in these areas, which shows the suitable conditions of these areas for the development of this product. Based on the local market price in 2014, the value of each ton of fresh Cornelian cherry is between 10 and 51 million tomans, which shows the importance of this product in the country's economy. However, due to its juicy nature, the fresh Cornelian cherry fruit has poor shelf life and should be consumed or processed quickly after harvesting [4]. Therefore, considering the low storage life of fruit and its short-term fresh supply in the market, it seems necessary to find solutions to increase postharvest life of fruit for better marketing and longer supply to the market. The results of various researches have shown that salicylic acid treatments have increased fruit yield and improved the characteristics of different fruits.

Salicylic acid is an internal growth regulator in plants, which is involved in a wide range of physiological and metabolic reactions in plants and affects their growth and development. Using salicylic acid externally on plants (fruits and vegetables) in non-toxic concentrations controls post-harvest rot and improve pathogen resistance. Salicylic acid induces the accumulation of H2O2 in plant tissue, as a result, plant defense genes are activated and plant resistance increases [5]. Preservation of fruit firmness as a result of salicylic acid treatment has been reported in several crops. In an experiment, concentrations of 0 to 32 µL of salicylic acid maintained the firmness of kiwifruit during the storage period [6]. Srivastava and Dwivedi [7] reported that in bananas treated with salicylic acid, the sweetness of the fruit decreased dramatically. Considering that no study has been done on the effect of salicylic acid treatment on the shelf life of commercial Cornelian cherry genotypes in Alamut region of Qazvin province. The purpose of this experiment is to investigate the effect of this combination on the quality and shelf life of two Cornelian cherry genotypes in order to determine the best and most effective combination with the most appropriate concentration to maintain postharvest quality of fruits in genotypes.

2-Materials and methods

The present research was conducted in the form of a factorial experiment based on a completely randomized design and in three replications. The fruits of Hir and KKP2 genotypes were harvested in August 2019 at the stage of commercial maturity and were transferred to the laboratory of Qazvin Agricultural and Natural Resources Research and Education Center, for treatment to increase the post-harvest life and storage quality. In this research, the effect of salicylic acid on some fruit traits such as fruit firmness, weight loss percentage, pH, titratable acid, soluble solids, ascorbic acid, anthocyanin level and phenolic compounds were measured. The factors included immersion in 3 levels (1 mM salicylic acid, 2 mM salicylic acid and distilled water as control) and storage time (0, 10, 20 and 30 days).

The immersion process lasted for 5 minutes. After applying the treatments, the fruits were dried for 1-2 hours at room temperature and then placed in sealed plastic containers. The treated fruits were stored in the refrigerator at 4 degrees Celsius for one month. Quantitative and qualitative factors were measured at 0, 10, 20 and 30 days. Parameters of fruit weight, seed weight and fruit flesh weight by digital scale (Sartorius model,

Germany), fruit length and diameter and seed diameter by caliper (Shoka Gulf model), fruit firmness by firmness meter (American T011 model), fruit pH by pH meter (American Hanna model), amount of total soluble solids or TSS by manual refractometer (ATAGO model), total acid or titratable acid by titration method with 0.1 normal NaOH [8], ascorbic acid by titration With iodine solution in potassium iodide in the presence of starch reagent [9], the amount of anthocyanin was measured by extract absorption method at different pH [10] and the amount of phenolic compounds was measured by Folin Ciocalto method [11]. Data analysis was done by using MSTATC statistical software and comparison of trait averages was done by Duncan's method and five percent probability level.

3- Results and Discussion

3-1- The comparison of data means

3-1-1- Fruit juice acidity (pH)

The results of analysis of variance showed that the simple effects of genotype, treatment, time and interaction effects of genotype × treatment on pH were significant at the five percent level. The interaction effects of genotype x time, treatment x time and genotype x treatment x storage time on this parameter were significant at 1% level. The results of the interaction effect of time and genotype showed that the Hir genotype showed a higher pH. With the passage of storage time, the pH of the fruit increased. The lowest pH of the genotypes was observed on day 0 (Figure 1). The interaction effect of treatment on genotype showed that in both genotypes, the highest fruit pH was observed in the control treatment (distilled water) (Figure 2). The interaction effect of time and salicylic acid treatment showed that the pH of fruit juice was higher in distilled water treatment at 10, 20 and 30 days of storage time (Figure 3).

Treatment with salicylic acid prevented the increase in pH in this experiment. The increase in pH during storage may be due to the breakdown and decomposition of organic acids in the respiration process. Salicylic acid can partially prevent the reduction of organic acids by reducing respiration and slowing down the metabolic processes of the cell [12]. In plum fruit, salicylic acid treatment has preserved the quality characteristics of the fruit, including pH [13]. Salicylic acid treatment maintained the pH of the fruit of grapes (CV.Qezel Ozum) [14].

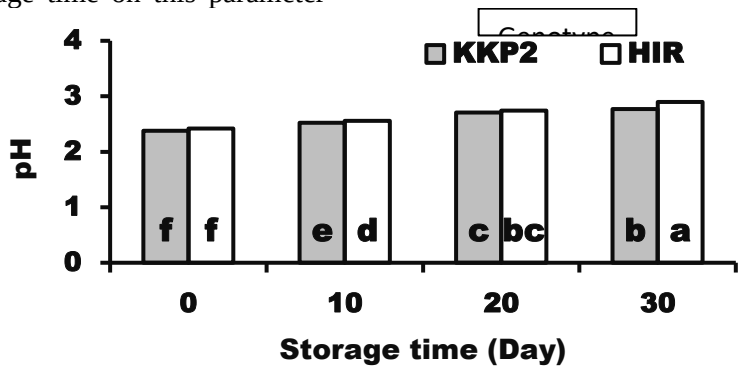

Fig 1 Interaction effect of time and genotype on pH of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test ($p \leq 0.05$).

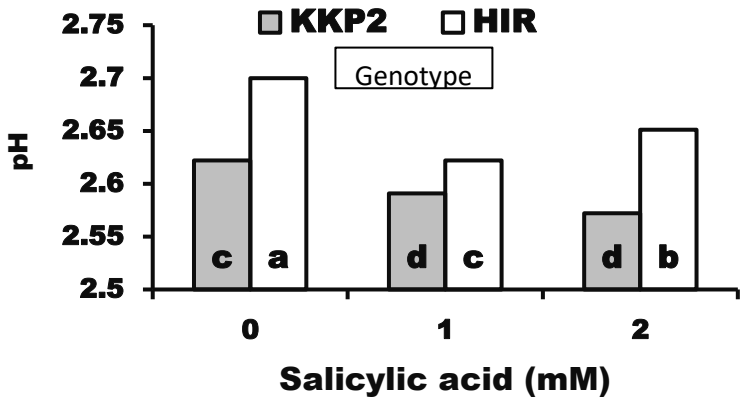

Fig 2 Interaction effect of treatment and genotype on pH of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test ($p \leq 0.05$).

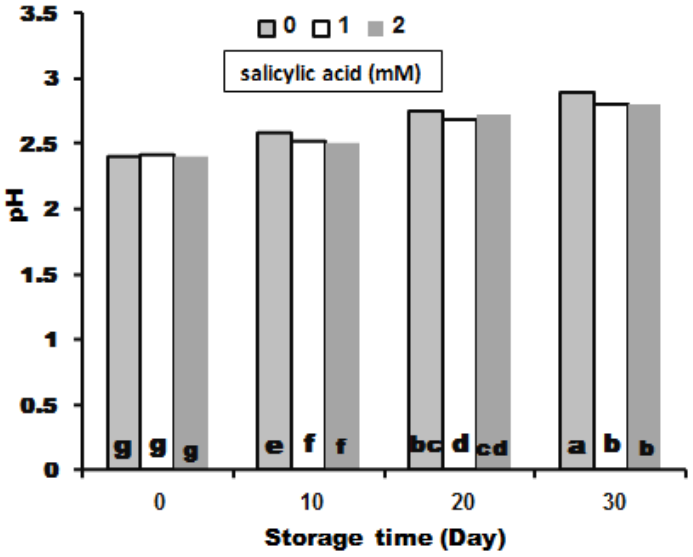

Fig 3 Interaction effect of treatment and time on pH of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test ($p \leq 0.05$).

3-1-2- Soluble solids

The simple effect of genotype, treatment, time, the interaction effect of genotype and treatment, the interaction effect of treatment and storage time on the amount of soluble solids were significant at the level of 1%, while genotype and time interaction and genotype, treatment and time interaction were not significant.

The interaction effect of genotype and treatment showed that in both genotypes, the highest fruit TSS was observed in the control treatment (distilled water) (Figure 4). The interaction effect of time and treatment showed that fruit TSS increased over time. At 0 day, no difference was observed between treatments, but salicylic acid treatment prevented the increase of TSS over time, and the highest value at days 10, 20 and 30 belonged to the distilled water treatment (Figure 5).

The concentration of soluble solids increases during ripening, which is the result of the hydrolysis of starch and its conversion into simple carbohydrates such as glucose [15]. By reducing the activity of enzymes responsible for the breakdown of cell walls such as cellulase, polygalactronase, antioxidant enzymes such as calatase, peroxidase, salicylic acid affects the breakdown of starch in the fruit tissue and as a result is an effective inhibitor of increasing the content of soluble solids in the

cell. [16]. The treatment of kiwi fruit with a concentration of 32 µl of methyl salicylate kept the amount of soluble solids lower than the control at the end of the storage stage in cold conditions [6]. The researchers have reported that methyl salicylate reduces the production of ethylene as a result of the decrease in the activity of sucrose-phosphate synthase enzyme and leads to a decrease in sugar synthesis. Based on the findings of Srivastava and Dwivedi [7], salicylic treatment reduces the increase in the flesh-to-skin ratio, which leads to a delay in banana fruit ripening. Salicylic acid has been reported to effectively reduce cellular respiration in several fruits. Salicylic acid as a signal induces cyanide-resistant respiration in plant cells by affecting the activity of enzymes [17]. The effect of salicylic in reducing the rate of respiration is due to its negative effects on the enzymes ACC synthase, ACC oxidase, polygalactronase and pectin methylesterase. Cellulase enzymes and antioxidants lead to a decrease in ethylene production and performance. Salicylic acid and acetylsalicylic acid inhibit the production of ethylene. The inhibitory action of salicylic acid is very similar to di-nitrophenol, which is an inhibitor of ethylene-producing activity [18].

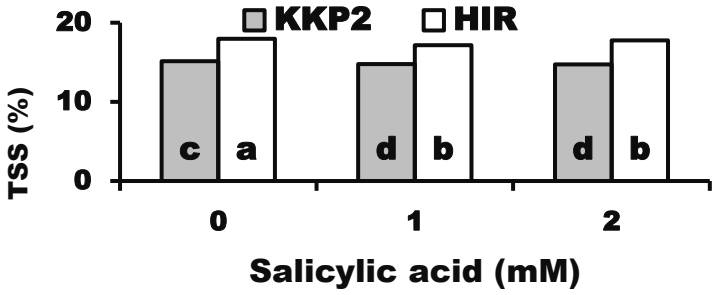

Fig 4 Interaction effect of treatment and genotype on TSS of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test ($p \leq 0.05$).

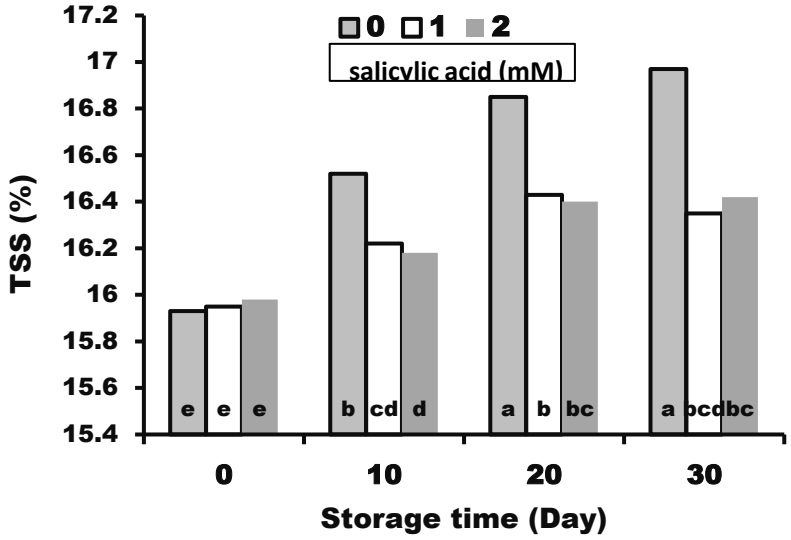

Fig 5 Interaction effect of treatment and Time on TSS of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test ($p \leq 0.05$).

3-1-3-Titratable acid

In terms of the amount of titratable acid, the simple effect of genotype, treatment, time and the interaction effect of genotype and time were significant at the level of 1%. However, the

interaction effect of treatment and storage time, the interaction effect of genotype and treatment, and the interaction effect of genotype, treatment and time were not significant. The analysis of interaction effects of storage time and genotype showed that the titratable acid of fruits decreased during the storage period, and KKP2 genotype showed a higher total acid at all measurement times (Figure 6).

Since organic acids are used as substrates for the enzymatic reactions of respiration, it is expected that during the post-harvest period, the total acid of the fruit will decrease and its pH values will increase. The reduction of total acid is very likely due to the biochemical changes of the organic compounds of the fruit during the respiration process [19]. The use of salicylic acid in Qezel Ozum grapes caused the preservation of total acid during storage [14]. The treatment of salicylic acid on strawberry fruits of Selvia cultivar maintained the amount of total acid during the storage period [20].

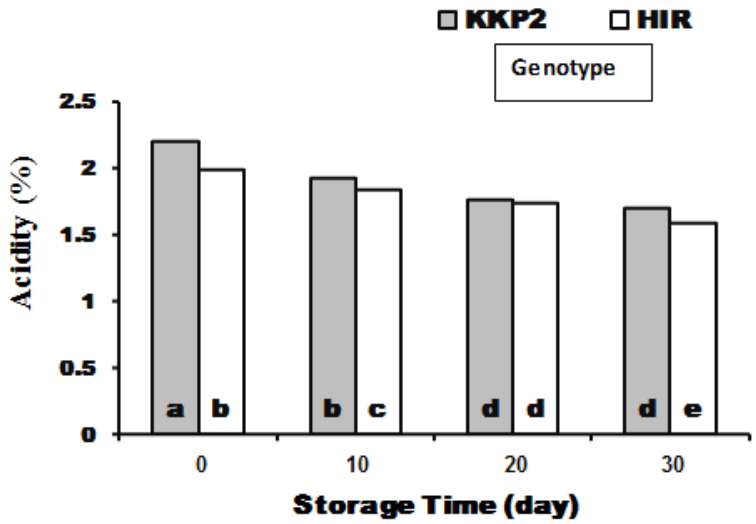

Fig 6 Interaction effect of time and genotype on titrable acidity of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test ($p \leq 0.05$).

3-1-4-Ascorbic acid

In the parameter of ascorbic acid, the results showed that the simple effect of genotype, treatment, time, the interaction effect of genotype and treatment, the interaction effect of genotype and time, and the interaction effect of treatment and storage time were significant at the level of 1%, while the interaction effect of genotype × Treatment × time was not significant. The interaction effect of time in the genotype showed that the ascorbic acid of the fruit decreased during the storage period and KKP2 genotype had higher ascorbic acid at all measurement times (Figure 7). The interaction effect of genotype in the treatment also showed that the highest amount of ascorbic acid was obtained in the treatment of 1 mM salicylic acid and the lowest amount belonged to the control treatment (Figure 8). The interaction effect of time and salicylic acid showed that the amount of ascorbic acid was different on the 10th, 20th and 30th days of the experiment (Figure 9).

Ascorbic acid rapidly degrades over time in the presence of oxygen. By increasing the activity of the ascorbate peroxidase enzyme and breaking down free radicals, salicylic acid delays the rapid oxidation of ascorbic acid and thus preserves the ascorbic acid of the fruit [16]. Lu et al. [21] reported that the application of salicylic acid reduces the rate of ascorbic acid reduction in pineapple fruit. Asghari et al [14] reported the maintenance of vitamin C content in grapes with the use of salicylic acid during storage.

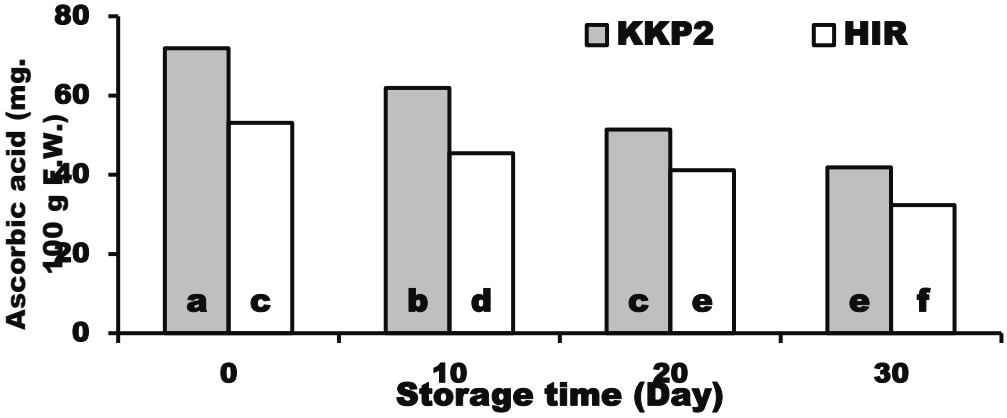

Fig 7 Interaction effect of time and genotype on ascorbic acid of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test ($p \leq 0.05$).

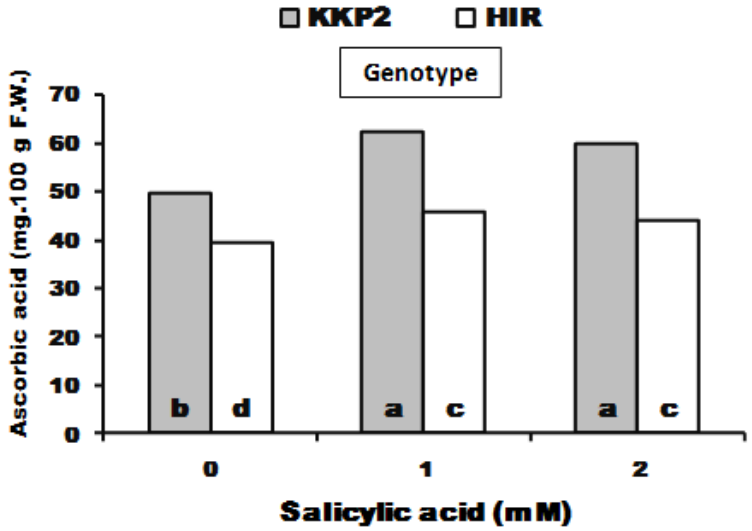

Fig 8 Interaction effect of treatment and genotype on ascorbic acid of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test ($p \leq 0.05$).

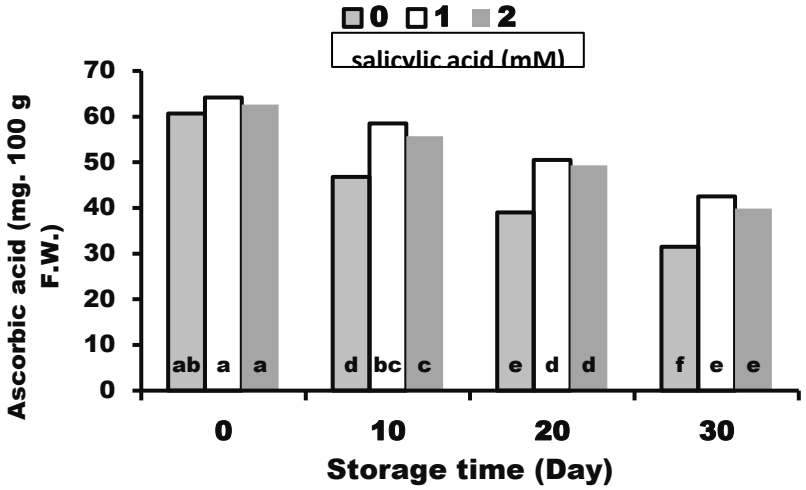

Fig 9 Interaction effect of time and treatment on ascorbic acid of cornelian cherry fruits. Columns with similar

letters have no significant difference in Duncan mean comparison test (p≤0.05).

3-1-5-Anthocyanin

The simple effect of genotype, treatment, time, the interaction effect of genotype and time, the interaction effect of treatment and storage time, the interaction effect of genotype and treatment, as well as the interaction effect of genotype × treatment × time on fruit anthocyanin were significant at 1% level. The interaction effect of time and genotype showed that anthocyanin decreased with time in both genotypes (Figure 10). The interaction effect of genotype and treatment showed that although the KKP2 genotype had more anthocyanin, the lowest fruit anthocyanin was observed in both cultivars in the control treatment (Figure 11). The interaction effect of treatment and storage time also showed that there was no difference between the treatments at 0 day, but in the following times, the amount of anthocyanin in the treated fruits was higher than that of the control (Figure 12).

The decrease in the amount of anthocyanin is the result of the destruction of this compound due to the activity of polyphenol oxidase and peroxidase enzymes. Yousefpour et al. [22] also reported that the treatment of cornelian cherry fruits with salicylic acid increased the anthocyanin content of the fruits during the storage period, which is in line with the results obtained from the present study. An increase in the amount of anthocyanin during the storage period in sweet cherry fruit by treatment with salicylic acid was reported by Valero et al. [23]. Compounds such as phenols, flavonoids and anthocyanins are among the factors that determine the antioxidant capacity and quality value of the fruit, which are produced from the phenylpropanoid pathway as a result of the activity of the phenylalanine ammonia-lyase enzyme [23].

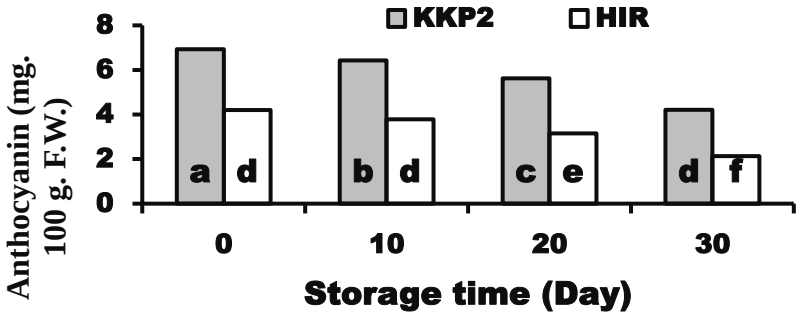

Fig 10 Interaction effect of time and genotype on anthocyanin of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test (p≤0.05).

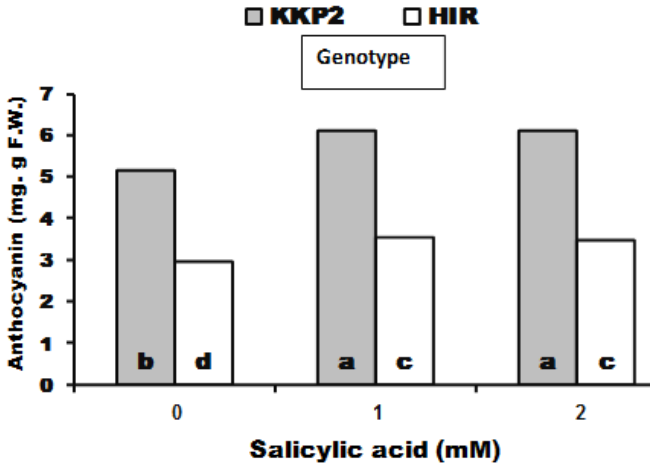

Fig 11 Interaction effect of salicylic acid treatment and genotype on anthocyanin of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test (p≤0.05).

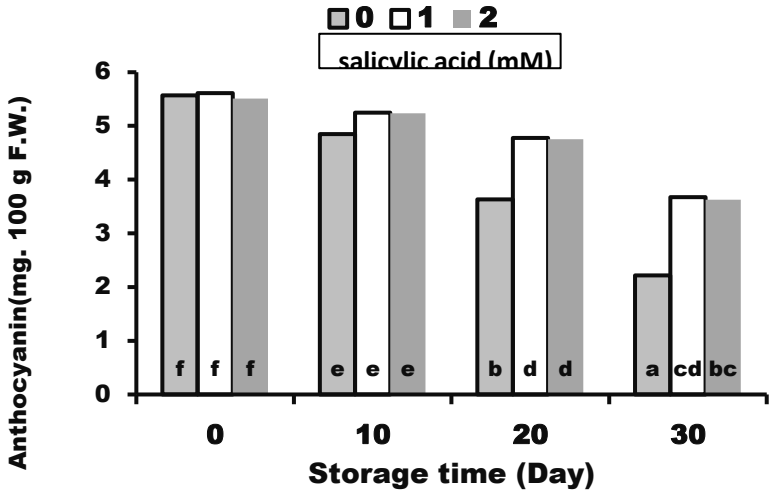

Fig 12 Interaction effect of salicylic acid treatment and time on anthocyanin of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test ($p \leq 0.05$).

3-1-6- Total phenol content

The simple effect of genotype, treatment, time, the interaction effect of treatment and storage time and the interaction effect of genotype, treatment and storage time on total phenol were significant at the level of 1%, but the interaction effect of genotype and treatment, the interaction effect of genotype and time on this parameter was insignificant. The results of the comparison of the average interaction effect of the treatment and time showed that there was no difference between the treatments at 0 day, but in the following times, the amount of phenol was higher in the applied treatments than in the control treatment (Figure 13).

Phenolic compounds have a great role in the quality of plant foods and health. Also, these compounds in plants absorb free radicals produced during oxidative stress with their antioxidant activity [24]. Phenolic compounds have the ability to induce the autoxidation system and chelate metal ions, which can cause the activity of some enzymes [25]. Phenols are affected by this enzyme during the storage period because they are the substrate of polyphenol oxidase enzyme. Further reduction in untreated samples could be due to rapid oxidation of flavonoids and phenolic compounds. Enzymatic oxidation of phenolic compounds related to the polyphenol oxidase enzyme causes the tissue to turn brown. On the other hand, the higher amount of phenolic compounds in the treated samples can be related to the decrease in respiration rate in these treatments, which leads to a decrease in the decomposition of these compounds [26]. Salicylic acid is a compound that stimulates the production of phenolic compounds in plants, and by affecting the enzymes effective in the production of phenolic compounds, it causes an increase in their production [16]. Yousefpour et al. [22] also reported that the treatment of cornelian cherry fruits with salicylic acid increased the amount of phenolic compounds in the fruits during the storage period.

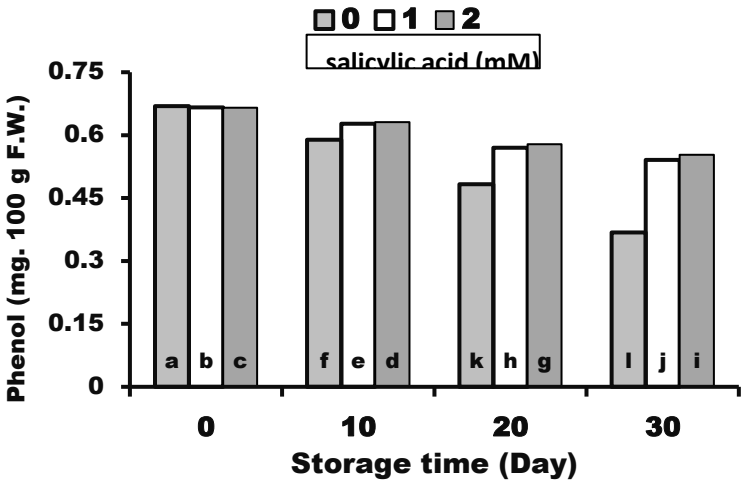

Fig 13 Interaction effect of salicylic acid treatment and time on phenol of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test ($p \leq 0.05$).

3-1-7- Weight loss

The results of analysis of variance showed that the fruit weight loss was influenced by the simple effect of variety, treatment, storage time, the interaction effect of genotype and treatment, the interaction effect of genotype and time, the interaction effect of treatment and time ($p \leq 0.01$), but it was not significantlyinfluenced by the interaction effect of genotype and treatment and interaction effect of genotype, treatment and time($p \leq 0.05$). The interaction effect of time and genotype showed that the difference weight loss among genotypes was not significant on day 0 and 10, but on day 20 and 30 after storage, the percentage of weight loss in KKP2 genotype was higher than Hir genotype (Figure 14). The interaction effect of time and treatment showed that no difference was observed between the immersion treatments in measurements on day 0 and 10, but on day 20 and 30 of the experiment, salicylic acid treatment caused a decrease in weight loss (Figure 15).

Weight loss is caused by moisture transpiration from the surface of the fruit and due to the difference in vapor pressure between the product and the surrounding environment [27], respiration and physiological mechanisms [28]. The results obtained in this research are in line with the results obtained from the application of salicylic acid in peach [29] and plum fruits [30]. The most important factor in fruit weight loss during the storage period is the increase in evaporation and transpiration from the surface of the fruit. The decrease in weight loss of fruits in the treatment with salicylic acid due to the decrease in respiration rate has already been reported in many horticultural products, including strawberries [31], bananas [7] and plums [32].

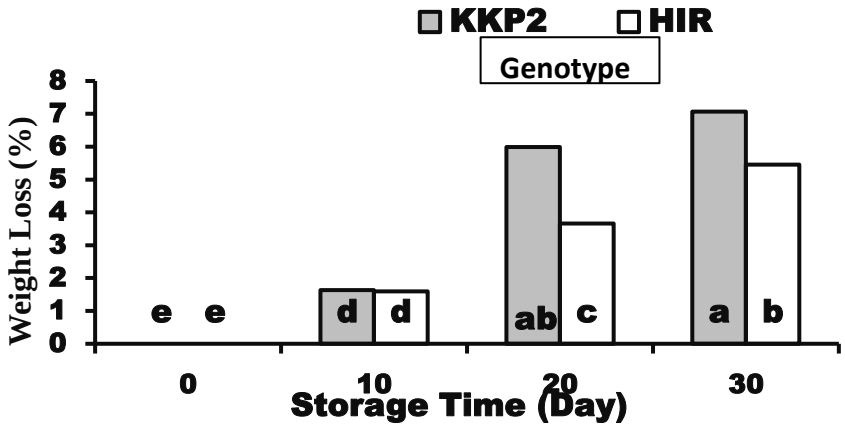

Fig 14 Interaction effect of genotype and time on weight loss of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test ($p \leq 0.05$).

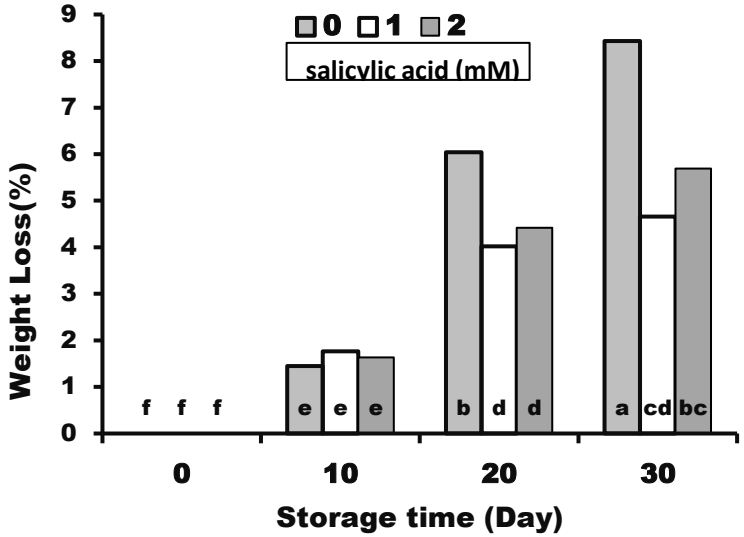

Fig 15 Interaction effect of salicylic acid treatment and time on weight loss of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test ($p \leq 0.05$).

3-1-8-Firmness of fruit texture

Variance analysis showed that fruit firmness was affected by the simple effect of variety, treatment, storage time, the interaction effect of genotype and treatment, the interaction effect of genotype and time, the interaction effect of treatment and time, but it was not affected by the interaction effect of genotype, treatment and time. The interaction effect of time in the genotype showed that all fruits showed a decrease in firmness during the storage period, and the lowest firmness was observed on the 30th day, and Hir genotype showed higher firmness at all measurement times (Figure 16). The interaction effect of genotype and treatment also showed that the highest firmness was observed in the 1 mM salicylic acid treatment. But the control treatment (distilled water) showed the least firmness. In both genotypes, the lowest fruit firmness was observed in the control treatment (distilled water) (Figure 17). The interaction effect of time and treatment showed that salicylic treatment prevented the reduction of the firmness of the fruit texture during the storage time (Figure 18).

Cornelian cherry is a highly perishable fruit that loses its firmness quickly during the ripening period, which is largely related to its short post-harvest life. Solomos and Laties [33] stated that the softening of fruits can be due to the breakdown of insoluble propectins into soluble pectin or the hydrolysis of starch. Pectin substances are responsible for the strength of the fruit and are the main components of the middle lamella and primary cell wall. In the ripening process, polygalactronase, pectin methylesterase, and pectin lyase are the main cell wall degrading enzymes that lead to depolymerization and solubility of pectin polysaccharides. Salicylic acid as a simple phenolic compound by regulating the expression of genes effective in ACC synthase and ACC oxidase and reducing the production of ethylene and cell wall destroying enzymes such as poly-galacturonase, cellulase and pectinase reduces the softening and maintains the firmness of the fruit tissue. [18 &31]. In line with the results obtained in this research, the use of salicylic acid in strawberry fruit maintained the firmness of the fruit tissue during the storage period [12]. Maintaining the firmness of fruit tissue during the storage period using salicylic acid treatments has been reported in kiwi [6] and banana [7].

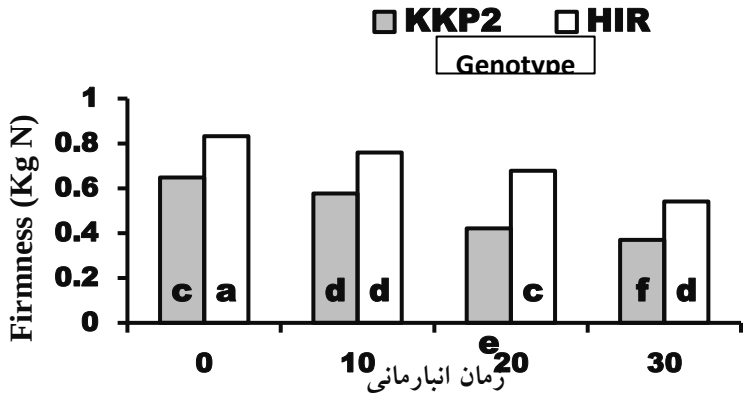

Fig 16 Interaction effect of genotype and time on firmness of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test (p≤0.05).

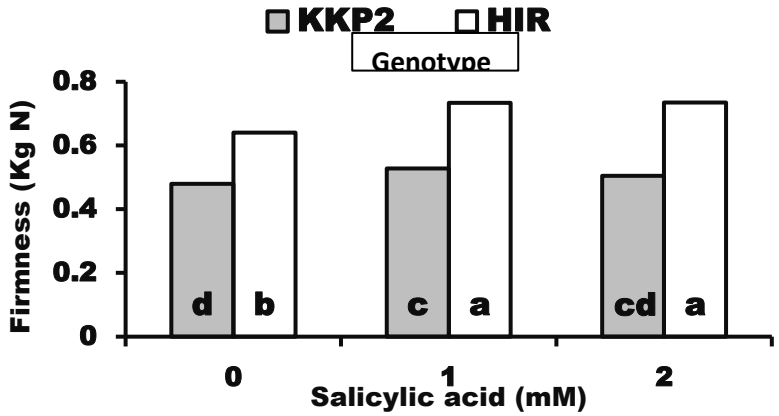

Fig 17 Interaction effect of salicylic acid treatment and genotype on firmness of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test (p≤0.05).

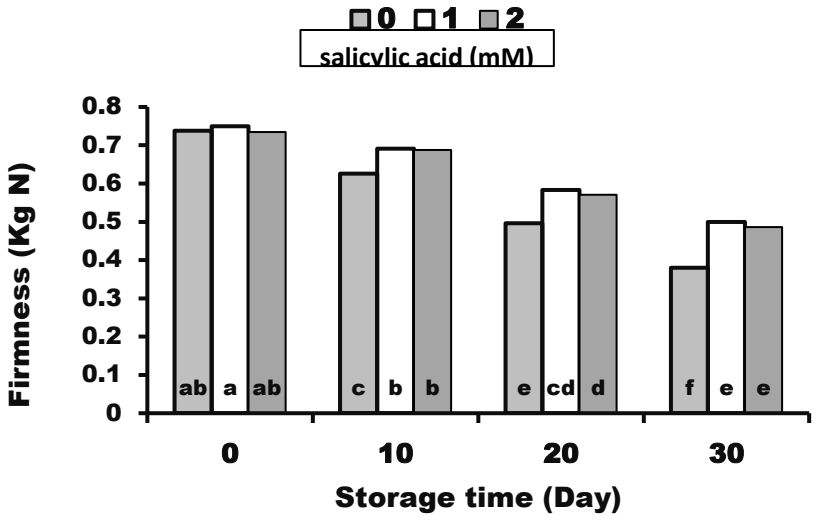

Fig 18 Interaction effect of salicylic acid treatment and time on firmness of cornelian cherry fruits. Columns with similar letters have no significant difference in Duncan mean comparison test (p≤0.05).

4- Conclusion

The results showed that the highest pH, soluble solids and weight loss were observed in control or distilled water treatment. Salicylic acid treatment prevented the increase of these parameters. The highest amount of ascorbic acid, anthocyanin and firmness was observed in the treatment of 1 mM salicylic acid. The amount of fruit phenol decreased more in distilled water treatment and 1 and 2 mM salicylic acid treatments prevented its further decrease during storage. Salicylic acid treatments can be used as a promising method by increasing firmness and increasing storage life for cornelian cherry fruits.

5- Acknowledgement

We hereby thank Qazvin Agricultural and Natural Resources Research and Education Center, for the financial support of this project.

6- Resources

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مقاله علمی_پژوهشی

اثر تیمار پس از برداشتی اسیدسالیسیلیک بر عمر انبارمانی و کیفیت میوه زغال‌اخته

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چکیده

میوه زغال اخته بسیار فسادپذیر است که برای کاهش ضایعات به مدیریت مناسب پس از برداشت نیاز دارد. این مطالعه با هدف افزایش عمر پس از برداشت و حفظ کیفیت میوه دو ژنوتیپ زغال اخته KKP2 و Hir به صورت فاکتوریل با طرح پایه کاملا تصادفی در سه تکرار انجام شد. فاکتورها شامل ۳ تیمار غوطه وری سالیسیلیک‌اسید (صفر، ۱ و ۲ میلی-مولار)، ٤ زمان انبارمانی (صفر، ۱۰، ۲۰ و ۳۰ روز) و دو ژنوتیپ زغال‌اخته بودند. میوه‌ها در مرحله بلوغ (بیش از ۹۰ درصد قرمزی پوست) برداشت و میوه‌های سالم و یکنواخت تحت تیمارهای غوطه‌وری قرار گرفتند و به مدت ۳۰ روز در دمای ٤ درجه‌سانتی‌گراد انبار شدند. در طی و پایان آزمایش، صفات مختلف فیزیکوشیمیایی میوه‌ها شاملمواد جامد محلول (TSS)، سفتی، فنول کل، آنتوسیانین، آسکوربیک اسید، pH و کاهش وزن به فواصل ۱۰ روزه مورد بررسی قرار گرفتند. نتایج نشان دادند که ژنوتیپ KKP2 میزان سفتی و قند کمتر و کاهش وزن بیشتری نسبت به ژنوتیپ Hir داشت. دو ژنوتیپ از نظر اسید کل تفاوت معنی‌داری با هم نداشتند. بیشترین مقادیر pH، مواد جامد محلول و کاهش وزن در تیمار شاهد یا آب مقطر مشاهده شد و تیمار سالیسیلیک‌اسید سبب ممانعت از افزایش این پارامترها شد. بیشترین میزان آسکوربیک اسید، آنتوسیانین و سفتی در تیمار ۱ میلی مولار سالیسیلیک اسید مشاهده شد. مقدار فنول میوه در تیمار آب مقطر کاهش بیشتری داشت و سالیسیلیک-اسید ۱ و ۲ میلی‌مولار از کاهش بیشتر آن در طی انبارمانی ممانعت کردند. تیمارهای سالیسیلیک اسید می‌تواند به عنوان یک روش امید بخش با افزایش سفتی و بالا بردن عمر انبارمانی برای میوه‌های زغال اخته مورد استفاده قرار گیرد.