Effects of Various Precooling Applications on Postharvest Quality of '0900 Ziraat' Sweet Cherries

M. Akbulut
Department of Horticulture
Black-Sea Agricultural Research Institute
Ministry of Agriculture and Rural Affairs
Samsun
Turkey

M. Özcan
Department of Horticulture
Faculty of Agriculture
Ondokuz Mayıs University
Samsun
Turkey

Keywords: *Prunus avium*, storage

Abstract

Fruits of '0900 Ziraat' sweet cherry were stored, after precooling (no precooling, precooling with air, precooling with water) in different package materials. Packaged cherry fruit were stored in 0 to 1°C and 90 to 95% RH. Precooling with water cooled 13 times faster compared with precooling with air. Total soluble solids (TSS) and titratable (TA) acidity were reduced during cold storage, and precooling reduced physiological disorders and fungal rots. Precooling applications reduced crop and quality losses. '0900 Ziraat' showed good storage performance for 3 or 4 weeks. Although flavour and quality of fruit started to decrease by the 3rd week, they were of acceptable quality for sale in the 4th week. The skin color and stem darkened by the end of storage period.

INTRODUCTION

The image of "Turkish Cherry" has become known in many countries, especially European countries, as Turkish exports have increased in recent years. The sweet cherry (*Prunus avium* L.) '0900 Ziraat', which is one of the highest quality cherry cultivars produced in Turkey, has played an important role in exports because it is resistant to transportation and storage damage. It is a late harvested, delicious fruit that does not crack and has excellent appearance. The most important problem for cherry exports is that the storage period and shelf life are short if it isn't stored under favourable conditions (Kaşka, 2001).

It has been shown that respiration and quality losses of cherry fruits increase, if the fruit is exposed to high temperatures after the harvest. So precooling is a useful process because it decreases product temperature and rapidly slows the respiration. There are many precooling processes, but the most common ones are precooling with air or with water. Quality traits of cherries provide opportunities for both precooling processes (Cemeroğlu et al., 2001). It has been demonstrated that precooling of cherry fruits immediately after harvest has a positive effect on fruit quality (Waelti, 1990). Studies have shown that precooling with water may be more suitable for cherry fruit (Ağar et al., 1995). The aim of this research was to establish the effects of different precooling processes on quality losses of '0900 Ziraat' cherries during storage.

MATERIALS AND METHODS

The research was conducted during 2001–2002 with '0900 Ziraat' sweet cherry. The fruit, which were not precooled, were packaged directly after harvest. The fruit which were precooled with air were transferred directly into the cold storage room (0°C and 90 to 95% relative humidity, RH). The fruit which were precooled with water were precooled by immersion into a water and ice mixture at 0°C. After precooling with water, surplus water on the fruit was removed and the fruit were packaged. Temperature variations on the fruit flesh during the precooling processes were measured by thermometer. Preliminary analyses were done on the fruits prior to storage, and physical and chemical changes in the fruits stored at 0 to 1°C and 90 to 95% RH were examined during storage. Experiments were planned with a factorial design in randomized parcels

and the results were analyzed statistically.

RESULTS AND DISCUSSION

Precooling with water provided more effective cooling in a shorter period compared with precooling with air. It was established that precooling '0900 Ziraat' fruit with water provided 13-fold faster heat transfer in the product compared with precooling with air (Fig. 1).

TSS fluctuated during the storage period. TSS in the fruit for which no precooling was applied was higher (19.3%, 15.7%) than precooling with air (19.0%, 15.4%) or water (18.6%, 14.9%) (Table 1).

TA decreased in all treatments during storage. The effect of the precooling treatments on titrable acidity was not significant in 2001, while precooling with air had a more positive effect (0.93 mg/100 ml juice) than the other precooling methods after storage in 2002 (Table 1).

Weight losses in the fruit increased during storage, although differences among the precooling applications were negligible (Table 2).

Physiological disorders and fungal rots increased during storage. The level of rots and disorders was higher level without precooling. Both precooling with air and precooling with water were effective to reduce rots and disorders (Table 2).

Based on a taste analysis, precooling with water had a positive effect on fruit quality. Fruit skin color changed from red to dark red and from yellow to dark, according to color tests during storage and fruit brightness decreased.

CONCLUSIONS

According to results above, developed recommendations are: A precooling application for '0900 Ziraat' sweet cherry is important. Precooling with water has a very positive effect. For this reason, precooling with water must be applied quickly (in the first four h) after harvest. If the conditions for precooling with water aren't possible, precooling with air will also have a positive effect on fruit quality. In addition, because losses are very high in cherries stored without precooling, precooling after harvest must be applied even if the product will be marketed in a short time.

Rots and disorders don't increase because of the precooling treatment, which is opposite to the view of many producers. Therefore, precooling is advised to producers due to positive effect on rots and disorders.

Literature Cited

Ağar, T., Kaşka, N., Kibritoğlu, A. and Ait, O.A. 1995. Effect of hydrocooling on the postharvest quality of sweet cherry cv. Aksehir Napoleon postharvest physioology, patology and technologies for horticultural commodities: recent advances. Proceedings of an Intl. Suposium Held at Agadir, Morocco. p.115–119.

Anonymous, 2000. Meyve-sebze-bağ çeşit kataloğu. T.C. Tarım ve Köyişleri Bakanlığı Atatürk Bahçe Kültürleri Merkez Araştırma Enstitüsü, Yalova.

Cemeroğlu, B., Yemenicioğlu, A. and Özkan, M. 2001. Meyve ve sebze işleme teknolojisi. I meyve ve sebzelerin bileşimi soğukta depolanmaları. Gıda Teknolojisi Derneği Yayınları No: 24. Ankara.

Kaşka, N. 2001. Türkiye'nin sert çekirdekli meyvelerde üretim hedefleri üzerine öneriler. I. Sert Çekirdekli Meyveler Sempozyumu. Bildiriler. 25–28 Eylül 2001 Atatürk Bahçe Kült. Mer. Araş. Enst. Yalova. p.1–16.

Waelti, H. 1990. Commercial cooling methods for fresh sweet cherries. Hort. Abst. 60(5):3165.

Tables

Table 1. Effect of precooling applications on the TSS and TA acidity of '0900 Ziraat' sweet cherry in 2001 and 2002.

Year	Treatment	Week 0		1		2		3		4		Mean	
		Total solible solids (TTS) (%)											
2001	CP	18.1	*c*	19.5	*a*	19.7	*a*	19.9	*a*	19.2	*ab*	19.3	
	AP	18.1	*c*	19.1	*ab*	19.6	*a*	18.9	*ab*	19.3	*ab*	19.0	
	WP	18.1	*c*	18.9	*ab*	18.8	*ab*	18.6	*ab*	18.7	*ab*	18.6	
	Mean	18.1	*C*[1]	19.2	*AB*	19.4	*A*	19.1	*B*	19.1	*B*		
2002	CP	16.5	*a*	15.3	*e*	15.5	*c*	15.7	*b*	15.4	*d*	15.7	*A*
	AP	16.5	*a*	15.5	*c*	15.6	*b*	14.7	*g*	14.5	*h*	15.4	*B*
	WP	16.5	*a*	14.9	*f*	14.7	*g*	14.2	*i*	14.2	*i*	14.9	*C*
	Mean	16.5	*A*	15.3	*B*	15.3	*B*	14.9	*C*	14.7	*C*		
		Titratable acidity (mg/100 ml juice)											
2001	CP	1.25	*a*	0.90	*b*	0.81	*cd*	0.72	*e*	0.64	*f*	0.86	*A*
	AP	1.25	*a*	0.96	*b*	0.77	*cde*	0.71	*cd*	0.61	*f*	0.86	*B*
	WP	1.25	*a*	0.87	*bc*	0.79	*cde*	0.77	*de*	0.63	*f*	0.86	*C*
	Mean	1.25	*A*	0.91	*AB*	0.79	*B*	0.73	*B*	0.63	*B*		
2002	CP	1.26	*a*	0.94	*c*	0.86	*c*	0.78	*d*	0.73	*d*	0.91	*B*
	AP	1.26	*a*	1.03	*b*	0.92	*c*	0.72	*d*	0.73	*d*	0.93	*A*
	WP	1.26	*a*	0.92	*c*	0.88	*c*	0.73	*d*	0.67	*d*	0.89	*C*
	Mean	1.26	*A*	0.96	*B*	0.89	*C*	0.74	*D*	0.71	*E*		

CP: Control (No Precooling); AP: Precooling with Air; WP: Precooling with Water.

[1]Mean separation at 5% level (DMRT); capital letters between mean values, small letters between combination values for precooling treatments and weeks.

Table 2. Effect of precooling applications on the weight loss, physiological disorders and fungal rots of '0900 Ziraat' sweet cherry in 2001 and 2002.

Year	Treatment	Week								Mean	
		0	1		2		3		4		
					Weight loss (%)						
2001	CP	-	0.9		1.7		2.1		2.9	1.9	
	AP	-	0.7		1.5		1.8		2.6	1.7	
	WP	-	0.9		1.7		2.1		3.0	1.9	
	Mean	-	0.8	*C*	1.6	*B*	2.0	*B*	2.8	*A*	
2002	CP	-	1.2	*g*	2.4	*f*	4.0	*e*	5.7	*ab*	3.3	*B*
	AP	-	1.0	*g*	2.9	*f*	4.9	*cd*	6.6	*a*	3.9	*A*
	WP	-	1.2	*g*	2.9	*f*	4.4	*de*	6.3	*ab*	3.7	*AB*
	Mean	-	1.1	*D*	2.7	*C*	4.4	*B*	6.2	*A*		
					Physiological disorders and fungal rots (%)						
2001	CP	-	6.5	*d*	8.2	*cd*	17.3	*c*	39.0	*ab*	17.7	*A*
	AP	-	4.2	*d*	4.7	*d*	13.2	*cd*	32.7	*b*	13.7	*B*
	WP	-	4.1	*d*	4.5	*d*	12.3	*cd*	44.9	*a*	16.4	*AB*
	Mean	-	4.9	*C*[1]	5.8	*C*	14.3	*B*	38.9	*A*		
2002	CP	-	3.9	*c*	3.7	*c*	13.7	*b*	18.7	*a*	10.0	
	AP	-	2.8	*c*	2.8	*c*	16.1	*ab*	15.2	*ab*	9.2	
	WP	-	3.2	*c*	2.5	*c*	14.7	*ab*	14.7	*ab*	8.8	
	Mean	-	3.3	*C*	3.0	*C*	14.8	*B*	16.2	*A*		

[1]Means separation at 5% level (DMRT); capital letters between mean values, small letters between combination values for precooling treatments and weeks

Figures

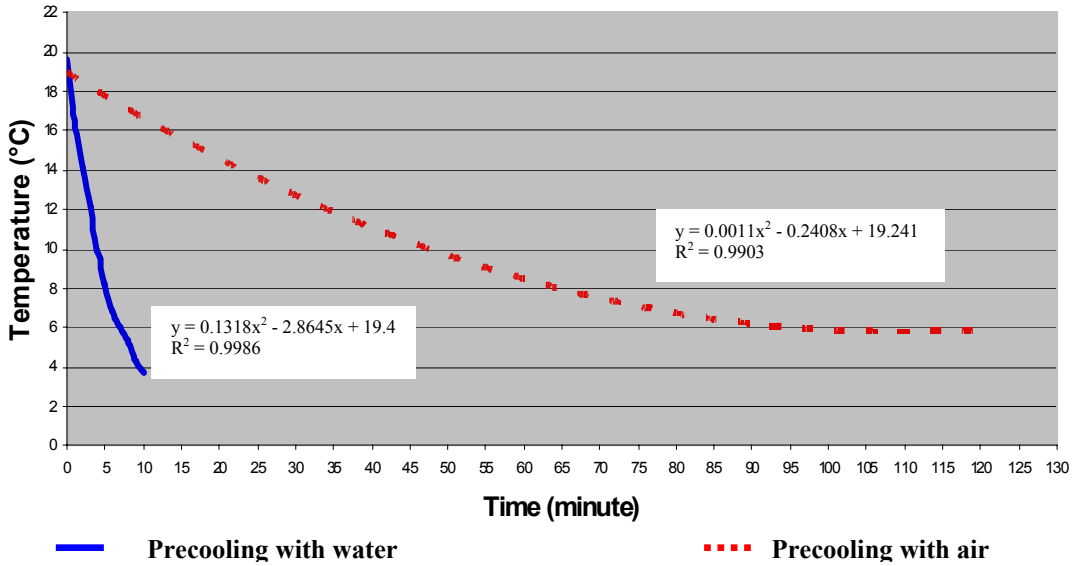

Fig. 1. Temperature variations in the '0900 Ziraat' sweet cherry fruit flesh during the precooling process.