

AGRICULTURAL SCIENCES

COMMERCIAL QUALITY OF THE PLUM DURING ITS COLLECTION AND AFTER SIX WEEKS OF ITS COLD STORAGE

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Abstract

The article presents the results of cold storage for 6 weeks at a temperature of $0 \dots + 2^{\circ}\text{C}$ and a relative humidity of 90-95% of plums of such new cultivars for the Guba-Khachmaz region as "Black Amber" and "Black Daymond", grown here on a medium-sized rootstock Myrobalan 29C (bred in California from the progeny of *Prunus cerasifera*). In addition to the above two cultivars, for comparison, cherry fruits of the "*Prunus domestica italica*" cultivar grafted on wild were also included in the experiments. During the entire storage period, the natural decline of the "*Prunus domestica italica*" cultivar, traditional for the region, was 3.0%, and in the two aforementioned cultivars of the latest introduction - 0.1 and 0.3%, respectively. The yield of standard fruits at the end of the established period for their storage was: "Black Amber" 93.5%, "Black Daymond" 90.6%, which is 8.5 and 5.9% more, respectively, than that of the "*Prunus domestica italica*" cultivar.

Keywords: Azerbaijan, plum "Black Amber", "Black Daymond" and "*Prunus domestica italica*", cold storage, preservation of consumer value.

1. BACKGROUND

Azerbaijan pays great attention to the development of the agricultural sector of the economy, in particular fruit growing. Moreover, this concerns not only solving the problem of increasing the yield of fruit crops, but also the introduction of effective post-harvest technologies in the places of their cultivation, which are able to provide access to fresh fruits in the winter-spring period [Piriyeva & Hafizov, 2022; Hafizov, G. & Hafizov, S., 2015; Hafizov, S. & Hafizov, G., 2018].

In recent years, plum cultivars of the latest introduction, especially "Black Amber" and "Black Daymond", have been deservedly popular here in the republic. This is mainly due to the fact that the fruits of these varieties are quite large, have an attractive color with a pronounced shine and with good transportability.

Plum refers to perishable products. The size of losses during storage largely depends on the degree of its maturity and varietal characteristics, in particular on the resistance of a particular cultivar to fungal diseases [Khan et al., 2013].

Since the yield of standard fruits depends on the responsiveness of each individual cultivar to certain storage conditions, this requires more awareness in this matter. Without this, effective management is impossible.

2. INTRODUCTION

Post-harvest storage is designed to provide information about the potential of this fruit in the agro-industry and to consider the possibility of its inclusion in programs of economic development and improvement of living conditions in rural areas [Martínez-Madrid et al., 2015].

European plum (*Prunus domestica* L.) cv. 'Oullins Gage' was harvested according to firmness on five harvest dates. Fruit was analysed at harvest and during storage for weight loss, firmness, total soluble solids

(TSS), titratable acidity (TA) and skin colour before and after a 3-day shelf-life period at 20°C . Significant differences were found among harvest dates in fruit mass, skin colour, firmness, TSS and TA. Fruit mass, TSS and colour b^* increased, whereas firmness and TA decreased significantly during the harvesting period. Firmness parameter as a maximum maturity index and TSS: TA (or b^* colour, a non-destructive measurement) as a minimum maturity index could be used to distinguish maturity at harvest. It is suggested that the best post-storage quality of 'Oullins Gage' plums would be obtained when fruit is harvested with TSS:TA >9 or b^* colour >30, but with a firmness >20N to assure a long storage life [Casquero & Guerra, 2009].

After harvesting, in the first two weeks, the plum can be stored at 0°C , then at a temperature of $3-5^{\circ}\text{C}$ and a humidity of 88-95%. When storing plums, it is important to limit the air circulation, since otherwise a strong withering of the fruit at the base of the peduncle is possible. At the same time, the quality of the fruits deteriorates rapidly [Lisina, 2017].

Meanwhile, modern methods of storage in a modified, and especially in a controlled gas environment, delay the processes of overripe fruits, reduce losses and thus prolong the shelf life. It is possible to create a modified atmosphere when storing fruits in polymer film bags by natural accumulation of carbon dioxide and lowering the acid content as a result of their respiration [Ulyanova et al., 1984].

Thus, the study of the degree of preservation of the consumer value of plum fruits in the process of cold storage is of great importance from the point of view of more complete use of available opportunities to increase the terms of their consumption in fresh form.

Studies on the study of the characteristics of short-term storage of plum fruits, depending on the storage regime, have been conducted for several years on the

basis of our institute, in the laboratory of Fruit processing and storage Technologies. The commercial quality of plum fruits of the cultivars “Black Amber”, “Black Daymond” and “*Prunus domestica italica*” was analyzed at the beginning and at the end of their storage before sale for 6 weeks days at a temperature of 0 ...+ 2 ° C and relative humidity of 90-95% directly in the region of their cultivation (Guba-Khachmaz).



Fig1. *Prunus domestica italica*



Fig. 2. Black Daymond



Fig. 3. Black amber

During the tests and at each control examination, 1 kg of fruit was extracted from the refrigerator.

The color, juiciness, aromatic and taste qualities and such biochemical parameters as soluble dry substances, total amount of dry substances, humidity, simple sugars, vitamin C, titrated acidity were evaluated.

The hardness of the fruit was determined using a penetrometer (fruttester) FT-327 (3-27 lbr).

This device is widely used to control the ripening and storage of fruits and berries, measures the hardness of the pulp of the fruit by pressing the plunger into the surface of the fruit. The pressure obtained in this way is expressed in g or kg/cm² and quantitatively characterizes the hardness and degree of maturity of the fetus.

To keep records of natural loss, the mass of control samples (beginning, middle, end of storage) was determined. The decrease was calculated as a percentage based on the initial weight of the sample when laying the fruit for storage and the subsequent difference in weight.

Total waste and technical damage were determined as a percentage based on the total mass of the average sample during analysis.

The processing of the primary data of quantitative analysis was carried out in accordance with the methodology [Sileyev, 2019], in this study it was reduced to

3. MATERIALS AND METHODS

The objects of the study were freshly harvested and stored plum fruits “Black Amber”, “Black Daymond” and “*Prunus domestica italica*” (Figures 1-3) grown in the Guba-Khachmaz region of Azerbaijan.

The prototypes (25-50 kg for each grade) were stored for 6 weeks in the refrigerator at a temperature of 1 ° C and a relative humidity of 90-95%.

calculating the average result from three repeated determinations.

4. RESULTS AND DISCUSSIONS

Table 1 shows the physical characteristics of the freshly harvested fruits of the three studied cultivars.

As it can be seen from it, the “*Prunus domestica italica*” cultivar has a fruit weighing 48.0 grams, which is 8.9 g and 19.2 g less than the other two varieties studied.

The plum fruits of the cultivars of the latest introduction were harder than those of the “*Prunus domestica italica*”. The hardness of fruits by varieties varied from 4.1 kg/cm² (“*Prunus domestica italica*”) to 5.0 kg/cm² (“Black Daymond”). This, presumably, should have played an important role in the responsiveness of the fruits of these cultivars to the conditions and shelf life.

There was practically no difference in their specific gravity (0.9- 1.1 g/cm³) between the fruits of these three cultivars.

In the “*Prunus domestica italica*” cultivar, one fruit occupied a volume of 46.1 cm³, and in the other two cultivars this indicator is much higher, exactly in the “Black Amber” cultivar it was 55.0 cm³, and in the “Black Daymond” cultivar it was 60.5 cm³.

Table 1.

Physical characteristics of plum fruits during their harvest in the Guba-Khachmaz region

Cultivar	Fruit weight, g	Fruit volume, cm ³	Specific gravity, g/cm ³	Hardness, kg/cm ²	Natural decrease, %
<i>Prunus domestica italica</i>	48.0	46.1	0.9	4.1	3.0
Black Amber	56.9	55.0	1.0	4.6	0.3
Blackk Daymond	67.2	60.5	1.1	5.0	0.4

Arithmetic mean of three repeated measurements in 2020-21

Before filing for storage, the chemical composition of the fruits in the varietal section was studied, the data obtained are presented in Table 2.

Table 2.

Chemical parameters of plum fruits during their harvest in the Guba-Khachmaz region (g / 100 g of raw mass).

Cultivar	Water	Soluble dry substances	Simple sugars			Titratable acidity	Vitamin C (mg/100 g)
			Monosaccharides	Sucrose	Total sugar		
Prunus domestica italica	83.7	16.8	5.28	2.73	8.01	1.2	3.1
Black Amber	78.5	19.9	8.43	1.1	9.53	1.7	4.9
Black Diamond	77.5	19.3	9.10	1.8	10.90	1.9	5.1

Arithmetic mean of three repeated definitions in 2020-21

This table shows that freshly harvested *Prunus domestica italica* plums in terms of monosaccharide content (5.28 wt. %) were slightly inferior to the plum varieties of the latest introduction (8.43 and 9.10 wt. %), and they contain a little more sucrose (2.73 wt. %), than in the plum varieties Black Amber and Black Daymond (1.10 and 1.80 wt. %).

Prunus domestica italica plum contained much less solids and soluble solids (concentration of cell juice) than the other two varieties studied, which also presumably had to affect the quality of its storage, depending on the varietal affiliation.

Indeed, the difference in water content and hardness significantly affected the quality of storage of cultivar plum.

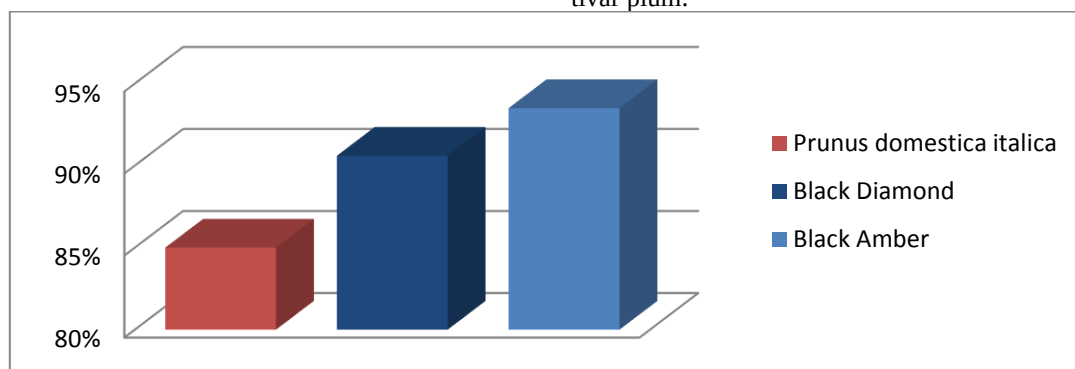


Fig. 4. Change in the yield of standard fruits by the end of the allotted time for plums, % to the total initial weight (25 kg) of the sample from each cultivar.

Figure 4 shows the yield of standard fruits after their storage for 42 days in the conditions set aside for this purpose (temperature 0 ... + 2 °C; relative humidity 90-95%).

It shows that in the “*Prunus domestica italica*” cultivar this indicator was 85.0%, and in the “Black Amber” and “Black Diamond” cultivars it is much higher - 93.5% and 90.6%, respectively

In the “*Prunus domestica italica*” cultivar, storage losses were associated with both physiological disorders and maniliosis, a disease caused by the fungus *Monilia -fructi - melongena*. Minor losses during storage of “Black Amber” and “Black Diamond” plums were caused by wilting.

5. CONCLUSIONS

Thus, the results obtained allow us to characterize the plum cultivars “Black Diamond” and “Black Amber” as cultivars whose consumer characteristics are relatively stable when stored for 40 days at a temperature of 0...+ 2 °C and a relative humidity of 90-95%.

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