

Studies on changes postmaturation to strawberries (*Fragaria ananassa*)

Beinsan Carmen^{1*}, Sumalan R.¹, Velicevici Giancarla¹

¹USAMVB Timisoara, Faculty of Horticulture and Forestry

*Corresponding author. Email: hortc2002@yahoo.com

Abstract The biological material was represented by three genotypes of strawberries Elsanta, Lugo and Spain. The objective of the experiment was to determine changes in the main biometrics and biochemical indices during post-maturation processes. The fruits were kept for 3 and 6 days at 4°C. During the experiment the following parameters were studied: fruit's dimensions (diameter, fruit length and weight), flesh firmness, acidity of juice fruit, soluble carbohydrate content and dry matter.

After 6 days of storage, due to post-maturation processes, especially respiration (degradation of the organic substrate) there were a reduction of the length, diameter and the weight of the fruits. In the case of biochemical parameters, after 6 days of preservation at 4 °C, it was observed a tendency to increase the content of soluble carbohydrates due to the transformation of the starch into glucose following the enzymatic hydrolysis processes is continued, there is also a decrease in the firmness of the fruits, but also a slight decrease in the juice acidity of the fruit pulp.

In this experiment we studied the influence of storage conditions on some quality indices of three strawberry genotypes, Elsanta, Lugo and Spain.

In terms of perishability, fruits, like horticultural products, are divided into four groups with a similar perishability degree: extremely perishable, very perishable, perishable and less perishable [12].

Extremely perishable fruits are characterized by thin epidermis, intense breathing and a large surface area of contact with the environment. As a result of these particularities, the duration of maintaining their quality, even under optimal temperature and relative air humidity conditions, is 2-3 days. Under unsuitable storage and conservation conditions, losses and downgrades of horticultural products exceed the limits permitted by law. In the group of excessively perishable fruits fall: strawberries, blueberries, raspberries, blackberries, currants and gooseberries [5].

The postharvest life of fruit and vegetables has been traditionally defined in terms of visual appearance (freshness, color, and absence of decay or physiological disorders) and texture (firmness, juiciness, and crispness) [6,7]. Strawberries are good sources of natural antioxidants [4, 9, 10]. In addition to the usual nutrients, such as vitamins and minerals, strawberries are also rich in anthocyanins, flavonoids, and phenolic acids [1,4,8].

Sugars are the main soluble components in ripe strawberry fruit, with glucose, fructose, and sucrose accounting for almost 99% of total sugar content. Glucose and fructose are predominant over

Key words

strawberries, acidity, postmaturation, firmness

sucrose, and the total sugar content can change during the growing period; however, the proportion of each sugar remains constant, even for different growing conditions and cultivars [3].

Fruit have long been regarded as having considerable health benefits due to their nutritional attributes, and in particular their antioxidant activity against cellular oxidation reactions. The positive effects of fruits may depend on the high amounts of several antioxidants [2].

Material and Method

The biological material was represented by three varieties of strawberry Elsanta, Lugo and Spain (Fig. 1).

During the experiment the following parameters were studied: fruit's dimensions (diameter, weight, fruit length), flesh firmness, acidity fruits juice, soluble carbohydrate content and dry matter [11].

Firmness is the best indicator of maturity. When the fruit has matured, the pulp becomes softer. The firmness of a fruit sample is measured by a penetrometer, measuring the force required to penetrate the fruit pulp, expressed in libre or kilograms.

Soluble carbohydrate content was achieved with digital refractometer, Brix degrees was equated to the percentage depending on the temperature determination. The percentage of dry fruit pulp was determined using Kern thermobalance. Storage conditions were: temperature 4 °C, for 3 and 6 days.



Fig. 1 Assortment of studied strawberries

Results

From the results shown in figure 2, regarding the main physical characteristics of fruits (length, diameter and weight) we not found significant changes after keeping for 3 days at 4 °C. After 6 days of this storage, due to post-maturation processes, in particular the respiratory (degradation of the organic substrate)

there were a reduction in length, diameter and weight of fruit. The largest weight, length and diameter belongs to the LugoJ genotype with an average weight of 17.56 g, 3.57 cm length and 2.74 cm in diameter, followed by the Spain and finally the Elsanta variety weighing 11.05 g after 6 days of storage at 4 °C (Fig. 2).

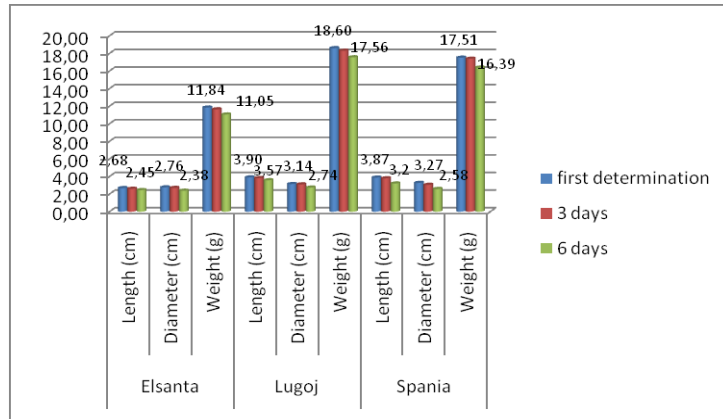


Fig. 2 The biometric characteristics of strawberries fruit varieties from the (4 °C)

Regarding the firmness of the fruits after 3 and 6 days of preservation, it can be seen a reduction in all genotypes tested (Fig. 3). At 4 °C, the most pronounced was the genotype in LugoJ, with 0.60 lb

after 6 days of conservation, while the genotype in Spain showed a less drastic reduction of firmness (0.65 lb).

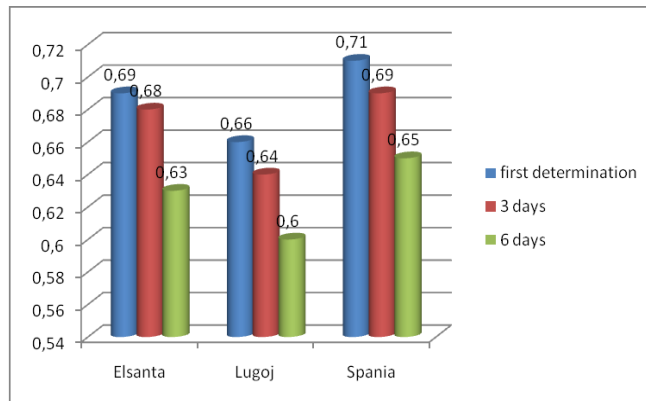


Fig. 3 Results regarding the fruits firmness in tested genotypes (4 °C)

Regarding the acidity of juice obtained from fruits pulp, the values were close to the three genotypes

after 3 days of preservation. The acidity of the juice was highlighted in the genotype from Spain with an

initial pH of 3.51, which decreased to 3.38 after 6 days of storage at 4 ° C. The lowest pH was recorded in the

genotype from Lugo by 3.15 after 6 days of storage (Fig. 4).

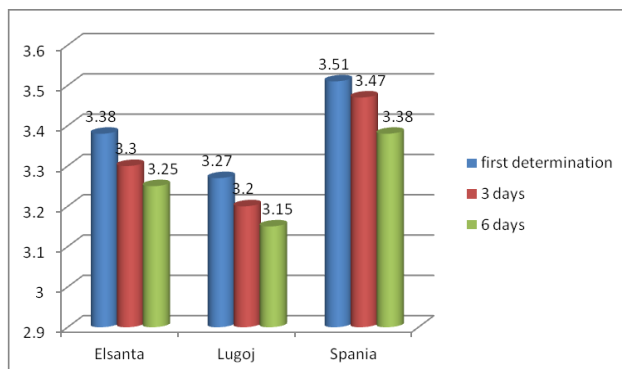


Fig. 4 Results regarding the fruits acidity in tested genotypes (4 °C)

The degree of maturity according to the Brix index reveals that the genotype from Lugo showed the highest percentage of soluble carbohydrates after 6

days of storage, 9.0% at 4 ° C, followed by Elsanta by 8.8%. At the opposite end, the genotype from Spain was 7.9%.

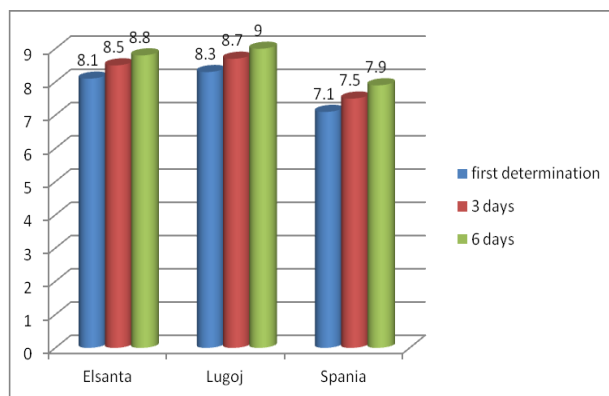


Fig. 5 Results regarding the total content of soluble glucyds in tested fruits (4 °C)

The tested strawberries showed a decrease in dry matter content at 4 ° C during storage.

Regarding the percentage of dry matter, the lowest value was found in the genotype from Spain by

10.01% and the highest value was recorded in the Lugo genotype by 11.52% after 6 days of storage. (Fig. 6).

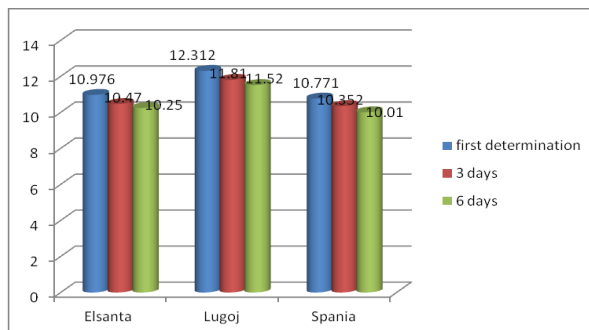


Fig. 6 Results regarding the dry matter percent in tested fruits (4 °C)

Conclusions

After the analysis of the main biometric (diameter, length, weight) it is found that after 6 days of storage, due to post-maturation processes, in particular respiratory (degradation of organic substrate) was a reduction of diameter, length and weight at all strawberry varieties tested.

During fruit preservation there was a natural tendency to reduce the firmness of the fruit pulp, the most pronounced being found in the Lugoij variety, after 6 days of storage at 4 °C, while the genotype in Spain showed a drastic reduction of firmness.

Regarding the acidity of the juice obtained from the fruit pulp, the values were close to the three genotypes, the lowest pH was recorded in the Lugoij variety, and the highest was in the Spain after 6 days of storage.

The degree of maturity according to the Brix index reveals that the genotype from Lugoij showed the highest soluble carbohydrate content after 6 days of storage at 4 °C, followed by Elsanta.

Regarding the dry matter quantity, the genotype from Lugoij showed the highest percentage after 6 days of storage, at 4°C, and the opposite was in the Spain.

For biochemical parameters, after 6 days of preservation at 4°C, the tendency to increase the content of soluble carbohydrates due to the transformation of starch into glucose following enzyme hydrolysis processes continues, there is also a decrease in firmness and substance dried, but also a slight decrease in the acidity of the juice from the fruit pulp.

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