

CAPACITY OF MAINTAINING THE APPLES QUALITY, IN FRESH CONDITION-CASE STUDY

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Abstract

A balanced diet implies consuming fruit throughout the year, for which their preservation throughout the winter helps to ensure their consumption and increase the growing profitability by avoiding the market overloading during fruit harvest. In order to establish the ability to maintain the quality of fresh apples, 6 varieties of apples were analyzed Florina, Generos, Golden Delicious, Idared, Jonathan and Redix with large spreading in the current range in our country. The fruits were produced in the fruit tree farm of Belciugatele Didactical and Experimental Station and were tested in the laboratory in the cold store of the unit. The experimental and storage conditions were $t = 0...+4^{\circ}\text{C}$, UR = 90-95%. After 120 days of storage were made determinations regarding :the recorded quantity and quality of the losses of fruit during storage; the change of the fruit consistency (penetrometer determined); the soluble dry matter evolution during storage (refractometer determined); the organoleptic appreciation (appearance, firmness, taste) of the fruits after storage. The mass losses were increased in the variety Golden Delicious. The contents of dry soluble substance in apples increased during the maintenance in different proportion, depending on the variety.

Key words: apple, growing, losses, organoleptic, soluble dry substance

INTRODUCTION

The great nutritional value of the fruit, due to its contents of highly assimilable sugars (glucose and fructose), organic acids, minerals and micro-elements, justify its inclusion in the daily ration of people. [7]

A balanced diet implies consuming fruit throughout the year, for which their preservation throughout the winter helps to ensure their consumption and increases growing profitability by avoiding the market overloading during fruit harvest. [3]

Preserving fruits in such conditions must ensure that when they are used they meet the best organoleptic qualities.[9]

It is believed that the fruits are preserved better if they maintain health, turgid and organoleptic characteristics and weight loss during preservation is very low. [5]

Achieving these parameters is subject to "dowry" that fruit have when placing in the storage, so all the physical, biochemical and organoleptic characteristics defining the

quality.[1]

Fresh fruits are living organisms, in their tissues, complex metabolic processes take place after the harvest, under the action of its own enzymes.[10] The preservation technologies are designed to reduce the intensity of the metabolic processes, in particular the breath and perspiration, as well as the activity of pathogenic micro-organisms which generate decomposition processes. [8] Fresh fruit is one of the indispensable components of rational nutrition of men. The food value of the fruit eaten fresh, due to their chemical components easily accessible by the human body, plus a number of excitatory gustatory, olfactory and visual factors which make them to be enjoyed at any time of day or season. [4]

Due to the complex chemical composition of the fruit, and the important role they play in nutrition, the food need should include 10-15% fruit for the daily consumption, which can not be substituted by other food. From chemical point of view, the fruit contain water

and dry substance (organic substances and minerals). The contents of water of the fresh fruit varies depending on the species, as follows: 74 % plums, peaches 91.5 %, 93 % of strawberry [2]

Sugars form the main mass of dry fruit component (about 90%). The most widespread are monosaccharides (glucose, fructose), disaccharides (sucrose) and polysaccharides (cellulose, starch and pectin). The sugars in fruits, especially simple ones are easily assimilated by the human body, entering directly into the bloodstream. [6]

MATERIALS AND METHODS

In order to establish the ability to maintain the quality of fresh apples, 6 varieties of apple were taken into consideration Florina, Generos, Golden Delicious, Idared, Jonathan and Redix with large spreading of the current variety in our country. The fruits were produced in the fruit tree farm of Belciugatele Teaching Station and were tested in the laboratory in cold store of the unit. The experimentation and storage conditions were $t = 0 \dots + 4 \text{ }^\circ\text{C}$, UR = 90-95 %.

After 120 days of storage determinations were used related to:

- the level of quantitative and qualitative losses recorded by fruit;
- modification of fruit consistency (determined penetrometer);
- evolution of soluble solid substance content (determined refractive);
- organoleptic assessment (appearance, firmness, taste) of the fruits after storage .

The experiments were organized in 6 comparative variants with 3 repetitions per variant, the fruit is placed in plastic boxes for fruits and vegetables, in a single layer for preservation (table 1)

Table 1. Experimental variants of the storage experiences

Variant	Apple Variety
1	Florina
2	Generos
3	Golden Delicious
4	Idared
5	Jonathan
6	Redix

During the storage, the daily control was performed of thermo-hydric factors in the cold room in order to ensure the compliance with the conditions of maintaining optimum quality (temperature $0 \dots 4 \text{ }^\circ\text{C}$ and relative humidity 90..95 %). It was also assessed the ability to maintain the fruit quality by findings on occurring aspect changes related to the dehydration, the emergence and development of various diseases of deposit. After removing the apples from the storage space, determinations were made on the quantitative and qualitative level of losses recorded by the fruit, the modification of the fruit consistency, (determined penetrometer), the evolution of soluble solid substance content (determined refractive) and organoleptic assessment (appearance, firmness, flavor), of the fruit after the storage.

The determination of loss of mass and the product spoilage during the storage was done by weighing the samples of resulted fruit or impaired fruit (ill) during the storage, compared to the initial amount deposited and the results are expressed in percentages.

The fruit firmness was performed with manual penetrometer type Effe -gi with large piston with the diameter of 11 mm, to a number of 25 fruits per variant, each fruit being penetrated in 4 points in the equatorial area, after the removal of skin in the penetration areas.

The determination of soluble solid substance was performed by refractometry method, using mass ABBE refractometer, expressing the results in percentages.

For the organoleptic assessment, tastings were conducted using the tasting sheets comprising a total of 3 assessment criteria (appearance, texture, taste). The assessment was made using 100 points scale. Each of the three assessment criteria have different weight in the general scoring, depending on their importance. This "aspect" is 15%, "texture" is 35% and "taste" is 50%. Depending on the achieved score, 5 quality classes differentiate, according to table 2. The organoleptic testing of the fruit was conducted in the laboratory inside the cold storage.

Table 2. Classification of fruit after scoring

Quality classes	Points
very good	80-100
good	60-79
Acceptable	40-59
Mediocre	20-39
not adequate	0-19

RESULTS AND DISCUSSIONS

The results regarding the level of quantitative and qualitative losses recorded by fruit during the storage to the analyzed variants are shown in table 3.

From the data presented it results that the total apple losses during storage were between 2,1 - 6.4% (depending on variety), with an average of 4.21%. The weight loss varied between 2.1 - 6.4%, with an average of 3.48% and the blackening between 0-2%, with an average 0.73%.

The lowest total losses were recorded in var. 4-Idared (2.1%), followed by var.1 - Florina, These variants showed low losses and record impairment due to the disease. The highest total losses were recorded in var.3- Golden Delicious (6.4%).

The mass loss during storage varied between 2.1-6.4% depending on variety, with an average of 3.48 %. The lowest losses were determined in fruit var.4-Idared (2.1%) and var.2-Generos (2.9 %) and highest in var.3 - Golden Delicious (6.4%).

The impairment losses experienced were low in general, averaging 0.73%. Thus, at a total of 3 varieties, losses were not recorded by impairment during the storage, and the other 3 variants, they were very small, of 1.0-2.0% depending on the variety.

Conclusions: The loss of mass varied between 2.1-6.4%, with an average of 3.48% and the blackening between 0-2%, with an average 0.73%. The lowest total losses were recorded in var.4-Idared (2.1%), the weight loss during storage varies between 2.1-6.4% depending on variety, with an average of 3.48%. The lowest losses were determined in fruit in var.4 - Idared (2.1%) and var.2 Generos (2.9%) and the highest in var.3 - Golden Delicious (6.4%). Impairment losses experienced in general were low, on an average 0.73%

The results regarding the modification of the fruit consistency (determined penetrometer) during the storage are shown in table 4.

When stored in cold places, the studied apple varieties presented a different level of pulp consistency, with variations between 3.92 kgf/cm² (var.6-Redix) and 5.11 kgf/cm² (var.2-Generos). The average value at the 6 variants was 4.62 kgf/cm². The varieties with the highest firmness were var.2-Generos (5.11 kgf/cm²) and var.1-Florina (5.01 kgf/cm²), and the lowest firmness recorded in var.6-Redix (3.92 kgf/cm²).

During the storage, the apples firmness decreased at most variants in different percentages, except for var.6-Redix, fruit firmness increased by 2.55%. The most drastical decrease of firmness recorded at var.3-Golden Delicious (31.26%), followed by var.2-Generos (26,02%).

Conclusions: Compared to the initial fruit firmness ranged from 3.92-5.11 kgf/cm² (depending on variety) after storing, the apples recorded firmness values of 3.63-4.39 kgf/cm² according to the variety.

The firmness of apples decreased at most variants during storage in cold places with values between 2.66-31.26%, while there are apples to which the value of this indicator increased by 2.55 % (var.6 - Redix).

Among some varieties, var.4-Idared and var.6-Redix were noted, with low variations of firmness during the storage. The last place was var.3-Golden Delicious, its firmness decreased by 31.26 % during storage.

The results on the evolution of soluble solid substance content during the storage refractive determined are shown in Table 5.

The initial content of soluble dry substance of apples which were experimented was between 10.80-13.2% depending on the variant, with an average of 12.00%.

During the storage all experimental variants showed increases in content between 1.89-6.48 % of soluble dry substance, with an average of 4.08%. The highest increases were determined to var.4 - Idared (6.48%) and lowest in var.1 - Florina (1.89%)

Table 3. Losses while preserving apples

Variant	Growing	Losses (%)			Observations	Place
		Total	Mass	Impairment		
1	Florina	3.5	3.5	-	15 % fruit with wrinkled aspect	2
2	Generos	4.3	2.9	1.4	very good aspect	4
3	Golden Delicious	6.4	6.4	-	81% fruit with accentuated wrinkle	6
4	Idared	2.1	2.1	-	very good aspect	1
5	Jonathan	5.0	3.0	2.0	20% fruit with wrinkled aspect	5
6	Redix	4.0	3.0	1.0	9% fruit with wrinkled aspect	3
	Average	4.21	3.48	0.73		

Table 4. Firmness of apples during storage and after storage

Variant	rowing	Firmness (kgf/cm ²)			
		Before storage	After storage	Differences (%)	
1	Florina	5.01	3.85	-23.15	
2	Generos	5.11	3.78	-26.02	
3	Golden Delicious	4.67	3.21	-31.26	
4	Idared	4.51	4.39	-2.66	
5	Jonathan	4.54	3.63	-20.04	
6	Redix	3.92	4.02	+2.55	
	Average	-	4.62	3.81	-

Table 5. Dry soluble substance evolution before and after storage

Variant	Cultivar	Soluble dry substance (%)		
		Before storage	After storage	Difference (%)
1	Florina	13.20	13.45	+1.89
2	Generos	10.45	11.00	+5.26
3	Golden Delicious	12.40	13.00	+4.83
4	Idared	10.80	11.50	+6.48
5	Jonathan	12.75	13.00	+1.96
6	Redix	12.50	13.00	+4.00
	Average	12.00	12.49	+4.08

Table 6. Organoleptic assessment of apples after storage

Variant	Growing	Organoleptic assessment-points				Score	Place
		Appearance	Firmness	Taste	Total		
1	Florina	13.80	30.20	40.00	84.00	Very good	5
2	Generos	14.40	32.20	44.00	90.60	Very good	1
3	Golden Delicious	9.00	19.60	36.00	64.60	Good	6
4	Idared	14.40	30.80	40.00	85.20	Very good	3
5	Jonathan	12.00	26.60	46.00	84.60	Very good	4
6	Redix	12.60	30.80	42.00	85.40	Very good	2

Conclusions: the soluble solid substance content of the apples increases during the storage in different proportions, depending on variety. The average growth is 4.08%, with variations ranging from 1.89-6.48. The results of the organoleptic test at apples (appearance, firmness, flavor) after storage are shown in Table 6.

In terms of appearance, it was found out that var.2-Generos, has obtained the highest score (14.40 points) of all experimental variants, equal to var.4- Idared. Var.3-Golden

Delicious obtained the lowest score on this indicator (9.00). At the end of storage period, the fruit firmness obtained a score between 19.60-32.20 points. Var.2- Generos variety was the most appreciated, achieving a score of 32.20, followed by variants var.4-Idared and var.6 - Redix variety, which obtained 30.80 points.

In terms of taste, the assessment score was between 36.0 and 46.0 points, depending on the variant. Among the varieties the highest score belonged to variant 5- variety Jonathan

(46.0 points) and the lowest variant 3 Golden Delicious (36.0 points).

The total score (firmness+skin+taste) was between 64.60 and 90.60 points, depending on the variant. In the first place with a score of 90.60 points and the qualification «very good», was ranked var.2-Generos, followed by var.6 - Redix with 85.40 points and 85.20 points var.4-Idared with and the same score. The last place was var.3-Golden Delicious, which recorded a score of only 64.60 points and the qualification «good».

Conclusions: Of the 6 apple varieties that were studied, 5 varieties (Generos, Redix, Idared, Jonathan and Florina) were rated «very good», and Golden Delicious «good», being in the last place.

CONCLUSIONS

The presented conclusions refer to the results obtained from the experiments carried out on fruit in 2013 harvest, in the specific technical and climatic conditions.

The total losses in apples during the storage are between 2.1-33.9% (depending on variety), with an average of 4.21%. The weight loss varies between 2.1-6.4%, with an average of 3.48% and the blackening between 0-2%, with an average 0.73%. The lowest losses were determined in fruit var.4-Idared (2.1%) and var.2 Generos (2.9 %) and the highest in var.3 - Golden Delicious (6.4%).

The impairment losses experienced in general were low, averaging 0.73%

Compared to the initial fruit firmness of 3.92-5.11 kgf/cm² (depending on variety), after storing, the apples recorded firmness values of 3.63- 4.39 kgf/cm² depending on variety.

The firmness of apples decreased at most variants during the storage in a cold place with values between 2.66-31.26%, while there are apples which this indicator increased by 2.55% (var.6 - Redix).

Among some varieties, var.4-Idared and var.6-Redix were noted with low variations of firmness during the storage. The last place was var.3-Golden Delicious, its firmness decreased by 31.26 % during the storage.

The soluble solid substance content in apples increases during the storage in different

proportions, depending on the variety. The average growth is 4.08%, with variations ranging from 1.89-6.48%.

Of the 6 apple varieties which were studied, 5 varieties (Generos, Redix, Idared, Jonathan and Florina) were rated «very good», and Golden Delicious «good», being in the last place.

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