

INFLUENCE OF FERTILIZATION SYSTEM ON THE QUALITY MAINTAINING OF PEACH FRUITS IN DIFFERENT STORAGE CONDITIONS

INFLUENȚA SISTEMULUI DE FERTILIZARE ASUPRA MENȚINERII CALITĂȚII FRUCTELOR DE PIERSIC, ÎN DIFERITE CONDIȚII DE PĂSTRARE

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Abstract. *The researches had as theirs principal objective to establish the more suitable fertilization system and storage methods for peach fruits, in order to maintain fruit quality a long period post-harvest. There were tested two peach varieties proceed from SCDP Constanta (Cardinal, Southland), which were fertilized with organic fertilizers and chemical fertilizers, applied on soil or on leafs. The peaches were stored at ICDIMPH-Bucuresti in three variants: ambient temperature ($T = 26-28^{\circ}C$), low temperature ($T=2-4^{\circ}C$ - refrigerating storage), refrigerated and modified atmosphere. There has been determinate the quantitative and qualitative losses during fruits preservation. In case of chemical fertilization – on soil + on leaves, the fruit storage capacity was better for both variety of perch. The organic fertilization places on the second position. The result point out the superiority of the storage in a modified atmosphere over the other methods. In this case, the losses are most reduced. The refrigerating storage, without modified atmosphere, gave also good results. It may be successfully used in the case when air gas composition in storage space can not be modified.*

Key words: Cardinal, Southland, fertilizers, refrigerating storage, modified atmosphere, mass and depreciation losses.

Rezumat. *Cercetările au avut ca obiectiv principal stabilirea celor mai adecvate sisteme de fertilizare și metode de păstrare a piersicilor, în scopul menținerii calității fructelor o perioadă cât mai îndelungată după recoltare. S-au experimentat două soiuri de piersic provenite de la SCDP Constanta (Cardinal și Southland), care au fost fertilizate cu îngrășăminte organice și îngrășăminte chimice, aplicate la sol și foliar. Piersicile au fost depozitate și păstrate la ICDIMPH-București în trei variante: la temperatura mediului ambiant ($26-28^{\circ}C$), în condiții frigorifice ($T=2-4^{\circ}C$) și în condiții frigorifice + atmosferă modificată. S-au făcut determinări în dinamică a pierderilor cantitative și calitative pe durata păstrării piersicilor. Dintre variantele de fertilizare, varianta de fertilizare chimică - la sol + foliară induce capacitatea de păstrare cea mai bună, la ambele soiuri de piersici. Pe locul 2 din acest punct de vedere se situează varianta de fertilizare organică. Rezultatele obținute indică superioritatea păstrării fructelor în atmosferă modificată, unde s-au înregistrat cele mai mici pierderi pe durata păstrării. Păstrarea frigorifică simplă a dat de asemenea rezultate foarte bune și poate fi utilizată cu succes în cazul în care nu există posibilitatea modificării compoziției gazoase a aerului din spațiul de păstrare.*

Cuvinte cheie: Cardinal, Southland, fertilizare, păstrare frigorifică, atmosferă modificată, pierderi cantitative și calitative.

INTRODUCTION

Because of the great taste attributes, aspect and specifically flavors, plus their importance in nutrition, peaches occupy an important place in consumption in both fresh and processed. Their superior dietary attributes are determined by their content of vitamins, minerals, cellulose, acids and pectin substances.

The achieving and maintaining the quality of the fruit depends on complex of factors involved in all links of culture and valorization technology, from the choice of variety, crop maintenance, till to harvest, conditioning and expedition.

The peaches are highly perishable fruit and that is why the maintaining of their quality after harvest, is an important issue for the valorization sector, considering the share of this species from total fruit.

The peaches storage capacity is dependent on the quality of material used to preserve, and on the conditions of storage. The chemical composition of peaches, which determine the biochemical processes during storage and, therefore, the storage capacity is strongly influenced by the fertilization regime. Based on the research results, it was proved that the dose in which is applied the organic and mineral fertilizer affect the chemical composition of fruit, having an effect on storage capacity (Salunke, 1974; Ion, 2004).

The way in which the technological factors during storage are realized (temperature, humidity, air composition, etc.) exert a great influence on shelf life of peaches and losses recorded (Gherghi, 1977, Gherghi et al., 2001).

In valorization technologies there are recommended the application of technological methods of storage (low temperatures, changing the gaseous composition of air, etc.) that determines the inhibition of physiological and biochemical processes of fruit, leading to maintain their commercial value as a longer period (Burzo, 1986; Burzo, 2005; Lille and King, 1999).

To underline how to turn up the influence of the culture fertilization and the storage fruits conditions, on maintaining quality of peach, were organized adequate experiences at ICDIMPH - HORTING, in collaboration with SSCP Constanta.

MATERIAL AND METHOD

The necessary research fruits were obtained from SCDP Constanta. The tested peach varieties are Cardinal (early variety) and Southland (semi early variety).

Fruits were harvested at a mature stage "parga".

Each variety has benefited, in orchard, by four different types of fertilization:

- V1 - control (unfertilized);
- V2 - organic fertilization (fermented manure);
- V3 - chemical fertilization (NPK complex fertilizers in relation to: 15:15:15.);

- V4 - chemical fertilization + foliar feeding (NPK 15:15:15 complex fertilizers in soil and with foliar fertilizer in plant – Murtonik 20:20:20).

In Research and Development Institute for Processing and Marketing of the Horticultural Products, the fruits were stored in 3 storage variants:

- at ambient temperature (T = 26-28° C, RH = 65-70%) in 1kg packaging - keep warm;

- in refrigeration room (T = 2-4° C, RH = 83-87%), in packs of 1 kg covered with perforated polyethylene film - cold storage;

- in refrigeration room (T = 2-4° C, RH = 92-96%), in hermetic packs of 1 kg, so that the composition of atmosphere inside them has modified, meaning reduction the O₂ content and increased CO₂ content and the air relative humidity - storage in modified atmosphere - MA.

The storage period (days) varied depending on the storage variant, such:

- warm storage: 7
- refrigeration storage: 28
- MA storage : 35.

After removal of the peaches from storage space we made observations on general appearance of the fruits and determinations regarding the mass losses (quantitative) and the depreciation losses (qualitative) suffered by fruits during their storage.

RESULTS AND DISCUSSIONS

The losses of the peaches recorded during the storage in normal temperature - warm (ambient temperature) for 7 days are presented in table 1.

Table 1

Losses in peaches during the warm storage

Variant	Losses - %					
	totals		mass		depreciation	
	Cardinal	Southland	Cardinal	Southland	Cardinal	Southland
V1	27,25	43,11	9,88	14,42	17,37	28,69
V2	22,35	23,07	7,80	13,12	14,55	9,95
V3	26,98	32,54	7,49	14,24	19,49	18,30
V4	19,51	18,85	8,04	2,09	11,47	16,76
Variety average	24,02	29,39	8,30	10,97	15,72	18,42

It found that total losses are higher in all four types of fertilization, due to both mass losses, but especially those by depreciation. At the V1 variant – control we meet the highest losses (27.25% of the Cardinal variety, 43.11% of the Southland variety), and at the V4 variant - chemical fertilization in soil + foliar feeding, the lowest (19.51% - Cardinal, 18.85% - Southland).

But skipping the variant of the fertilization, the total losses recorded during the warm peaches storage of the Cardinal variety are 24.02%, of which 8.30% mass losses and 15.72% depreciation losses. In Southland variety peaches, total losses are 29.39% (10.97% weight loss and 18.42% by

impairment losses).

The fruit impairment, in case of peaches, are due to late infections caused by fungi *Monilinia laxa* and *M. fructigena* before harvest, when they are too little visible. After harvest, during transport and storage, the attack rapidly evolves (depending on temperature) and the entire fruit rots.

Moreover, during the storage can lead to the rotting of the surrounding healthy fruit, mycelium penetrating into them directly or through injuries almost invisible.

The fruits can also be infected through wounds, blows or pressure produced during harvest and handling by the molds *Rhizopus stolonifer* and *Botrytis cinerea*.

By using cold storage of peaches, losses were recorded both quantitative and qualitative, much smaller than warm keeping (table 2). Thus, the values found at the Cardinal variety, were: mass losses = 1.87%, depreciation losses = 5.40% and total losses = 7.27%.

Table 2

Losses in peaches during the cold storage

Variant	Losses - %					
	totals		mass		depreciation	
	Cardinal	Southland	Cardinal	Southland	Cardinal	Southland
V1	14,55	15,05	3,20	1,49	11,35	13,56
V2	5,34	6,65	1,05	1,45	4,29	5,20
V3	7,39	7,41	1,44	2,10	5,95	5,31
V4	1,79	4,91	1,79	1,61	-	3,30
Variety average	7,27	8,50	1,87	1,66	5,40	6,84

From the fertilization variants, V4 variant performed best in cold, with 1.79% total losses and the worst, V1 variant, with 14.55% total losses. On the second place, V2 variant was located, with 5.34% total losses.

At the Southland variety the losses were also significantly reduced by this method of storage, reaching an average of 8.50% total losses, 1.66% mass losses and 6.84%, depreciation losses. V4 variant is also remarkable, with 4.91% total losses (1.61% mass losses + 3.30% quality losses), followed by V2 variant (losses: 6.65%, 1.45% and 5.20%, respectively). On last place, with total losses of 15.05% ranks V1 variant.

The losses determined after 35 days of storage in modified atmosphere conditions were significantly lower values compared with the others methods of storage (table 3).

Table 3

Losses in peaches during storage in MA

Variant	Losses - %					
	totals		mass		depreciation	
	Cardinal	Southland	Cardinal	Southland	Cardinal	Southland
V1	9,24	7,90	0,20	0,20	9,04	7,70
V2	1,91	0,22	0,19	0,22	1,72	-
V3	5,65	3,35	0,19	0,32	5,46	3,03
V4	0,16	0,19	0,16	0,19	-	-
Variety average	4,24	2,91	0,19	0,23	4,05	2,68

The average of the total losses at the Cardinal variety in these conditions is 4.24% (0.19% mass losses and 4.05% quality losses). From the fertilization variants, the first place, with the lowest total (0, 16%), mass (0.16%) and qualitative losses (0%) is occupied by V4 variant, followed by V2 variant (1.91%, 0.19% and 1.72% respectively).

The Southland variety recorded total losses of 2.91% (0.23% mass losses + 2.68% by depreciation losses) only. The V4 variant of fertilization was not reported losses of quality and the quantitative losses were almost zero (0.19%). A similar situation is found in the V2 variant too, with total losses of 0, 22%. Even in the V1 variant the losses were significantly reduced, those being of 7.90%, 0.20% and 7.70% respectively.

From experimental data results that the fertilization variant of orchard peaches, at the two studied varieties, the best results in terms of losses during storage, from all the three technological methods, is V4 variant, followed by V2 variant, and the worst results were obtained in V1 variant.

CONCLUSIONS

1. The ability to maintain the quality of peach fruit varies depending by the fertilization system, variety and storage conditions of the environment and especially by temperature and gaseous air composition.

2. From the fertilization variants, the V4 variant (chemical fertilization on soil + foliar feeding) induces the best storage capacity, to both tested varieties of peaches. Foliar fertilizers provide, besides the contribution of macro-and micronutrients and other organic substances that stimulate the metabolism of chlorophyll assimilation, energy efficiency and ultimately the quality of the fruits. On the second place, in this respect, stands V2 variant (organic fertilization), which has also the advantage of obtaining organic fruits.

3. There are also differences between varieties in terms of storage capacity and their response to applied storage technology. Thus, while at the Cardinal variety total losses are: 24.02% to warm, 7.27% to cold and 4.25% in modified atmosphere, at Southland varieties these are higher in warm (29.39%) and cold (8.50%) and lower in modified atmosphere (2.91%).

4. In the conditions in which it is practice the adequate methods of fruits storage (optimal temperatures for storage or modified atmosphere characteristic for a species or a variety), biochemical processes are inhibited, maintaining product quality. From the three methods of storage (ambient temperature, refrigeration room and refrigeration room + modified atmosphere) the best results were obtained in the case of the 3rd method, in which were recorded the lowest losses during storage.

5. Refrigeration storage can be successfully used for peaches in case there is no possibility of modifying the air gaseous composition storage space. Low temperatures inhibit or slow down the growth of fungi and mold and slow the rate of biochemical processes during their storage, so the depreciation losses are greatly reduced.

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