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DETERMINATION OF THE SENSORY QUALITY OF APRICOTS DEPENDING ON THE BIOLOGICAL TREATMENTS IN ORCHARD

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Abstract

Biological control is a method of controlling pests such as insects, mites and plant diseases using products that don't harm human health. Biological control may be an option in preventing crop disease and fungicide resistance. This work present influence of biological treatments on sensory quality of the apricots of Orizont variety. In orchard it was fertilized with the biological fertilizer Cropmax which was applied together with some biological fungicides, insecticides and/or acaricides in four variants: v1= Cropmax + Konflic + Funres; v2= Cropmax + Oleorgan + Canelys; v3= Cropmax + Canelys + Mimoten. After harvest, the fruits were stored in different storage conditions: ambient temperature (20-22ºC), for 7 days, temperature of 10-12°C (refrigerant conditions, for 15 days) and temperature of 3-5ºC, with and without modified atmosphere (cold storage), for 30 days. At harvest and at the end of the storage the sensorial quality of the fruits (appearance, firmness and taste) was determinated. The V1 variant highlighted because its fruits presented the greatest values of these parameters at the moment of the harvest and it have maintained their high values during storage in all technological preservation variants.

Key words: *biological fertilizers, pesticides, storage conditions*

INTRODUCTION

Fresh apricots *(Prunus armeniaca* L.) are in high demand, but are available for only a short period during the Summer.

Fragrant and sweet, with a low caloric intake of just 47 kcal per 100 grams, apricots are some of the most loved fruits. The apricots are above all a true pro-vitamin A battery, proven by the cheerful and beautiful orange colour. Four large apricots are sufficient to ensure the daily requirement of vitamin A, a valuable and vital antioxidant to the body. The apricots are rich in C vitamin and B vitamins complex but also in minerals and oligo-elements (600 mg/100 g). They are a generous source of potassium (315 mg/100 g), which makes apricots the best ally of athletes. Potassium is the mineral that has the property to stimulate the metabolic and natural elimination of toxins. The presence of potassium gives fruit colour and retains the aroma (Ion, 2010). Also the apricots are an excellent source of fiber. The apricots act gently in the intestine, stimulate the transit, and the mild acidity make them easily digestible, being very well assimilated by the body, which is why they are considered ideal food for babies and for those who have problems in the digestive tract. Consumed frequently the apricots fight asthenia and depressive states, stop memory loss due to high phosphorus content, treat insomnia and fight against infections in the body.

The organic crops contribute to the presser-vation of precious natural resources, species diversity and soil quality and, out of respect for Planet, we have a duty to extend their surfaces.

Even for those who believed that "organic nutrition" is a whim of the modernity, it is becoming increasingly clear that we must pay special attention to where our food comes from and how it is produced. Plant protection without chemicals is of interest to most fruit growers (but not only - Singh, 2017, 2019) due to the increasing demand for the organic products. The fruits produced without additives and chemicals are required in both fresh and, in particular, canned form.

The sensory evaluation of several varieties of apricots led Valentini et al. (2006) at the conclusion that the overall quality is positively related with flavor, sweetness and juiciness. In general, the most appreciated apricots had a well balanced ratio sugars/acids, although the different proportion between the main acids can influence the fruit acceptance.
In a study on the sensory quality of apricots and peaches Bassi and Selli (1990) also suggests that sugar and acid patterns of fruit flesh may be useful in cultivar characterization.
Not only the biological treatments in orchard influence the sensory quality of apricot after harvest, but also harvest maturity stage. There is more information on the correct harvest maturity stage that should be chosen to ensure a long post-harvest life and high sensory quality (Infante et al., 2008; Chira et al., 2018).
In order to obtain highly qualitative fruits as far as the organoleptic aspect is concerned, their temporarily storage must be under certain conditions, defined for each species of fruit separately.
The temporary storage of the fruit depends in particular on temperature. The damage caused by very high or low temperatures results in tissue decomposition (Alexe et al., 2014, Chira et al., 2016).
Cold storage makes it possible to market perishable fruits and vegetables outside their harvest season. The main purpose of storage is to control the rate of sweating, respiration, disease and insect infestation and to keep the vegetable products in optimum condition for the consumer (Spadoni et al., 2015).
In most cases, the maintaining of a defined temperature and humidity regime is not enough to prolong the period of fruit storage and reduce fruit losses. A defined gas composition of the atmosphere, strictly differentiated for each type of fruit and for different varieties of the same species, is also required (Rao, 2015).
Our previous research has focused on the influence of foliar biological treatments on the preserving capacity after harvesting of the apricots (Moale, 2019), evaluating the quantitative and qualitative losses of the fruits during the storage under different technological conditions.
The purpose of this paper is to determine the effect of the biological treatments applied to apricot trees of Orizont variety on the sensory qualities of apricots at the moment of the harvest and their evolution post-harvest.
Also, the influence of the technological factors from the storage areas (temperature, humidity, gaseous composition of air) on the maintenance of these qualities was evaluated.

MATERIALS AND METHODS

The apricots of Romanian variety Orizont (Figure 1) were harvested from the experimental culture of Research Station for Fruit Growing Constanta. The researches were conducted in years 2017 and 2018 at the Research and Development Institute for Processing and Marketing of the Horticultural Products “Horting” Bucharest.

Figure 1. Apricots of the Orizont cultivar

In orchard the experimentation consisted of the foliar application, on the apricot trees, of the fertilizer Cropmax together with some biological fungicides, insecticides and/or acaricides, in three variants, as follows:
- V1 - Cropmax 0.15% + Konflic 0.3% + Funres 0.3% (Figure 2);
- V2 - Cropmax 0.15% + Oleorgan 0.3% + Canelys 0.3% (Figure 3);
- V3 - Cropmax 0.15% + Canelys 0.3% + Mimoten 0.3% (Figure 4);
- V4 - control - untreated
For this purpose the STIHL 400 SR atomizer was used.

Figure 2. Biological products for V1 variant

Figure 3. Biological products for V2 variant

Figure 4. Biological products for V3 variant

The products which were used are described below:
- Cropmax - super-concentrated, foliar fertilizer (100% natural);
- Konflic - organic insecticide; it is a natural product used against the pest population (white fly, trips, aphids);
- Oleorgan - insecticide; it is a natural product which contains vegetable oils, used to combat and reduce the population of pests (white fly, trips, aphids) from horticultural crops;
- Funres - fungicide; it is a natural herbaceous extract intended to combat diseases of the horticultural crops, such as *Botrytis* sp., *Sclerotinia* sp., *Peronospora* sp., *Phytophthora* sp.;
- Mimoten - fungicide, with a preventive and curative effect on most fungi and bacteria that attack the crops and fruit trees, by inhibiting their growth and development (*Botrytis* sp., *Septoria* sp., *Sphaeroteca* sp.);
- Canelys - acaricide, a natural product successfully used to control the population of mite spiders *(Tetranichus* sp.) and of some pathogen fungi, as *Oidium* sp.

After harvesting, as soon as it was possible, the fruits were transported to the Research and Development Institute for Processing and Marketing of the Horticultural Products Bucharest. There the apricots were examined organoleptic, in order to estimate the appearance (size, shape, colour), the taste (sweetness, flavour) and the firmness (texture) of the fruits.

To find out what are the factors on which the maintaining of the sensory quality of apricots depends, we have placed the fruits in storage under different technological conditions, as follows:
- ambient temperature - warm (T = 24-27°C, RH = 69-71%), for 7 days;
- fridge storage (T = 10-12°C, RH = 75-78%); for 15 days;
- cold storage (T = 3-5°C, RH = 82-86%), for 30 days;
- cold + modified atmosphere (MA) storage (T = 3-5°C, RH = 92-96%) - in hermetic packages, so that the composition of the atmosphere inside was modified, by the reducing of the O_2 amount and the increasing the CO_2 amount - storage in modified atmosphere - MA, for 30 and 45 days;

After storage, the fruits were re-examined to determinate the effect of culture technology on quality preserving capacity after harvesting of the apricots.

The evaluation of the organoleptic quality was achieved by carrying out the fruits sensory testing, using a grading scale from 1 to 100. Tasting sheets were used which included a number of three criteria of appreciation (aspect, firmness, taste), with different share in the general notation, depending on their importance: the aspect represents 15%, firmness 35%, and taste 50%. Depending on the score obtained, five quality classes are distinguished, as follows: very good (80-100 points), good (60-79 points), satisfactory (40-59 points), sufficient (20-39 points) and insufficient (0-19 points).

RESULTS AND DISCUSSIONS

The results shown in Table 1 indicate that, in the moment of the harvest, the apricots got high marks because of their attractive appearance, firmness and taste.

The apricots of V1 variant (Cropmax 0.15% + Konflic 0.3% + Funres 0.3%) got the highest score (91.20 point) and the apricots of V4 variant (control - untreated), the lowest (81.20 points).

The tasters accorded the same rating for all four variants of biological treatments, "very good" qualifying.

Table 1. The organoleptic appreciation of apricots at harvest (points)

Criteria for assessment	Variant			
	V1	V2	V3	V4
Aspect	13.20	12,60	13.20	11.40
Firmness	31.00	30,80	32.20	28.00
Taste	47.00	38,00	38.00	41.60
Total score	91.20	81,40	83.40	81.20
Qualifying	very good	very good	very good	very good

After 7 days of storage in an ambient temperature, the organoleptic quality of the apricots deteriorated drastically, the score dropped due to the diminishing of the aspect, firmness and taste, so that the final grade was “good” for V1-V3 variant, at inferior limit of the class for V1 and V2 variant (Table 2).

Table 2. The organoleptic appreciation of apricots after storage in ambient temperature -T = 24-27°C for 7 days (points)

Criteria for assessment	Variant			
	V1	V2	V3	V4
Aspect	10.80	10.20	10.80	6.00
Firmness	23.40	23.80	25.20	20.80
Taste	40.00	30.00	30.00	27.00
Total score	74.20	64.00	66.00	53.80
Qualifying	good	good	good	satisfactory

In the V4 variant one of the repetitions presented a strong attack of diseases (Figure 5), fact for which some tasters gave very few points, and the rating obtained by this variant was “acceptable”.
On the first place, with 74.20 points, it is ranked V1 variant and on the last, with 53.80 points, it is located V4 variant.

Figure 5. Warm storage of apricot - infested fruits

After 15 days of storage in temperature of 10-12°C (Figure 6) the parameters of the organoleptic properties of the apricots in V1 variant remained fairly reasonable, the score being of 84.50 points and the grade “very good” (Table 3).

Table 3. The organoleptic appreciation of apricots after storage in fridge storage - T = 10-12°C for 15 days (points)

Criteria for assessment	Variant			
	V1	V2	V3	V4
Aspect	12.00	12.20	12.60	11.60
Firmness	30.50	26.60	30.50	27.20
Taste	42.00	36.00	34.00	32.40
Total score	84.50	74.80	77.10	71.20
Qualifying	very good	good	good	good

At the apricots from the other three variants, the organoleptic quality was degraded, but not very much, which is why they received the “good” rating.

Figure 6. Fridge storage of apricot

During storage at a temperature of 3-5°C for 30 days (Figure 7) the metabolic processes of the fruits slowed down, so that the sensory quality of the fruits was better preserved (Table 4).

Table 4. The organoleptic appreciation of apricots after storage in cold storage - T = 3-5°C for 30 days (points)

Criteria for assessment	Variant			
	V1	V2	V3	V4
Aspect	13.80	13.20	9.60	9.60
Firmness	28.00	22.60	26.60	26.60
Taste	42.00	34.00	34.00	30.00
Total score	83.80	69.80	70.20	66.20
Qualifying	very good	good	good	good

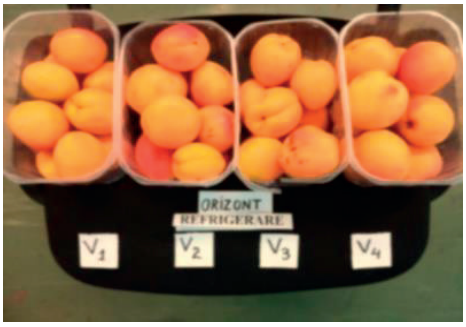

Figure 7. Cold storage of apricot

Variant V1 maintained its 1st place in the ranking (83.80 points), and the other variants kept their positions from previous experiments.

During MA storage for 30 days, the apricots, though are maintaining their pleasant aspect and their firmness, the quality of the taste has decreased a lot so that the tasters degraded V2 variant and V4 variant in the quality class "good" (Table 5).

Table 5. The organoleptic appreciation of apricots after storage in cold + modified atmosphere storage - T = 3-5°C for 30 days (points)

Criteria for assessment	Variant			
	V1	V2	V3	V4
Aspect	13.00	12.60	13.20	11.00
Firmness	31.00	30.60	31.20	26.80
Taste	42.20	34.80	36.00	39.20
Total score	86.20	78.00	80.40	77.00
Qualifying	very good	good	very good	good

The V1 variant, with a score of 86.20 points received, together V3 variant (80.40 points), grading "very good".

CONCLUSIONS

The organoleptic quality of the apricots at harvest and its evolution post-harvest varies according to type of applied culture technology.

The use of the different biological treatment schemes applied to apricots trees against pathogens is reflected in the level of organoleptic parameters of the fruit at harvest, but also in their evolution during storage.

The greatest values of these parameters at harvest is recorded by the fruits obtained from the trees that were treated with Cropmax 0.15% + Konflic 0.3% + Funres 0.3% (V1 variant), followed by V3 variant: Cropmax 0.15% + Canelys 0.3% + Mimoten 0.3%.

During storage the V1 variant was also particularly highlighted because its fruits have maintained their high values of the sensory quality in all technological preservation variants.

The cold + modified atmosphere (MA) storage recorded the best results regarding the slowing down of the rhythm of the metabolic processes and inhibition or slowing down the fungi and molds growing rate, which has been reflected in the maintaining of the sensory quality for a longer period of time.

Because low temperatures inhibit or slow down the fungi and molds growing rate - specific to each species of vegetables and slow down the rate of biochemical processes during their storage. Therefore, the losses through depreciation are greatly reduced.

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