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STUDIES REGARDING THE EFFECTIVENESS OF PRE AND POST - HARVEST TREATMENTS, UPON THE SHELF LIFE OF SOME APPLE FRUITS VARIETIES STORED UNDER NATURAL VENTILATION ENVIRONMENT

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Abstract

The present paper show the research results of the pre-harvest treatments using the fungicides: Rovral 500 SC - 0,15 %, Magnate 50 EC - 0,09 % and Switch 62,5 WG – 0,1%, as well as post-harvest treatments: using Rovral 500 SC – 0,15% and Magnate 50 EC –0,09 %. The experiment was placed on the private farmers from Voinesti village – Dambovita region, well known regarding the tradition of apple growing, using the apple varieties Florina, Generos and Ciprian. From the obtained results it can be noticed that the pre-harvest and especially the post-harvest treatments, including packaging materials disinfection, are effective to control pathogens during storage period. The product Rovral 500 SC was more efficient than the fungicide Switch 62,5 WG, but less efficient than Magnate 50 EC product.

Key words*: treatments, rottenness, pre - harvest, post – harvest.*

INTRODUCTION

In the apple growth technology, one of the most important intervention is represented by the phytosanitary treatments performed in the orchard, as well as those carried out prior to the storage period (Boyette M. D. et al., 2008.). The losses due to the rottenness during the storage period are considerable, being up to 20-30% from the total yield.

Improving the cultural practices and to choosing the best varieties has an important contribution to the yield increase and to maintaining the fruit quality during the storage period.

Pre-harvest and post-harvest phytosanitary treatments represent an indispensable issue for the apple culture (Collins Mark et al., 2011).

Economical losses caused by the parasite fungus justify the phytosanitary treatments during the vegetation period, but at the same time, imply a special care to decrease the pesticide residues on fruits (Chira Lenuta, 2008).

During storage period, apples can be attacked by a high number of fungus pathogens that cause their rotting. Infection can begin from the orchard or during transport and the storage period, usually because of the poor hygiene of the packaging materials or of the storage environment.

MATERIALS AND METHODS

The experience has been organized in the Voinesti village area, in the private orchards of some members of the Dambovita Fruit Growing Association.

The purpose of this study was that of evaluating the apple fruits storage capacity and quality maintaining, following the phytosanitary treatments applied in the orchard and after harvest, in the autumn of the years 2014 and 2015. There were also analyzed samples of fruits, with a view to

appreciate the physical and chemical characteristics, at the end of the storage period, for Florina, Generos and Ciprian varieties.

It is necessary to mention that in the orchard the treatments have been performed on 1 ha/ farmer and after harvest the fruits were exposed to phytosanitary treatments, 100 kg fruits of each variety.

For the pre-harvest treatment the fungicides used were Rovral 500 SC - 0,15 %, Magnate 50 EC - 0,09 % and Switch 62,5 WG - 0,1%. These have been applied 20 days before harvesting and are recommended to prevent and to control the major apple fruits storage diseases produced by the fungus: *Penicillium sp., Botrytis cinerea, Monilinia fructigena* and *Gloeosporium album.*

The storage of the fruits has been performed in the store with a natural ventilation environment, with the following conditions: temperature 14-15^{o}C and air relative humidity 75-80 %.

For the post-harvest treatments in 2015 the following fungicides were used: Rovral - 0,15 % and Magnate - 0,09 % which have demonstrated to be the most effective on the orchard in the previous year. The two experimental variants were the treatment on fruits and the treatment on packaging materials (plastic material boxes) and fruits.

RESULTS AND DISCUSSIONS

As far as the pre-harvest treatment is concerned the data presented in Table 1 it can be observed that for all varieties, the best results have been obtained with the product Magnate 50 EC at 0,09 %. The attack rate was 6,0 % in the case of Florina; 6,4% for Generos and 5,8 % at Ciprian, but after different storage periods depending on the variety.

Table 1. The effectiveness of pre-harvest treatment on losses caused by rotting, during storage period

Variety	Variant	Concentration (%)	Storage period (days)	Rotted fruits
Florina	Control	-	90	17.7
	Rovral 500 SC	0.15	90	6.8
	Magnate 50 EC	0.09	90	6.0
	Switch 62,5 WG	0.10	90	7.4
Generos	Control	-	70	15.6
	Rovral 500 SC	0.15	70	7.2
	Magnate 50 EC	0.09	70	6.4
	Switch 62,5 WG	0.10	70	7.6
Ciprian	Control	-	105	16.8
	Rovral 500 SC	0.15	105	6.7
	Magnate 50 EC	0.09	105	5.8
	Switch 62,5 WG	0.10	105	7.8

Between the tested fungicides, the bad results have been obtained in the case of Switch 62,5 WG, apple fruits being attacked on a rate of 7,4 % - Florina; 7,6 % - Generos and 7,8 % - Ciprian. The product Rovral 500 SC was more efficient than the fungicide Switch 62,5 WG, but less efficient than Magnate 50 EC product.

We can underline that the treatments performed in the orchard before harvest period have had a major effect to reduce the percent of rotting fruits in the storehouse. The reduction was above 65 % in the case of Magnate 50 EC 0,09 %, in comparison with the untreated control.

Also, it was observed that in the case of Florina the main pathogen agent was *Penicillium* sp. which produces the moist rot, while for Generos the most important was the lenticular rot produced by the fungus *Gloeosporium album*. For the Ciprian variety mixed attack produced by *Penicillium* sp., *Botrytis cinerea* and *Monilinia fructigena* was observed.

If we consider the storage period, which was 90 days for Florina, 70 days for Generos and

105 days for Ciprian, we can say that the last variety had a very good behavior during storage, in relation with the major pathogens.
In regard to the post-harvest treatment, as can be observed in Table 2, these were more efficient than those performed during the vegetation period, with the same product and concentration. The Magnate 50 EC product in a concentration of 0,09 % was again remarked and it gave the best results. Ciprian variety had a less rate of rotting fruit, even if the storage period was longer.

Table 2. The effectiveness of post-harvest treatment on losses caused by rotting, during storage period

Variety	Variant	Concentration (%)	Storage period (days)	Rotted fruits (%)
Florina	V1- Control	-	90	11.4
	V2- Rovral (fruits)	0.15	90	5.4
	V3-Rovral (package + fruits)	0.15	90	2.3
	V4- Magnate (fruits)	0.09	90	4.5
	V5-Magnate (package + fruits)	0.09	90	2.0
Generos	V1- Control	-	70	10.4
	V2- Rovral (fruits)	0.15	70	4.8
	V3- Rovral (package + fruits)	0.15	70	2.9
	V4- Magnate (fruits)	0.09	70	4.4
	V5-Magnate (package + fruits)	0.09	70	2.2
Ciprian	V1- Control	-	105	10.0
	V2- Rovral (fruits)	0.15	105	4.8
	V3-Rovral (package + fruits)	0.15	105	2.8
	V4- Magnate (fruits)	0.09	105	4.2
	V5-Magnate (package + fruits)	0.09	105	2.4

As we can see, in the case of all varieties, the lower rotting percent has been registered for the variants where the fruits as well as the packaging materials were treated, so this is an very important issue for the farmers who store the apple fruits for a longer period. To prevent rotting, it is recommended to disinfect the packaging materials, because these are an important source of pathogen infection, mainly when they are reused for a longer period of time. Thus, in the case of the Florina variety - V3, the attack rate was only 2 %, as compared with the control – 11,4 %, or to the variant when there only fruits have been treated – 4,5 % , when the Magnate fungicide was used.
From the present data it can be noticed that the pre-harvest and especially the post-harvest treatments, including packaging materials disinfection, are effective to control pathogens during storage period.

CONCLUSIONS

The storage period under natural ventilation environment was 90 days for Florina, 70 days for Generos and 105 days for Ciprian; the last variety had a very good behavior during storage, in relation with the major pathogens.
For all varieties, the lower rotting rate has been registered at the variant in which both the fruits and packaging materials were treated because these are an important source of pathogen infection.
For the Florina variety, the principal pathogen agent was *Penicillium* sp. which produces the moist rot, while for Generos the most important was the lenticular rot produced by the fungus *Gloeosporium album*.
The product Rovral 500 SC was more efficient than the fungicide Switch 62,5 WG, but less efficient than the Magnate 50 EC product.

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