Effect of postharvest treatment substances antimicrobial action on the commercial quality and declining masa cherry fruit after storage

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An important task of modern producers are not only producing the required volume of production, as well as its storage and making available to the consumer with minimal losses and high quality.

The main factors of spoilage of fruits and vegetables during storage are infectious diseases. Today searching the ways for storage that inhibit the development of pathogens [1, 2].

The cherry fruit have high acidity (1,5%), but pH is 3.1. Thats why agents of their damage are mainly mold fungi and yeast. The means of defense against them are matter of antimicrobial action: sorbic, benzoic, citric acid, alcohol, etc. [3]. Effects of sorbic and benzoic acids are directed against mold fungi and yeasts, some bacteria [4]. Citric acid slows the growing of all microorganisms and, in particular, prevents the development of bacteria, reducing the pH of the cell sap. It also shows antioxidant effect [5]. Aqueous solutions of ethanol with a concentration above 70% have antibacterial properties [6]. Investigation of antimicrobial properties of these for post-harvest treatment of fruit blossom before storage previously not conducted.

However, only artificial cooling does not always protect products from physiological disorders and microbial diseases, and avoid losses [7]. One of the effective ways of keeping fruit cherry is modified gas environment that is created as a result of respiration of fruits and selective permeability plastic film. So, according to V. M. Naychenko, N. M. Osokina [8] the varieties of Podbyelska cherry removed from the stem at the stage of technical maturity, packaged in boxes of 5 kg capacity, pre-chilled at a temperature of 0° C, kept 20 days, during 12-20 h at optimal temperature 1–2°C. This weight loss fruits were 1,3–2,3%, the yield of marketable products – 72–75%, including first grade – 40,7%, other – 34,6%. An important indicator of the safety of products is a natural weight loss. Its occur as a result of evaporation and respiration of fruits, the latter occurring oxidation of organic matter to release heat, water that enters to air in storage [9]. The quality of the stored product should be assessed by merchantability fruit after storage [10, 11].

The study – by product quality and natural weight loss establish technological feasibility of antimicrobial agents for postharvest treatment of fruit cherries.

Research Methodology. Work performed in Uman National University of Horticulture during 2004–2006. Objects of research – the fruits of cherry varieties Alfa, which crop harvested in Mliyivsky Institute pomolohiyi L.P. Simirenko.

For testing the products collected during dry weather in boxes, trays № 5.2 capacity 5 kg, transported to the cell pre-cooling (temperature 0 ... +2 ° C). Fruits

treated immediately pre-prepared solutions: 0,5% sorbic, 0,4% citric acid, 0,7% sodium benzoate and ethanol (95,5%). After processing of aiking the fruits, ware packed in plastic bags and loaded into the camera durable KHR-12M (temperature 0 ... –1 ° C, relative humidity about 95%). Fruits in boxes - trays № 5.2 (control 1) and 1 kg of plastic bags (control 2) laid for storage without processing agents of antimicrobial action.

Commodity production analysis was performed according to the standard [12]. Natural weight loss of cherry fruits ware determined by weighting the samples on weight [13].

Mathematical processing of the data was carried out by B.A. Dospyehov [14] by a personal computer (program "Excel 2000", "STATISTIC").

The research results. Mass loss in the fruit occurs through evaporation and costs of organic matter as a substrate for respiration of fruits and essentially depend on the method of storing and year of study.

Note the differences in mass loss by years of research. As can be seen from table 1, the storage of fruit cherries are in control of one mass loss were significantly different. In particular, the yield in 2005 compared with that in 2004, the mass loss was 2% higher , due to the favorable year of growth.

In 2006, noted a similar trend: fruit mass loss is 15,7 % higher.

A significant difference in years of research in mass loss between fruits stored in different atmospheres . In particular, the modified gas medium mass loss account for 1,0–1,2 %, which is 4-6 times less versus usual.

Significant effect on weight loss fruit processing substances made of antimicrobial action .

Significantly lower mass loss observed in treated fruits cherries 0,4% solution of citric acid. In 2004, they were less, and in 2005 and 2006, the difference was 16,7–20 % compared to untreated fruits (control 2).

On average , during the years of research, the storage of fruits without treatment in normal gaseous medium (control 1) cherry varieties for Alfa average mass loss during 2004–2006 amounted to 5,4%.

In maintaining weight loss in fruit affects gas. Mass loss of fruit stored in modified gas medium is 1,0–1,1 % (control 2), which is six times less than with conventional gas medium. This is due to the inhibition of respiration intensity and low fruit and water vapor permeability of plastic film.

Conducted studies have established the benefits of treatment substances antimicrobial activity of fruit blossom and save them as a modified gas medium. Loss of weight on average during the years of research in the fruit decreased by 18–27 %. In particular, the fruit of the spirit to finish – 9 % solution of sodium benzoate and sorbic acid – 18%, and citric acid at – 27 % compared to untreated fruit in plastic bags (control 2).

Thus, the fruit of cherries using plastic film , which serves as a barrier to evaporation of moisture from the fruit , and after-treatment solutions: sodium benzoate, sorbic, citric acid and alcohol is stopped and inhibit microorganisms and help to preserve the product.

1. Mass loss and yield marketable products cherry fruit varieties in Alpha container after storage processing depending on the substance of antimicrobial action

Variables	Year	Duration of storage , days	loss weight, %	Yield of marketable products, %
Fruits with treatment in a box (control 1)	2004	15	5,1	79,3
	2005	17	5,2	79,3
	2006	15	5,9	79,6
	Median	16	**5,4**	**79,4**
Fruits without treatment in a plastic bag (control 2)	2004	34	1,1	80,2
	2005	40	1,2	79,9
	2006	41	1,0	79,9
	Median	38	**1,1**	**80,0**
Plastic bag with fruit treated : 0.7 % solution of sodium benzoate	2004	34	0,8	81,7
	2005	40	1,0	81,6
	2006	41	0,9	81,2
	Median	38	**0,9**	**81,5**
0,5 % solution of sorbic acid	2004	34	0,8	81,0
	2005	40	1,0	80,8
	2006	41	0,9	81,2
	Median	38	**0,9**	**81,0**
0,4 % solution of citric acid	2004	34	0,51	82,6
	2005	40	1,0	82,0
	2006	41	0,8	82,3
	Median	38	**0,8**	**82,3**
95.5 % of ethanol	2004	34	1,0	79,4
	2005	40	1,0	79,0
	2006	41	1,0	79,6
	Median	38	**1,0**	**79,3**
HIP_{05}			*0,4*	*0,4*

At the end of the storage yield of marketable fruit cherries (Table 1) in all variants of the experiment was 79–82 %.

The quality of the fruit, which were kept in a modified gaseous medium (control 2) was better due to fewer technical defects. Therefore the output of commodity production in 2004 cherry fruit by 0,9 % higher compared to fruits stored under conventional gas medium.

Processing of fruit blossom substances antimicrobial action had a significant impact on commodity quality products. Yes, cherry fruit treated with 0,7 % solution of sodium benzoate were 1,3–1,5 % for a larger share of commodity products than without treatment.

A similar pattern is observed for cherry fruit treated with 0,5 % solution of sorbic acid. Thus, the yield of marketable products they had a 0,8–1,3% higher than without treatment (control 2).

Output of marketable products for cherry fruit treated with ethanol was 79–79,6 %.

Average for 2004–2006 study, the processing of aqueous solutions of sorbic acid and sodium benzoate yield marketable products cherry fruit reached 81,0 % and 81,5 %, which is 1,3–2 % compared to untreated (control 2). Among other aqueous solutions of antimicrobial activity , fruit treatment with a solution of citric acid promoted the highest output of commodity production – 82,3 %.

Output of marketable products for cherry fruit, which were kept in the ordinary gaseous medium, averaged 79,4 %, whereas the modified gas environment – 80%.

When processing an aqueous solution of 0,7% sodium benzoate, sorbic 0,5%, 0,4 % citric acid, the yield of marketable products made 81,0–82,3 %.

Output of marketable products in the form of alcohol treatment the lowest – 79,3 %, which is likely due to its high concentration in the processing of fruit cherries.

Thus , processing of fruit blossom 0,4 % solution of citric acid is the most effective among the studied drugs antimicrobial activity, and contributes to commercial quality fruit and cut their losses.

Thus , the efficiency of storage of fruits cherries largely type of processing fruits substances antimicrobial action. By increasing the shelf life of fruit blossom modified gas medium at 2,5 times the output of commodity products at 0,6–0,9 % higher than normal gas.

Conclusions. So, processing of fruit blossom 0,4% citric acid solution and store them in a modified gas environment is the most effective among the studied drugs antimicrobial activity and contributes to commercial quality fruit at 82,3% and reduce their losses by 27%.

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