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Microbiological study of fresh and pasteurised pulped fruits juices

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Abstract

Consumers increasing interest for natural juices determined us to do some microbiological tests both for fresh fruits juices and for those with pulp which are preferred by children. This study was for unpasteurized (FJ), pasteurized (PJ)and termic treated juices of apples (PA), pears (PP) and oranges,(PO) all products being in shelf life. In addition to pasteurized juice samples were analyzed after application of microbiological and subsequent heat treatment (TJ), by incubation at 37o C, for 5 days (for germination of spores that were not destroyed in the pasteurization). The microbiological tests was aimed at determining efficiency of the juice pasteurization technique

Tests showed some microbial groups with risk such as coliform bacteria, but also the presence of filamentous fungus, yeasts and mucogen bacteria. Statistic analysis reveals significant differences between mycological and bacterial load of fresh (FJ) and pasteurized juices. Quantitative variation, but also a similar behavior was registered in case of the last two juices. What is remarkable is the absence of coliforms from all analyzed samples.

Keywords: fresh fruits juices, pulp juice, pasteurisation, mucogene bacteria, yeasts, molds, coliforms bacteria

1. Introduction

Lately, the demanding of natural juices is big, being preferred despite of carbonated ones with sugar because of the "fresh flavor" and the benefits on health [9], because of their content of vitamins and soluble and not soluble fibers [8,10]. The stability of juices depands on the raw material, technology conditions, packing materials, storing conditions. These factors could be the cause of some phisical, chemical, microbiological or enzimatic modifications which will affect sensitive and nutritive proprieties [2].

Even the fruits juices are pasteurized at high temperature and pressure, there are microorganisms that resist at these kind of factors.

Raw material for these kinds of juices has to be one of good quality, fruits and vegetables has to be sorted, those deteriorated has to be taken off in order to reduce the risk of microbial transfer from raw material to equipment and the final product [9]. Some of manipulation techniques of fruits and vegetables used in juices technologies could be an important factor for microbiological state of products.

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Temperature control in fruits and vegetables preparation is important to avoid the growing of pathogens microorganisms which appear on cut surfaces.

In the case of fruits juices that are kept at high temperature long periods of time and packed in tetra pack, they develop the grows of some thermophile microorganisms. The juices develop bad flavors, undesirable colors, and these changes determine products deterioration, main cause being the yeasts [3].

The presence of some bacteria such as E. coli in these products, as a fecale contamination factor isn`t unexpected because raw material could be exposed to contamination during maturation and harvesting. Although it is known that pathogen agents could survive in fruits with an acid pH such as oranges and lemons, it is not likely possible to increase their number in such a medium. A pathogen agent from fruits and vegetables becomes a danger for public health if it is capable to survive inside these products and reach the consumers [4,5]. A number of studies established that even human pathogen agents could survive in some juices. Some of these are: *E coli* O_{157}: H_7 in apple juice, where survive for 24 days at 4^0C and orange juice [4,5, 6].

The present paper reveals that the studies were oriented to a large number of prokaryote and eukaryote microorganisms, including fecal coliformes from pasteurized and fresh juices of apples, pears and oranges.

2. Materials and methods

*Study zone.*The study was made in Timisoara. The pasteurized juices of apple (PA), pear (PP) and orange (PO) were taken from supermarket, and the fruits for fresh juices (FG) were from 700 agrofood market, from the producers from Caras-Severin

Samples characteristics. Packages for pasteurized juices were of 330mL, and the containers for fresh juices were of 500mL. All kinds of analyzed juices were without agents of preservation. For pasteurized juices the content of fruits was 50%.
All samples were sealed when were bought and kept at appropriate temperature. The shelf life was 9 month.

Microbial tests were done in the Microbiology laboratory from Faculty of Horticulture and Silviculture of USAMVB Timisoara.

*Microbial evaluation.*The samples were processed through serial dilution (10^{-1} – 10^{-5}). All determination were done in three repetitions, on specific microbiological medium:

- Sabourand medium to isolate microscopical mushrooms, incubation temperature was 20^0C for 7 days;
- Agar medium with yeasts extract (10%) and sucrose 5% to isolate mucogene bacteria, incubation temperature was 30^0C for 48 hours;
- Lauryl broth with sodium sulphate to reveal coliform bacteria incubation temperature was 37^0C for 48 hours;
- The samples of pasteurized juices were tested after a further incubation at 37 ° C for 5 days (TJ).
- The methods that were used were after [1,7,11,12]

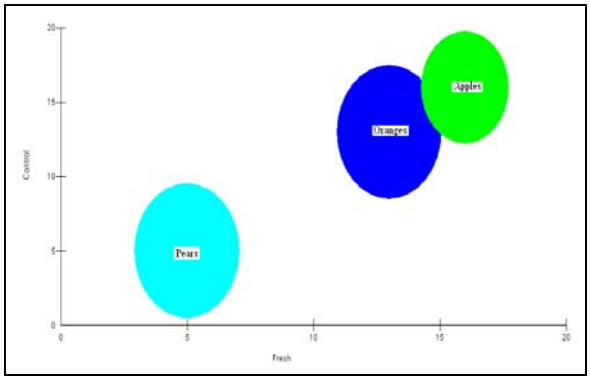
*Statistical analisys:*We used the statistical program MVSP 3.1. registrated to Webomatic RO SRL

Statistics: The evaluation of the experimental data results, Principal Component Analysis. MVSP normally uses the cyclic Jacobi method and Hill of calculating ordinations.

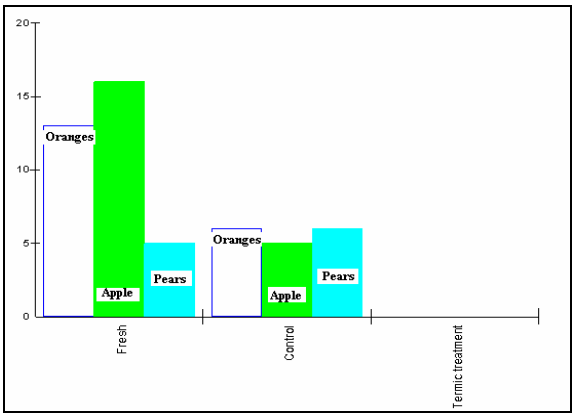
3. Results and discussions

1. The presence of microscopic fungus in fresh and pasteurized juices from apple, pears and orange

Figures 1a and b shows that fresh juice (FJ) and pear whiteness (PO) has the similar behavior. The similarity is showed in figure 1a, but there is a variation between apple and orange samples.



(a)



(b)

Figure 1a,b. Graphic representation of number of microscopic fungus from fresh juice samples and whiteness sample

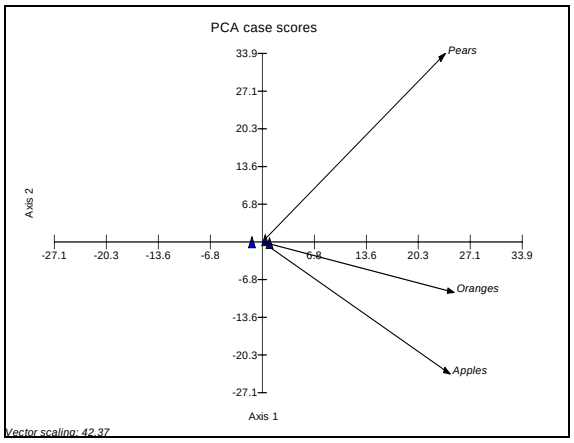


Figure 2. PCA case scores for pears, oranges and apples

The analysis we made on the three studied juices showed that pear juice has a different behavior (quadrant I) in comparison with apple and orange juices (quadrant IV)

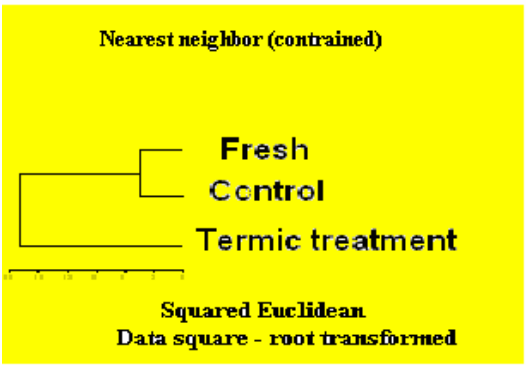


Figure 3. Cluster Analysis for fresh (FJ), control (PJ) and termic treated juice (TJ)

Matrix distance between fresh and witness is 4.493, and still they behave the same, but between pasteurized samples - termic treated (TJ)/witness (PO, PP, PA) and pasteurized samples- termic treated (TJ)/ fresh (FJ) are values till 17000, respectively 34000.

2. Mucogen bacteria presence in fresh and pasteurized apple, pear and orange juice

On the below graphic representation (figure 4 and 5), could be observed the difference between pear juice and the other two studied from microbial point of view. On the other hand could be observed the similarity between apple and pear samples with some variation of UFC/mL in apple juice.

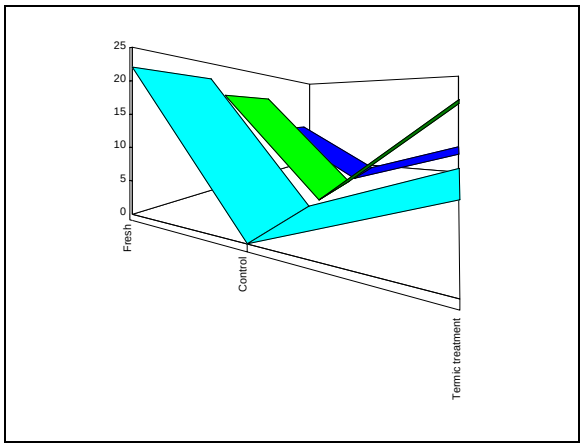


Figure 4. Surfaces space analysis for the three experimented varieties

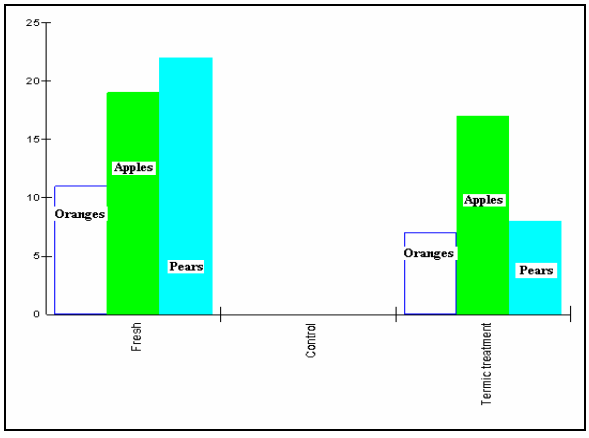


Figure 5. Graphic representation of mucogen bacteria number from analyzed juice samples

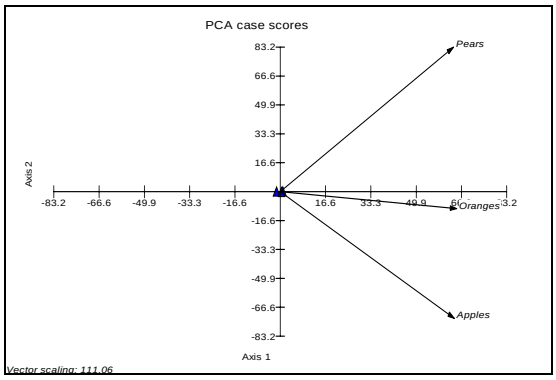
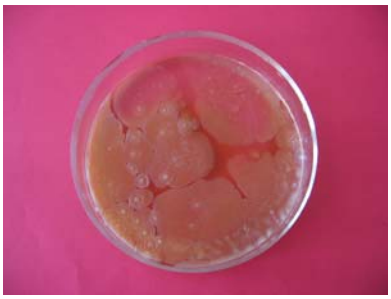
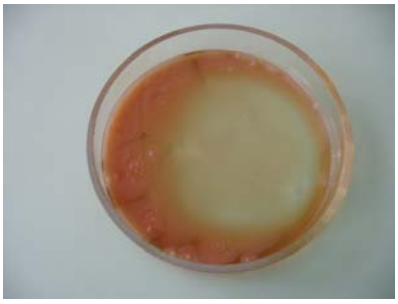


Figure 6. PCA case scores for pears, oranges and apples

Figure 6 shows the presence of apple and orange samples in the same quadrant, but with the same variation. Pear samples detached significant from the other samples for UFC /mL.



(a)



(b)

(c)

Figure 7. Mucogen bacteria present in fresh juices (FJ), (a, c) and in pasteurised (PJ) and termic treated samples (TJ),(b)

3. The presence of coliform bacteria in fresh and pasteurized apple, pear and orange juices

Table 1.Presence/absence of fecale coliform in fresh juices

Juice type	**Fruit**	**Dilution**	**Coliform bacteria**
Fresh, not pasteurized juice	orange	10^{-5}	**absent**
		10^{-4}	
		10^{-3}	
	apple	10^{-5}	
		10^{-4}	
		10^{-3}	
	pear	10^{-5}	
		10^{-4}	
		10^{-3}	

Table 2.Presence/absence of fecale coliform in pasteurized juices with pulp

Juice type	**Juice aroma**	**Pasteurizated samples**	**Coliform bacteria**
Pulp pasteurized juice	orange	Termic treated (37°C)	absent
	Apple		
	Pear		
	Orange	Not termic treated (control)	
	Apple		
	Pear		

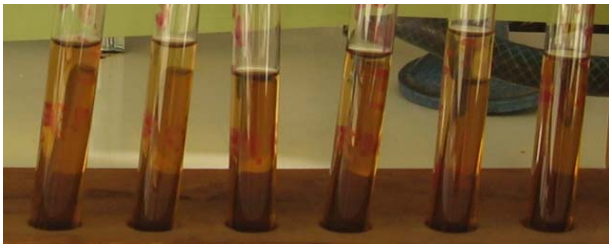


Figure 8. Coliform bacteria are absent in analysed juices

As we can see, coliform bacteria coudn`t be revealed in juice samples analyzed.

4. Conclusion

On the obtained results we can say that:

- pear juice is significant different from apple and orange juices from bacterial point of view;
- apple and orange juices present a similar behavior, but could be seen a variation of UFC/ mL, too;
- coliform bacteria was absent from all analysed samples.

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