

Influence of Ozone on Properties of Jams

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Abstract

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The influence of ozone on some properties of fruit jams was studied. Ozone did not influence the pH value, the contents of reducing sugars and organic acids, or the sensoric properties of the fruit jams tested. It may be used as a source of sterile air over the jam surfaces in yoghurt production.

Keywords: ozone; fruit jams; sensoric properties; yoghurt

Different fruit jams are added into yoghurts and some other dairy products during their production to obtain fruit taste and aroma. The stock jams are kept in store chambers, boxes or vessels in which they could be contaminated mainly by air. Because of that, air is either filtered or replaced with nitrogen atmosphere. Some other solutions, however, exist. One of them is the use of ozone to create sterile (semisterile) atmosphere over the jam surfaces (EASTON 1951; BEUCHAT 1991).

The advantage of ozone in comparison with nitrogen is the possibility to generate it directly in the place of application, without any transport. Besides, the filtration of air is not absolutely safe (BOTT 1991; LINAGJI XU 1999).

Ozone has a high antimicrobial effect but there is no information about its influence on the quality and normal

sensoric properties of jams (BARTH *et al.* 1995; GRAHAM 1997).

This problem was studied in our laboratory in cooperation with the firm HIVUS (Žilina, SR), a producer of ozone generators.

Some fruit jams were ozonized and the influence of ozone on the pH value, the contents of reducing sugars and organic acids as well as on sensoric properties was tested.

The dairy TAMILK (Trnava, SR) supplied us with bilberry (0326), strawberry (0143), and peach (0621) jams produced by FRUJO.

The basic characteristics of these jams are given in Table 1.

Well homogenized jam samples in calibrated tubes were placed under DESOSTER (HIVUS, Žilina, SR) ozone gen-

Table 1. The basic characteristic of jams

Jam	Bilberry		Strawberry		Peach	
Contents (g/kg)	Frozen bilberry	400	Frozen strawberry	400	Frozen peach	450
	Saccharose	570	Saccharose	590	Saccharose	440
			Beet concentrate	8		
Stabilizer	E 440	4.5	E 1442	5.0	E 1442	34.0
			E 440	4.7		
pH	3.8 ± 0.3		3.8 ± 0.3		3.8 ± 0.3	
Heavy metals (mg/kg)						
Lead	0.02		0.03		0.02	
Mercury	0.001		0.001		0.002	
Cadmium	0.012		0.001		0.011	

erator (40–45 mg O₃ per h). The surfaces 30 min three times daily of the jam samples were ozonized with subsequent 6 h breaks for a period of three days. Every day before the first ozonization the surface layers of jam samples were removed and the new surface layer thus formed was ozonized. After the third day of ozonization of the jam samples the pH value, the contents of reducing sugars and organic acids (citric, malic and lactic), and the sensoric properties were evaluated. The results are shown in Tables 2–5.

The indication of jam samples in tables: 0 – before ozonization, 1 – after the first day, 2 – after the second day, and 3 – after the third day of ozonization.

Table 2. pH of jam samples

Sample	Bilberry	Strawberry	Peach
0	4.25	4.40	4.20
1	4.40	4.40	4.20
2	4.37	4.60	4.40
3	4.28	4.70	4.60

Table 3. Contents of reducing sugars in jam samples (g/kg)

Sample	Bilberry	Strawberry	Peach
0	180	547	620
1	188	540	650
2	188	550	630
3	186	548	660

Table 4. Contents of organic acids (g/kg) in jam samples

Samples	Citric acid	Malic acid	Lactic acid
Bilberry			
0	1.312	6.67	0.052
1	1.312	6.67	0.056
2	1.425	7.33	0.056
3	1.312	6.00	0.056
Strawberry			
0	1.575	10.34	0.141
1	1.762	11.67	0.141
2	1.837	12.00	0.141
3	1.825	12.34	0.126
Peach			
0	0.225	2.34	0
1	0.225	2.34	0
2	0.225	2.34	0
3	0.225	2.67	0

Table 5. Sensoric properties of jam sample

Jam sample	Bilberry	Strawberry	Peach
Color			
0	pink-red	bright red	pale orange
1	pink-red	bright red	pale orange
2	pink-red	bright red	pale orange
3	pink-red	bright red	pale orange
Aroma			
0	typical fruit	strawberry	typical fruit
1	typical fruit	strawberry	typical fruit
2	typical fruit	strawberry	typical fruit
3	typical fruit	strawberry	typical fruit
Taste			
0	sweet bitter	strawberry sweet	typical fruit
1	sweet bitter	strawberry sweet	typical fruit
2	sweet bitter	strawberry sweet	typical fruit
3	sweet bitter	strawberry sweet	typical fruit

The contents of citric, malic and lactic acids were determined by isotachophoresis under the following conditions: analyser type ZK 01, conductive electrolyte 10 mM HCl + 0.1% m-HEC + β-alanine as a counterion, pH 3, terminating electrolyte 5 mM acetic acid, pre-separating column 150 μA.

From the data published in the tables can be stated that ozonization has a very small influence on the pH value, the contents of reducing sugars and organic acids and was not detectable by sensoric evaluation. Ozonization can therefore be used as a safe method for creating sterile (semisterile) atmosphere over the surface of dairy raw materials and products without any risk of damage.

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Súhrn

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Študoval sa vplyv ozónu na niektoré vlastnosti ovocných džemov. Ozón neovplyvňuje hodnotu pH, obsah redukujúcich cukrov a organických kyselín ani senzorické vlastnosti študovaných ovocných džemov. Bolo by možné použiť ho ako zdroj sterilného vzduchu nad povrchom džemu pri výrobe jogurtu.

Kľúčové slová: ozón; ovocné džemy; senzorické vlastnosti; jogurt

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