MICROBIOLOGICAL QUALITY ASSESSMENT OF ROSE HIP NECTARS TREATED WITH HIGH VOLTAGE ELECTRICAL DISCHARGE DURING REFRIGERATED STORAGE

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Introduction

Conventional thermal processing technology for pasteurization of nectars ensuring microbiological safety and enzyme inactivation, but causes physical and chemical changes and decreases the bioavailability of some nutrients (1). Therefore, an increasing effort has been made in applying novel technologies to preserve the sensory, nutritional and functional properties while providing safe products (2). High voltage electrical discharge (HVED) is one of such novel non-thermal processing technologies.

This study aimed to investigate the microbiological quality of rose hip nectars treated with HVED (100 Hz, 20 minutes) during storage. Microbiological quality assessment of untreated, HVED treated nectars (prepared with/out purée blanching, low-calorie nectar), as well as pasteurised nectar, was performed on „0," 6 and day 12 of storage at 4 °C.

Materials and Methods

The rose hip fruits (*Rosa canina* L.) are washed and air dried at room temperature. For the study, the stem was removed from the rose hips and then cut in half, removing tiny hairs and seeds. Then it was crushed with a stick blender and the pulp was diluted with water in equal proportions. Rosehip purée was obtained with electric mill by passing through sieve of 1 mm pore size. The purée for the preparation of nectar (N3) was blanched in a microwave oven at 800 W for 45 seconds. The purée was processed into nectar by adding sugar (7.5%) or low calorie sweetener (3.75%; Sweet Stevia, Vitalia: isomalt 99.2% and steviol glycoside 0.8%), 0.15% citric acid and water up to 12-13% soluble solids, with 40% purée. After preparation, nectar samples (300 mL) were treated in HVED instrument (30 kV, 100 Hz, 20 min; Inganiare CPTS1, Croatia) with stirring on a magnetic stirrer. Pasteurised nectar (N5) was prepared by pasteurisation at 85°C for 20 minutes.

Microbiological methods (3):

Aerobic mesophilic bacteria *HRN EN ISO 4833-1:2013

Enterobacteriaceae *HRN EN ISO 21528-2:2017

Escherichia coli *HRN ISO 16649-2:2001

Salmonella spp. *HRN EN ISO 6579-1:2017/A1:2020

Listeria monocytogenes *HRN EN ISO 11290-1:2017

Yeasts and moulds *HRN ISO 21527-2:2012

Results

Table 1 The average counts of aerobic mesophilic bacteria (AMB) and *Enterobacteriaceae* (E) in the nectars during refrigerated storage

AMB			E		
Sample/ Day	Microbiol. limit (cfu/mL)	Results (cfu/mL)	Sample/ Day	Microbiol. limit (cfu/mL)	Results (cfu/mL)
Day „0"			**Day „0"**		
N1	10^3	<10	N1	10	<10
N2	10^3	<10	N2	10	<10
N3	10^3	<10	N3	10	<10
N4	10^3	<10	N4	10	<10
N5	10^3	<10	N5	10	<10
Day 6			**Day 6**		
N1	10^3	<10	N1	10	<10
N2	10^3	<10	N2	10	<10
N3	10^3	<10	N3	10	<10
N4	10^3	<10	N4	10	<10
N5	10^3	<10	N5	10	<10
Day 12			**Day 12**		
N1	10^3	<10	N1	10	<10
N2	10^3	<10	N2	10	<10
N3	10^3	<10	N3	10	<10
N4	10^3	<10	N4	10	<10
N5	10^3	<10	N5	10	<10

N1 - nectar without HVED treatment

N2 - nectar treated with HVED

N3 - nectar prepared with purée blanching treated with HVED

N4 - low calorie nectar treated with HVED

N5 - pasteurised nectar

Table 2 The results of the detection of *Salmonella* spp. (S) and *Listeria monocytogenes* (LM) and average counts of *Escherichia coli* (EC) in the nectars during refrigerated storage

S			LM		EC		
Sample/Day	Microbiol. limit (cfu/mL)	Results (cfu/mL)	Microbiol. limit (cfu/mL)	Results (cfu/mL)	Sample/Day	Microbiol. limit (cfu/mL)	Results (cfu/mL)
Day „0" absence in 25 mL			absence in 25 mL		**Day „0"**		
N1		nd		nd	N1	10^2	<10
N2		nd		nd	N2	10^2	<10
N3		nd		nd	N3	10^2	<10
N4		nd		nd	N4	10^2	<10
N5		nd		nd	N5	10^2	<10
Day 6 absence in 25 mL			absence in 25 mL		**Day 6**		
N1		nd		nd	N1	10^2	<10
N2		nd		nd	N2	10^2	<10
N3		nd		nd	N3	10^2	<10
N4		nd		nd	N4	10^2	<10
N5		nd		nd	N5	10^2	<10
Day 12 absence in 25 mL			absence in 25 mL		**Day 12**		
N1		nd		nd	N1	10^2	<10
N2		nd		nd	N2	10^2	<10
N3		nd		nd	N3	10^2	<10
N4		nd		nd	N4	10^2	<10
N5		nd		nd	N5	10^2	<10

nd – not detected

Results

Table 3 The average counts of yeasts and moulds in the nectars during refrigerated storage

YEASTS AND MOULDS		
Sample/Day	Microbiol. limit (cfu/mL)	Results (cfu/mL)
Day „0"		
N1	10^2	9.1×10^3
N2	10^2	4.8×10^2
N3	10^2	<10
N4	10^2	6.4×10^2
N5	10^2	<10
Day 6		
N1	10^2	1.6×10^3
N2	10^2	7.0×10^2
N3	10^2	<10
N4	10^2	<10
N5	10^2	<10
Day 12		
N1	10^2	1.0×10^5
N2	10^2	1.6×10^4
N3	10^2	<10
N4	10^2	2.2×10^4
N5	10^2	<10

N1 - nectar without HVED treatment

N2 - nectar treated with HVED

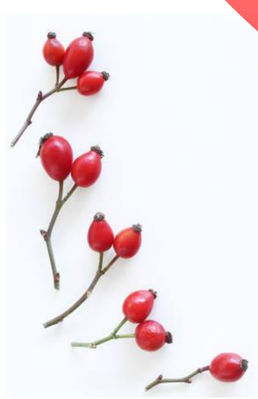
N3 - nectar prepared with purée blanching treated with HVED

N4 - low calorie nectar treated with HVED

N5 - pasteurised nectar

Conclusions

- ✓ Aerobic mesophilic bacteria, *Enterobacteriaceae* and *Escherichia coli* count in all samples during 12 days were below the permitted levels.
- ✓ *Salmonella spp.* and *Listeria monocytogenes* were not detected in any of the nectar samples.
- ✓ The results showed the best microbiological stability during 12 days of storage in nectar prepared with purée blanching treated with HVED and in pasteurised nectar, where the count of yeasts and moulds on day 12 was below the critical limits prescribed for fresh fruit juices.



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