

NATURAL ACIDIFIER PRODUCED FROM APPLES IN THE EARLY RIPENING PHASE

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Abstract. It is proposed the apple acidifier obtaining technology, a non-alcoholic natural product that manifest superior nutritional advantages for chemical food additives: acidifiers, sweeteners, widely used in canned. Process apple acidifier obtaining, according to the invention, includes primary apple processing, crushing, heating up to temperature of 50°C and treatment with pectolytic + amyloytic enzymes for 1 hour, pressing, deburring, clarifying and filtering, heat treatment at 60 °C for 20 min., packing and sealing, in case of concentrated acidifier production it must be evaporated at the 55°Brix, then packaging and sealing, followed by pasteurization and cooling. The acidifying agent possesses good organoleptic characteristics and balanced nutritional value, conditioned by the optimal ratio of organic acids / carbohydrates / polyphenolic substances.

Key words: apple, natural acidifiers, non-alcoholic products.

Introduction

The Republic of Moldova has over 70 thousand ha with plantations grown with 20 apple varieties, the most famous being Golden, Gala, Red Chief, Idared, Jonald [1]. Total annual production is about 400 thousand tones [3], of which 50% are exported fresh, 26% are directed to industrial processing for concentrated juice, and 24% are sold on the local market [2]. Apples are the third product with highest value in agriculture, being a strategic product for the northern area of the republic, where the largest plantations are located.

However, agricultural companies also have difficulties: on the Russian Federation market there are restrictions on exports of fresh apples and the export quotas of the EU market are insufficient for the marketing of indigenous production.

A pressing problem for Moldovan processing enterprises is the huge storage of concentrated apple juice and sales are below expectations because of the high production costs compared to the costs of Chinese processing enterprises that place on European market the concentrated juice from apples at lower prices.

Another aspect is at the early maturation stage of apples, in the years with insufficient soil humidity, about 25-30% of the expected fruit is removed from the plantations, which is not used for food purposes but is converted into green mass as a fertilizer. At the same time, most cans of vegetables and fruits are made using citric and acetic acids, chemical origin or products of selected microorganisms, which is not to the liking of many consumers.

Significant apple volumes in the early maturing phase, which are obtained in adjusting the harvest load, as well as the need for natural acidifiers for the production of canned and refreshing beverages, require the basic task of the proposed process to obtain apple products with significant content native organic acids and other valuable nutrients.

Materials and methods

In July-August 2016-2018 was harvested apples of 4 grape varieties at different stages of their maturation, on the experimental ground of the Scientific-Practical Institute of Horticulture and Food Technologies. Acidifiers have been obtained.

The content of soluble solids was determined by refractometer.

The titratable acidity expressed in g/dm³ of tartaric acid was determined by titration with 0.1 N alkaline solution of NaOH to the low pinkish tint.

The content of polyphenol substances is determined by UV-VIS spectrophotometry selon MA-MD-AS 2-10 INDFOL Quantitative analysis was performed at the diode matrix detector (DAD) at wavelengths 192, 208, 210 nm.

The pH value was determined in accordance with MA-AS MD-313-15-pH.

Results and discussions

The procedure for obtaining experimental apple acid samples

Example 1 Natural apple acidifier from apples

10 kg Rewena variety apples, containing 11.2% water-soluble dry substances and 3.0% titratable acidity recalculated to malic acid, were received, inspected and sorted. Washing with drinking water under 1.2bar was performed. and by crushing, a must have been obtained. This was heated to 50°C and treated at this temperature with pectolytic enzyme preparations at a dose of 30 mg/kg and amylotic at a dose of 10 mg /kg for 25 minutes. The enzymatically treated mash was pressed, then deburred and clarified with Klarsol Super 0.5 ml/dm³ and 0.1 ml/dm³ Erbigel for 30 minutes.

The heat treatment regime was performed at 60°C for 20 minutes. The process was completed by casting the hot acidic acid in the jars and twisting off with Twist off caps.

Organoleptic indices: The apple acidifier Rewena containing 11.0% soluble dry substance is a clear, golden yellow opalescent liquid. The taste is intensely acidic and pleasant, slightly sweet; the aroma is pleasant, specific to the green apple, moderately expressed.

The physicochemical indices for apple acidifying agent are shown in Table 1.

Table 1. The characterization of physical-chemical indices of apple natural acidifier

Type of indices	Natural acidier
Dry soluble substances, °Brix	11,0
Carbohydrates, % :	7,0
Fructose, %	4,5
Glucose, %	2,0
Organic acids, % :	3,0
Polyphenolic substances content, mg/dm ³	350
Sugar/acidity ratio	2,33

Example 2. Concentrated acidifying agent from apples

The 10 kilograms of Coredem variety, containing 12.5% water-soluble dry substances and 2.5% titratable acidity recalculated to malic acid, were received, inspected and sorted. Washing with drinking water under 1.5 bar was performed. and by crushing, a must have been obtained. This was heated to 50°C and treated at this temperature with pectolytic enzyme preparations at a dose of 28 mg/kg and amylotic at a dose of 10 mg/kg for 30 minutes. The enzymatically treated mash was pressed, then deblocked and clarified

with Klarsol Super preparations 0.4 ml/dm³ and Erbigel 0.1 ml/dm³ for 30 minutes. The heat treatment regime was carried out at 60°C for 20 minutes, followed by concentration in the evaporator at 50°C and a pressure of 0.95 bar until the water-soluble content reached 55°Brix. The concentrate acidifier was poured hot in jars, sealed with Twist off caps and pasteurized at 70°C for 15 min.

Organoleptic indices: 55°Brix Apple Concentrated Acid is a clear, viscous and opaque, brownish-brown liquid. Taste and aroma are characteristic of Coredem variety.

The physicochemical indices of the apple concentrate are shown in Table 2.

Table 2. The characterization of physical-chemical indices of apple concentrated acidifier

Type of indices	Concentrated apple acidifier
Dry soluble substances, Brix	55,0
Carbohydrates, %:	35,0
Fructose	22,5
Glucose	10,0
Organic acids, % :	2,1
Polyphenolic substances content, mg/dm ³	1500
Sugar/acidity ratio	3,6

Therefore, it can be shown that the production of acidifier is sufficient that the apple contain from 10,0% to 13,9% soluble substances, at this stage they have 7-12,2% sugars and have titratable acidity of 1,7 to 3,0%, polyphenolic substances accumulate 200 mg/dm³ in white varieties and 500 mg/dm³ in red varieties.

Conclusions

1. Were studied 4 apple varieties during their maturation, and were established optimal characteristics for natural acidifier.

2. The proposed process allows apples to be processed in the early maturation phase, previously unsolicited in the food industry, to obtain natural and concentrated apple acidifier.

References:

1. Mere. Pentru că gustul face diferența. Prezentare generală referitor la suprafețele plantate și soiurile de mere cultivate în Republica Moldova.

www.moldovafruct.md/ro/products/1

2. **Golban Artur**, Analiza competitivității întreprinderilor agricole cu producție de mere din Republica Moldova prin prisma lanțului valoric. Universitatea Agrară de Stat din Moldova

http://dspace.uasm.md/bitstream/handle/123456789/1191/Vol_43_91-95.pdf?sequence=1&isAllowed=y

3. Producția totală de mere în Republica Moldova pe anul 2016. http://statbank.statistica.md/pxweb/pxweb/ro/40%20Statistica%20economica/40%20Statistica%20economica__16%20AGR__AGR020/AGR020200.px/table/tableViewLayout/1/?rxid=9a62a0d7-86c4-45da-b7e4-fecc26003802