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PHYSICOCHEMICAL AND FUNCTIONAL CHARACTERISTICS OF ELDERBERRY (SAMBUCUS NIGRA L.) JAMS

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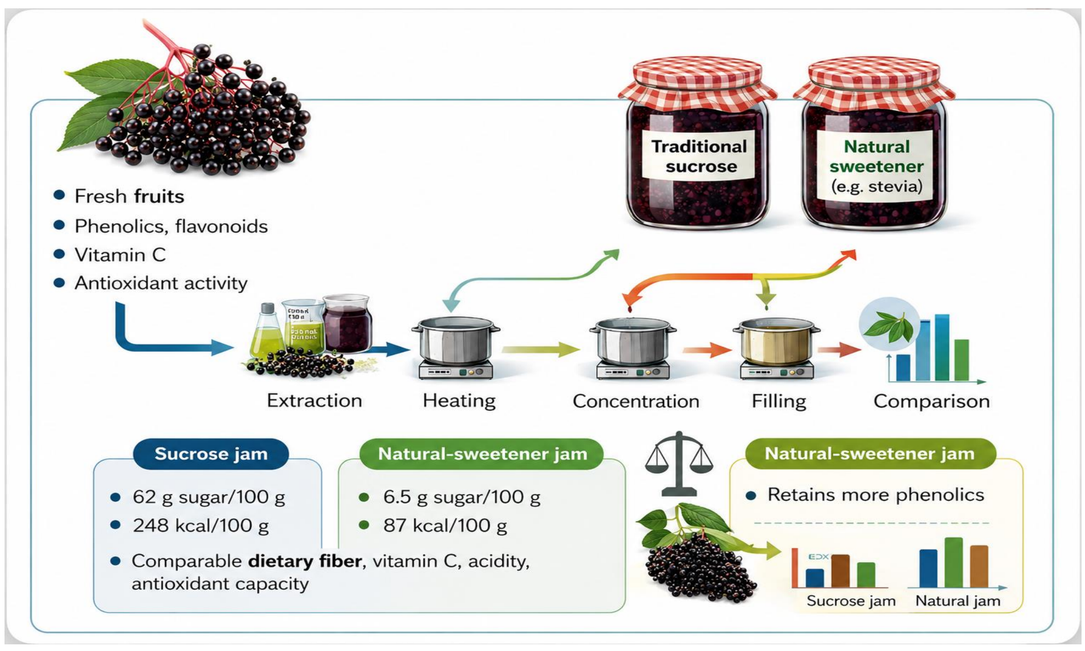
Abstract: Sambucus nigra fruits are rich in bioactive compounds such as polyphenols, flavonoids, and antioxidants, making them valuable ingredients for functional foods. This study compared the nutritional, physicochemical, and functional properties of two elderberry jam formulations: a traditional sucrose-based jam (60% w/w) and a sorbitol-sweetened alternative (60% w/w). Both products were processed by atmospheric thermal evaporation to 60±2°Brix. Analyses included total polyphenols, antioxidant activity (DPPH), color parameters, acidity, and Vitamin C retention. The sorbitol formulation showed a 35% lower energy value than the sucrose control and preserved 85% of the fresh fruit's antioxidant activity. Although Vitamin C decreased after processing in both samples, the sorbitol jam demonstrated better retention of functional compounds, stable color characteristics, and improved texture due to higher moisture. These results suggest that sorbitol can be an effective alternative sweetener for producing lower-calorie elderberry jam with enhanced functional quality.

• Introduction

Elderflower (Sambucus nigra L.) has been traditionally used across Europe for its aromatic, medicinal, and nutritional properties. The elderberries contain a rich spectrum of bioactive compounds, including phenolic acids, flavonoids such as rutin and quercetin derivatives, volatile terpenes, and essential minerals (Ağalar, H.G.,2019). These compounds contribute to the plant's well-documented antioxidant, antimicrobial, anti-inflammatory, and immunomodulatory effects. In recent years, consumer interest in natural, plant-based functional foods has increased significantly, driving innovation in the development of value-added products derived from edible flowers (Vujanović, M.; et al., 2020). Sugar preservation is a standard method for stabilising plant materials, as high solute concentrations inhibit microbial growth. While sucrose is the traditional sweetening agent, sorbitol—a polyol with a low glycemic index and humectant properties—offers a functional alternative for reducing caloric content while maintaining product stability.

• Material and method

The jam samples were obtained in the Laboratory of Food Preservation, and the analyses were carried out in the Laboratory of Meat Technology, Faculty of Food Engineering.



• Results and discussions

Parameter	Fresh Elderberries	Sucrose Jam	Natural-Sweetener Jam
Yield (%)	—	38.45%	33.72%
Energy value (kcal/100 g)	~73 kcal	260 kcal	92 kcal
Carbohydrates (g/100 g)	14.2 g	66 g	16.8 g
Sugars (g/100 g)	9.6 g	64 g	7.2 g
Vitamin C (mg/100 g)	36.5 mg	7.6 mg	8.2 mg
Total acidity (% citric acid)	0.42%	0.58%	0.49%
pH	4.10	3.45	3.62

Parameter	Fresh Elderberries	Sucrose Jam	Natural-Sweetener Jam
Total phenolic content	320 mg GAE /100 g	145 mg GAE /100 g	172 mg GAE /100 g
Antioxidant activity (DPPH)	89% inhibition	48% inhibition	58% inhibition
Color parameters (L*, a*, b*)	L*: 28, a*: 12, b*: 4	L*: 32, a*: 14, b*: 6	L*: 34, a*: 13, b*: 5

• Conclusions

The results demonstrate that natural-sweetener elderberry jam represents a promising alternative to traditional sucrose jam, offering significantly lower energy and sugar content while maintaining valuable functional properties. Although thermal processing reduced Vitamin C and antioxidant compounds in both formulations, the natural-sweetener jam preserved higher levels of phenolics, flavonoids, and antioxidant activity compared to the sucrose control. Furthermore, both jam variants retained acceptable physicochemical characteristics, including acidity and color stability. These findings support the potential use of alternative sweeteners for developing healthier elderberry-based functional products with improved nutritional quality.