THE USE OF O/W NANOEMULSIONS FOR THE PRODUCTION OF FUNCTIONAL FRUIT JELLIES WITH MODULATED BIOACCESSIBILITY

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Emulsions are a colloidal system composed of two immiscible liquids. The type of emulsion is determined by the size of its droplets and its stability and can be categorized as macroemulsions, microemulsions, and nanoemulsions. A nanoemulsion is a heterogeneous molecular system in which one liquid is dispersed within another, with droplet sizes ranging from 20 to 500 nm. This parameter significantly affects the stability, rheological properties, and controlled release of encapsulated substances, thereby improving their bioavailability. Emulsions enable the combination of polar and nonpolar materials, modify texture, taste, and odor, and enhance the delivery of active substances in treatments. This highlights their broad application potential across multiple sectors, including food industry.

Therefore, the aim of this study was to develop functional fruit jellies based on oil-in-water (o/w) nanoemulsions. It was assumed that this process would allow for the creation of a product with a complex matrix of bioactive hydrophilic and hydrophobic compounds with increased bioavailability, as well as designed health-promoting properties and an attractive sensory profile.

The research material consisted of functional jellies prepared using emulsions with the addition of selected thickeners: gelatin or a mixture of pectin and guar gum. The emulsion was formulated from a mixture of apple and chokeberry juices, hazelnut oil, and whey protein.
The developed fruit jellies were shown to have an attractive polyphenolic profile, dominated by polymeric proanthocyanidins and monomeric flavan-3-ols. The presence of tocopherols, zeaxanthin, and β-carotene, derived from hazelnut oil, was also confirmed. Emulsification prior to gelation enhanced the protection of compounds in the initial sections of the digestive system — the oral cavity and stomach — indicating improved preservation of bioactive compounds during simulated digestion. The resulting complexes also exhibited high antioxidant activity (>2 mmol Trolox/100 g of product) and anti-inflammatory activity (IC50 < 0.40 mg/mL).

In conclusion, the use of emulsions in jelly production presents a promising approach to designing innovative products with functional properties.

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"Nanoemulsions as a way of modulating health-promoting properties and bioavailability of bioactive compounds isolated from different plant matrices"
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