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## **Self-Assembled Pectin-based Nano/Microcapsules in Fruit Pastilles: A Strategy for Clean-Label Nutraceuticals with Improved Stability and Bioactivity**

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The growing demand for "clean label" functional foods necessitates the development of products that not only promote health but also possess high sensory quality. Fruit-based products provide an excellent matrix for enrichment with bioactive ingredients, appealing to a broad range of consumers. The aim of this study was to develop an innovative, simple, and eco-friendly technology for producing fully natural, health-promoting fruit pastilles containing nano/microcapsules with bioactive ingredients (propolis, sea buckthorn oil). A novel encapsulation and production method was established, consisting of: (a) mechanical homogenization of fruit pulp (plums, apples) to release and disperse endogenous pectin; (b) formation of a nanoemulsion of bioactive ingredients using ultrasonic homogenization; (c) combining both fractions via ultrasound treatment, inducing the self-assembly of pectin into shells encapsulating the nanoemulsion droplets; and (d) forming and drying the final product. This technique yielded stable nano/microcapsules with a diameter of 0.1–5 µm and a pectin shell thickness of 5–100 nm, fully integrated within the fruit matrix. Electron microscopy confirmed the proper morphology of the capsules. The capsule-enriched products exhibited more favorable textural properties (reduced hardness) compared to control samples. A key achievement was significantly improved stability; after 6 months of storage, the product retained its organoleptic properties, whereas non-encapsulated samples underwent degradation (oil rancidity). Furthermore, the products demonstrated significant local antibacterial activity against upper respiratory tract pathogens, such as *Staphylococcus aureus*, confirmed by distinct growth inhibition zones. The obtained products can serve as natural nutraceuticals with extended shelf life and potential supportive effects in throat infections, setting a new direction in the design of clean-label, smart foods and dietary supplements.