

## WATER-IN-OIL HIGH INTERNAL PHASE EMULSIONS STABILIZED BY SUNFLOWER WAX AND PGPR

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High internal phase water-in-oil emulsions (W/O HIPEs) are two-phase systems that contain at least 74 % (w/w) of water droplets dispersed in an oil-based surrounding medium. Such emulsions exhibit outstanding solid-like rheological behavior, which makes them suitable to be applied as low-calorie fat replacers. HIPEs are currently stabilized by semi(synthetic) surfactants (mainly PGPR) due to the presence of a high-water content, and their replacement by food-grade emulsifiers is still a challenge. In view of this, this study aimed to identify natural ingredients to partially replace PGPR in W/O HIPEs formulation. For this, we used two different sunflower waxes that are mainly composed of fatty acids and fatty alcohols. The difference between conventional (SW) and hydrolyzed (HSW) sunflower wax is that the former shows a longer chain and is more hydrophobic than the latter. Using a conventional dripping process, W/O HIPEs containing 80% of dispersed phase were produced regardless of the wax concentration (0 - 2%, w/w) and using a fixed concentration of PGPR (0.5%, w/w). Our results showed that increasing wax concentration reduced the droplet sizes of fresh W/O HIPEs (~ 44 and ~74%, corresponding to the same SW and HSW content), resulting in better kinetic stability both at 5 °C and 25 °C for 60 days. The increased stability was even more pronounced for emulsions with SW, which can be associated with the higher hydrophobicity promoted by long and saturated fatty acid chains (C26-C32). Furthermore, the storage modulus ( $G'$ ), obtained from oscillatory rheology, overcame the loss modulus ( $G''$ ) when waxes were added into the formulation. This indicates the presence of a more elastic crystalline structure, which was also corroborated by polarized light microscopy. Therefore, our study indicates that SW can improve the rheological properties and, consequently, the stability of W/O HIPEs, allowing the development of a colloidal system containing natural ingredients with high structuring properties. In addition, our study makes it possible to understand the functionality of waxes as W/O HIPEs stabilizers that can be excellent fat replacers, contributing to the texture and sensory properties of food products.

Keywords: Sunflower waxes, food emulsions, W/O HIPEs, fat replacer and stability.