

Bridging Lubrication and Sensory Perception in Plant-based Beverages

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Plant proteins are increasingly used in foods and plant-based beverages. However, these products often exhibit undesirable sensory characteristics, such as dryness, astringency, and bitterness, which limit their acceptance. It is well recognised that texture attributes such as smoothness, creaminess and fattiness are not solely determined by rheological properties, but are also strongly influenced by lubrication behaviour. Despite the growing interest in this area, there is still limited understanding of the contribution of individual ingredients and the combined effects of multiple components on lubrication properties of complex foods, as well as how specific lubrication profiles relate to sensory perception. Therefore, this study investigated the lubrication behaviour of model plant protein-based beverages containing protein aggregates, oil droplets and polysaccharides, aiming to clarify the mentioned issues. The effects of oil droplet concentration, aggregate size and polysaccharide type were examined. Increasing oil content effectively reduced friction, and a synergistic lubrication effect was observed when large protein aggregates were mixed with oil droplets. However, this effect disappeared after the reduction of the aggregate size by homogenisation. In contrast, adding polysaccharides at equal viscosity did not significantly change friction, indicating that the observed synergy was not viscosity driven but related to the specific contribution of protein aggregates. Sensory evaluation revealed that smaller aggregates led to a reduction in grittiness, higher oil content enhanced creaminess, and polysaccharides mainly increased perceived thickness and creaminess. A correlation analysis showed that viscosity was associated with thickness, creaminess and dryness, while friction in the mixed regime (10 mm/s) correlated with perceived creaminess. Overall, this study elucidates how various components within multi-component food systems influence sensory perception and how tribological behaviour is linked to sensory quality in plant protein-based beverages.

Keywords:

Lubrication; Plant protein aggregates; Oil droplet; Polysaccharide type; Sensory properties

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