Influence of phospholipids and a novel vegetable oil blend on the formation and quality of faba protein-stabilized plant-based whipped cream

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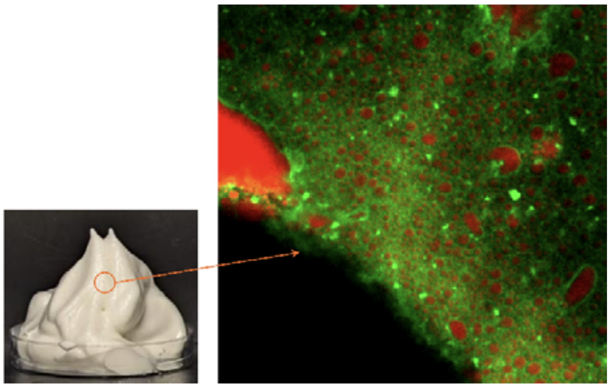
This study aims to evaluate the effects of two types of phospholipids and an experimentally developed novel healthy vegetable oil blend on the properties of faba bean protein-stabilized plant-based whipped cream without relying on any gums. Interfacial protein displacement by the phospholipids in a 30 wt% oil-in-water (O/W) emulsion showed that only the phosphatidylinositol (PI)-rich phospholipid could displace proteins from the oil droplet interface, while the phosphatidylcholine (PC)-rich phospholipid had no effect [1]. The presence of PI facilitated a kinetically favourable reduction in interfacial tension. Protein alone did not influence the fat crystal contact angle in the aqueous phase, which was significantly reduced by PI. The contact angle range indicated that fat crystals were preferentially wetted by liquid oil.

Oil-in-water cream emulsions were prepared with a 30 wt% oil blend containing PI and a 70 wt% aqueous phase with faba bean proteins using a high-pressure homogenizer. After storing for one week in a refrigerator (4°C), the emulsions were whipped using an automatic whipping machine, and the stability, rheology, overrun, and stabilization mechanisms of the plant-based whipped cream were examined. As a control, a dairy whipped cream made from 35% fat-based cream was used. The proportions of crystallized fat in emulsions prepared with the oil blend at 4°C were favourable for partial coalescence, achieving the desired crystallization and melting points [2]. The plant-based whipped cream with PI achieved a peak overrun twice that of the dairy cream, with less serum loss; however, it took longer to reach this peak than the dairy cream. At peak overrun, it showed viscoelastic strength comparable to that of dairy whipped cream. Confocal microscopy confirmed that fat crystal-induced partial coalescence and protein-induced bridging flocculation caused droplet aggregates to form a network, stabilizing air bubbles and creating a stable 3D structure of plant-based whipped cream. This study demonstrates that plant-based cream emulsions can be just as functional as their dairy counterparts without requiring the addition of food gums, thickeners, or synthetic emulsifiers.

Keywords:
pulse protein, cream emulsion, fat crystallization, interfacial tension, contact angle, solid fat content



Visual observation and microstructure of faba protein-stabilized plant-based whipped cream

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