**The effect of sugar on the formation and stability of emulsion-based confectionery filling formulations**

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Many food products communicate (through packaging and advertising) a certain sensorial/textural promise to the consumer; this is that they provide an eating experience that closely resembles that of freshly made foods (fruits, dairy products, desserts etc.). Confectionery products, in a similar manner, aim to deliver the best consuming experience through convenient formats that can be readily available and have relatively long shelf-life at ambient conditions. The compositional requirements that are in place to ensure the high quality of the product until the moment of consumption pose challenges that often hinder these products from delivering on their ‘promise’ from a flavour and texture point of view. Emulsion technology can enable the creation of novel types of confectionery products with unique textural characteristics. As such, there is interest in studying emulsion properties under sugar concentrations that are relevant to those products. Current research has been done by Ueda and Matsumoto (1991), Kulmyrzaev, Bryant, and McClements (2000) focusing on the physiochemical property of emulsion with the addition of sugar, but mostly in low sugar content environment. Nevertheless, not much research has been focused on the interfacial behaviour and stability, especially within an environment of high sugar concentration. Due to the complexity of these systems, traditional emulsion-based confectionery/desserts products are faced with significant stability challenges over their shelf-life period. Crucial to this, is the role of emulsifiers used within the emulsion architecture. However, in response to shifting consumer needs in terms of dietary requirements, lifestyle and sustainability, there is growing research effort into investigating the use of plant-based ingredients/material in everyday foods. Such consumer trends raise the need to also study the behaviour of plant-based emulsifiers in emulsion-based foods, including confectionery formulations. Despite this though, research comparing commonly used emulsifiers (for example milk proteins) to plant proteins, particularly within a high sugar content environment, is currently absent. The present study aims to investigate the interfacial behaviour of different types of emulsifiers, ranging from low molecular weight surfactants and proteins, typically used in the food industry, to plant derived proteins, in the presence of sugar. The performance of the chosen emulsifiers are compared, under various sugar concentrations, in terms of the oil/water interfacial tension reduction that they provide, the emulsion microstructure that they facilitate forming (emulsion droplet size and polydispersity), and its stability and rheological behaviour. In terms of interfacial behaviour, both emulsifier type and sugar concentration were found to contribute to the oil/water interfacial tension reduction, which was then also shown to be crucial in the emulsification process. The role of sugar was investigated both on its impact on the interfacial dynamics but also on its effect to bulk viscosity and rheology. Overall, this work shows promising results that clearly indicate that plant-based emulsifiers can be successfully incorporated into confectionery formulations.

Kulmyrzaev, A., Bryant, C., & McClements, D. J. (2000). Influence of sucrose on the thermal denaturation, gelation, and emulsion stabilization of whey proteins. *J Agric Food Chem, 48*(5), 1593-1597. doi:10.1021/jf9911949

Ueda, K., & Matsumoto, S. (1991). Effect of sugars on the physicochemical properties of W/O/W emulsions. *Journal of Colloid and Interface Science, 147*(2), 333-340. doi:<https://doi.org/10.1016/0021-9797(91)90165-5>