**Type of protein and pectin affect formation and functionality of plant-based Maillard conjugates**

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Plant proteins are limited in their use as emulsifiers due to their low solubility and functionality, especially at their isoelectric point. Maillard reaction-based conjugation with polysaccharides is a strategy to improve their ability to stabilise emulsions. Conjugate formation occurs in the initial stage of the Maillard reaction. Advanced Maillard reaction stages and associated undesirable degradation reactions should be avoided. Usually, conjugate production consists of freeze-drying as a pre-treatment followed by long-term incubation under a controlled atmosphere. This process is time and energy-consuming and thus economically unviable. As an alternative, vacuum drying was recently introduced as a continuous process on an industrial scale1, combining the drying process and conjugate formation. The latter depends on the choice of protein and polysaccharide as well as on the choice of process conditions, such as temperature or time.

The aim of the present study was to qualitatively describe the conjugation reaction by vacuum drying under variation of (a) the process conditions (time and temperature), (b) the origin of plant protein (potato, soy, pea, rapeseed) and (c) the type of pectin (low methoxylated, high methoxylated, amidated). Target parameters for conjugate formation were a decrease in free amino groups, low colouration, structure (determined by FT-IR) and an increase in molecular weight (determined by SDS and PAS-PAGE). The functionality of the conjugates was examined as solubility and emulsion stability (derived from the oil droplet size) at the isoelectric point of the respective proteins.

The most promising process parameters for conjugation of plant proteins with pectin by vacuum drying were 3 h at 100°C. Under these conditions, all conjugate samples showed a strong decrease in free amino groups, low browning, wide molecular weight distribution with a prominent high molecular weight fraction and improved functionality. In particular, soy protein conjugate samples showed the highest decrease in free amino groups. The conjugation yield could be further increased with an increasing degree of methoxylation or the presence of amide groups. Especially the utilisation of amidated pectin led to emulsions with the narrowest oil droplet size distribution and lowest oil droplet size.

For a better understanding of the underlying mechanisms for emulsion stabilisation, future research will focus on the interfacial properties of the conjugates as determined by interfacial shear rheology and pendant drop analysis. Additionally, the wide molecular weight distribution should be investigated with regard to elucidating possible side reactions such as pectin degradation.

*References:*

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