Influence of ferulic acid and intermolecular cross-linking on the emulsifying properties of sugar beet pectin

B. Bindereif, H. P. Karbstein, U. S. van der Schaaf

*Karlsruhe Institute of Technology, Institute of Process Engineering in Life Sciences – Chair of Food Process Engineering, Gotthard-Franz-Str. 3, Building 50.31, 76131 Karlsruhe*

Over the last decade, consumer demand for natural food products without synthetic ingredients has been constantly increasing. In beverages, gum arabic is widely used for encapsulation of flavour oils and for emulsification. However, due to fluctuations in supply and price of gum arabic in the international market, food industry is looking for alternatives. A possible substitute for gum arabic is pectin. Pectins are natural biopolymers and widely used as gelling, thickening and stabilizing agents.
It is already known that emulsifying properties are influenced by the accessibility of protein and ferulic acid to the surface of the oil droplets, proportion of ester groups and molecular mass distribution of the fractions. When comparing the molecular structures of commercially available pectins, differences depending on the origin of pectins are obvious. In contrast, sugar beet pectin (SBP) contains higher amounts of protein and ferulic acid and has less molecular mass than other pectin types. Therefore, sugar beet pectin combines both emulsifying and stabilizing properties and is used to improve the physical stability of oil-in-water emulsions. It was reported that emulsions stabilized with SBP showed similar or even higher stability as compared to emulsions stabilized with gum arabic.

In this study, the influence of ferulic acid groups on the emulsifying properties of SBP was investigated. For this purpose, we compare emulsions stabilized by SBP with and without enzymatic hydrolyzes of ferulic acids.
In addition, it is possible to enhance the interfacial elasticity of emulsions by conjugation of biopolymers. Due to the hindered deformability of elastic interfaces, droplets show improved resistance to droplet coalescence. Laccase, a phenol oxidase, catalyzes intermolecular cross-links via ferulic acid groups of SBP. We will also show results on long-term stability of emulsions stabilized by laccase mediated conjugation of SBP at the oil/water interface.