

Effects of the Proteinaceous Moiety on the Emulsifying Properties of Sugar Beet Pectin

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Summary

The role of the proteinaceous moiety in emulsifying was investigated using pectin from sugar beet. Physicochemical and macromolecular characteristics of sugar beet pectin were examined with or without an enzymatic modification using multiple acid-proteases. The enzymatic modification decreased the total protein content from 1.56 ± 0.15 % to 0.13 ± 0.02 % by the Bradford method without significant change in ferulic acid or most constitutional sugars. It also decreased the weight-average molecular weight from 517 ± 28 to 254 ± 20 kg/mol and the z-average root-mean-square radius of gyration from 43.6 ± 0.8 to 35.0 ± 0.6 nm. Emulsifying properties of the polysaccharide with or without the enzymatic modification were evaluated by droplet size distribution and creaming stability of O/W emulsions (pH 3.0) containing 15 w/w% middle-chain triglyceride and 1.5 w/w% sugar beet pectin as main constituents. The modification increased the average diameter of oil droplets from 0.56 ± 0.04 to 3.00 ± 0.25 μm immediately after the preparation, suggesting a decrease in the emulsifying activity. It caused the creaming of the emulsions during incubation at 60°C , which was in line with the finding that macroscopic phase separation occurred only in the presence of the modified pectin after storage at 20°C for a day, suggesting a decrease in the emulsion stabilizing ability. The modification also decreased significantly the amount of the pectin fraction that absorbed onto the surface of oil droplets from 14.58 ± 2.21 % to 1.22 ± 0.03 % and the interfacial concentration of the polysaccharide from 1.42 ± 0.23 to 0.45 ± 0.05 mg/m², where the proteinaceous materials in the pectin molecules activated the oil-water interface. Results from the present study suggest an important role of the proteinaceous moiety to explain the emulsifying properties of sugar beet pectin as in the case of gum arabic and soy bean soluble polysaccharide.