Effect of Salts on the Emulsifying Properties of Diacylglycerol

Kyoko Ohashi
Department of Food Science and Nutrition, Facutly of Life Science, Showa Women's University

Summary

Introduction Sodium chloride (NaCl) is an essential compound for producing a salty taste, and is a major ingredient in seasonings that are used for giving a salty taste. Various kinds of salt incorporating other salts are now commercially available.

The aim of this study is to clarify the effects of various types of salt on emulsions prepared with diacylglycerol (DAG) for comparison with triacylglycerol (TAG) in two systems: 1) a water-in-oil emulsion system without an emulsifier, and 2) a simulated-mayonnaise oil-in-water emulsion system.

Materials and Methods DAG and TAG samples with the same fatty acid composition were used. In system 1), 0, 0.025, 0.05, 0.1, 0.25 and 0.5 M aqueous solutions of NaCl, KCl, $CaCl_2$ or $MgCl_2$ were used as the aqueous phase. The same volume of oil and each salt solution was homogenized. Each emulsion was heated at 70℃ and the change with time in the volume of the emulsified layer was measured. In system 2), the same salts as those used with system 1) and several kinds of commercially available salt products were used. Simulated mayonnaise samples were prepared with oil, egg yolk and a 3.5% acetic acid aqueous solution containing each salt sample at concentrations of 0, 1.65 and 3.30%. The flow behavior and oil-particle-size distribution of the two emulsion systems were respectively measured with a cone-and-plate viscometer and image analyzer attached to a microscope (system 1) and by a fine-particle counter (system 2).

Results and Discussion System 1) The emulsions prepared with TAG separated into an oil layer and aqueous layer just after preparation, while those prepared with DAG were stable during storage. Each of the salts increased the stability and viscosity of the emulsions prepared with DAG. This effect increased with increasing concentration of all of the types of salt tested, and was stronger for the salts having a divalent cation than for those having a monovalent cation. However, the particle-size distribution of the emulsions was similar, regardless of the type of salt or its concentration. System 2) The addition of salt increased the viscosity of all the emulsion samples prepared, while it decreased the mean oil-droplet size in these emulsions. These effects were stronger for the salts having a divalent cation than for those having a monovalent cation. Although the highest concentration of salt was more effective for the TAG emulsions, the DAG emulsion samples containing the highest concentration of $CaCl_2$ showed unusual flow behavior and were slightly unstable.

Conclusion The effect of salt on the emulsifying properties of DAG varied according to the type and/or concentration of the salt, and on the system in which DAG was incorporated.