

## Colour Formation and Maillard Reactions in Spray-Dried Milk Powders

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**Abstract :** Spray drying is the final stage of milk powder production. Traditionally, the quality of spray-dried milk powders has mainly been assessed using their physical properties, such as their moisture contents, while chemical changes occurring during the spray drying process have often been ignored. With growing concerns about food quality, it is necessary to establish a better understanding of heat-induced degradation due to the spray-drying process of skim milk. In this study, the extent of thermal degradation for skim milk in a pilot-scale spray dryer has been investigated using different inlet gas temperatures. The extent of heat-induced damage has been measured by the formation of advanced Maillard reaction products and the loss of soluble proteins at pH 4.6 as assessed by a fluorometric method. A significant increase in the extent of thermal degradation has been found when the inlet gas temperature increased from 170°C to 190°C, suggesting protein unfolding may play an important role in the kinetics of heat-induced degradation for milk in spray dryers. Colour changes of the spray-dried skim milk powders have also been analysed using a standard lighting box. Colourimetric analysis results were expressed in CIELAB colour space with the use of the E index (E) and the Chroma (C) for measuring the difference between colours and the intensity of the colours. A strong linear correlation between the colour intensity of the spray-dried skim milk powders and the formation of advanced Maillard reaction products has been observed.

**Keywords :** colour formation, Maillard reactions, spray drying, skim milk powder

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