The microstructure of protein networks in yogurts defines important physical properties of the yogurt and hereby partly its quality. Imaging this protein network using confocal scanning laser microscopy (CSLM) has shown good results, and CSLM has become a standard measuring technique for fermented dairy products. When studying such networks, hundreds of images can be obtained, and here image analysis methods are essential for using the images in statistical analysis. Previously, methods including gray level co-occurrence matrix analysis and fractal analysis have been used with success. However, a range of other image texture characterization methods exists. These methods describe an image by a frequency distribution of predefined image features (denoted textons). Our contribution is an investigation of the choice of image analysis methods by performing a comparative study of 7 major approaches to image texture description. Here, CSLM images from a yogurt fermentation study are investigated, where production factors including fat content, protein content, heat treatment, and incubation temperature are varied. The descriptors are evaluated through nearest neighbor classification, variance analysis, and cluster analysis. Our investigation suggests that the texton-based descriptors provide a fuller description of the images compared to gray-level co-occurrence matrix descriptors and fractal analysis, while still being as applicable and in some cases as easy to tune.

Practical Application
Confocal laser scanning microscopy images can be used to provide information on the protein microstructure in yogurt products. For large numbers of microscopy images, subjective evaluation becomes a difficult or even impossible approach, if the images should be incorporated in any form of statistical analysis alongside other measuring modalities or sensory data. Instead, automated image texture analysis can be used to provide objective descriptions of the images, and we provide a comparative study for a broad range of the many image texture analysis available. All of the investigated techniques should be applicable for any type of pseudo homogenous image structures.

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