

THE USE OF MULTIVARIATE DISPLAY TECHNIQUES FOR THE IDENTIFICATION OF ANIMAL FAT SPECIES ON THE BASIS OF THEIR FATTY ACID COMPOSITION

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INTRODUCTION

Many studies in analytical food chemistry are concerned with the identification of the origin of samples of a particular food category and thus with the ability of discriminating between different origin-specific classes (1, 2, 3, 4, 5). In a first step, the characterization of different possible classes usually consists of the selection of parameters that are assumed to have some discriminating power. To this end, qualitative organoleptic parameters (taste, color...) or quantitative chemical parameters (the concentration of particular chemical elements, organic or inorganic compounds...) might be determined. The most classic approach is then to consider and evaluate only one or two of these parameters at a time (i.e. uni- or bivariate approach) and to verify whether the different classes can be distinguished from each other on the basis of each of the selected parameters (for instance, on the basis of the difference in mean value for a particular parameter or the difference in proportion for two parameters, etc...). However, it is often found that one or two parameters are not sufficient to discriminate between the different possible classes. Therefore, it is often advisable to approach the problem of class-distinction and class-characterization from a multivariate point of view, that is, considering all parameters at the same time in only one statistical analysis. The advantage of such a multivariate approach is that the information concerning the specificity of each of the different parameters towards the different classes is represented in a more compact manner, and that, moreover, supplementary information might be obtained since multivariate analysis also reveals the inter-relationships between the different parameters or variables.

The application of multivariate statistical methods in food analysis has already proven to be useful, for example

in the determination of the geographical origin of olive oils (3, 4) and wines (5). This article describes the application of two different but related multivariate display techniques in the identification of the origin of animal fat samples characterized by their fatty acid composition. The purpose of the article is two-fold. By extensively describing the display results obtained, it tries to illustrate the applicability of multivariate display methods in identification problems and, secondly, it tries to describe and evaluate the differences in results obtained with the two different methods.

DATA

The analysis is based on data that describe the fatty acid pattern in four different animal groups. Earlier studies already showed that the fatty acid pattern is to some extent species specific (2). The fatty acids might therefore be suitable parameters for discriminating between different animal species.

The data tables tabulate the percentages of seven different fatty acids in the total triglycerides (table 1) and the 2-monoglycerides (i.e. incorporated in the 2-position of glycerol) (table 2) of respectively 20 hen samples, 14 horse samples, 15 beef samples and 21 pork samples. The seven fatty acids that were determined are myristic acid (C14:0), palmitic acid (C16:0), palmitoleic acid (C16:1), stearic acid (C18:0), oleic acid (C18:1), linoleic acid (C18:2) and linolenic acid (C18:3). In what follows we will refer to the percentage in total triglycerides as the t-variant of the fatty acid and the percentage in the 2-position as the m-variant of the fatty acid. The procedure for the quantitative analysis of these fatty acids in the animal samples is fully described in references 2 and 6.