BEEF MEAT TRACEABILITY. CAN NIRS COULD HELP?

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The quality of meat is highly variable in many properties. This variability originates from both animal production and meat processing. At the pre-slaughter stage, animal factors such as breed, sex, age contribute to this variability. Environmental factors include feeding, rearing, transport and conditions just before slaughter (Hildrum et al., 1995). Meat can be presented in a variety of forms, each offering different opportunities for adulteration and contamination. This has imposed great pressure on the food manufacturing industry to guarantee the safety of meat. Tissue and muscle speciation of flesh foods, as well as speciation of animal derived by-products fed to all classes of domestic animals, are now perhaps the most important uncertainty which the food industry must resolve to allay consumer concern. Recently, there is a demand for rapid and low cost methods of direct quality measurements in both food and food ingredients (including high performance liquid chromatography (HPLC), thin layer chromatography (TLC), enzymatic and inmunological tests (e.g. ELISA test) and physical tests) to establish their authenticity and hence guarantee the quality of products manufactured for consumers (Holland et al., 1998). The use of Near Infrared Reflectance Spectroscopy (NIRS) for the rapid, precise and non-destructive analysis of a wide range of organic materials has been comprehensively documented (Osborne et al., 1993). Most of the established methods have involved the development of NIRS calibrations for the quantitative prediction of composition in meat (Ben-Gera and Norris, 1968; Lanza, 1983; Clark and Short, 1994). This was a rational strategy to pursue during the initial stages of its application, given the type of equipment available, the state of development of the emerging discipline of chemometrics and the overwhelming commercial interest in solving such problems (Downey, 1994). One of the advantages of NIRS technology is not only to assess chemical structures through the analysis of the molecular bonds in the near infrared spectrum, but also to build an optical model characteristic of the sample which behaves like the "finger print" of the sample. This opens the possibility of using spectra to determine complex attributes of organic structures, which are related to molecular chromophores, organoleptic scores and sensory characteristics (Hildrum et al., 1994, 1995; Park et al., 1998). In addition, the application of statistical packages like principal component or discriminant analysis provides the possibility to understand the optical properties of the sample and make a classification without the chemical information. The objectives of this present work were: (1) to examine two methods of sample presentation to the instrument (intact and minced) and (2) to explore the use of principal component analysis (PCA) and Soft Independent Modelling of Class Analogy (SIMCA) to classify muscles by quality attributes. Seventy-eight (n: 78) beef muscles (m. *longissimus dorsi*) from Hereford breed of cattle were used. The samples were scanned in a NIRS monochromator instrument (NIRSystems 6500, Silver Spring, MD, USA) in reflectance mode (log 1/R). Both intact and minced presentation to the instrument were explored. Qualitative analysis of optical information through PCA and SIMCA analysis showed differences in muscles resulting from two different feeding systems.