QUALITEC: Traceability, improvement and protection of agro-foods QUALIty by means of TEChnological instruments

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Introduction

QUALITEC is the acronym of an ambitious 3-year project (2009–2011) financed by the Italian Agricultural Research Council (CRA), to answer the increasing demand of consumers for safe, high quality food products. In this project 10 different Italian Research Institutions are involved whose expertise covers almost the whole agricultural sector.

The aim of this project is to develop validated analytical methods for authentication of the origin, both geographical and genetic, of agro-food products such as cereals, animal feed and dairy, grapes and wine, honey, industrial crops and meat.

The project will provide objective tools, not only for verifying the authenticity of agricultural products and defending them but also for identifying adequate systems to develop traceability methods.

Materials and methods

Different technologies and approaches will be used, ranging over genomic and metabolomics, image analysis and fast, low-cost, non-destructive methods, chromatographic and spectroscopic procedures.

DNA-based analyses will be utilised in order to find specific markers of geographical origin, and new instrumentation such as magnetic resonance imaging (MRI) or High resolution Solid state NMR (HS-MAS-NMR) will be used to analyse intact products, giving information on their structure, and on the state of their cellular tissue. In particular these techniques are suitable for analysing and checking the shelf-life of fruits and vegetable.

Metabolic profiling of cereals will allow the understanding of the influence of genotype, coupled with the agronomic techniques on the grain or on the pasta quality.

The simultaneous studies on several agro-food products analysed by different techniques could help in identifying the most suitable and cheapest tools for checking the traceability of each agro-food product.

Near InfraRed Spectroscopy will be employed mainly for dairy, feed, and meat products, as a nondestructive and fast technique for the identification of their origin.

On the basis of the particular regulation adopted in the Parmesan production area for Parmigiano Reggiano cheese production, fodder crops used for feeding cows will be studied. Actually, the Parmigiano Reggiano regulation establishes a severe feeding program for lactating cows, whose milk is collected exclusively for the production of this cheese. The feed rationing of dairy cows is based on the use of local forage.

Forages will be collected both from the Parmesan and other areas: their quality will be characterised chemically, and by applying calibrations already available in the database of Research Centre for Fodder Crops and Dairy Production. Models suitable to discriminate different forages will be made and tested. The DNA of the same samples will be analysed, with the aim of finding out genetic markers.

"Mozzarella di Bufala Campana", an Italian PDO cheese, produced by stretching the cheese curd, will also be taken into account, as a model for the dairy field. Each step of its production will be monitored, as well as its shelf life. The NIR spectra recorded will be used in comparison with the data obtained by MRI and HR-MAS-NMR.

Finally the quality of meat will be studied with NIR spectroscopy, NMR and electrophoresis mainly during the" making soft" process.

Results expected

The main objectives of the project have been identified as following:

- Evaluation of the discriminating power of NIRS to identify the characteristics of genuineness and of guaranteed origin of each agro-food product studied;
- Identification of quality markers;
- Quantitative NIR prediction in measuring some selected markers;
- Evaluation of the relationship between NIR and NMR imaging data, and/or genetic markers;
- Validation of NIR results by comparison with those obtained by Official Methods of Analysis;
- Calibration modeling for product classification.

A dedicated database, where full project results will be stored, will be an additional tool for producers, regulatory and control Institutions, and consumers associations, all of which will be able to verify the authenticity of agricultural products: this tool will be ready and available on-line at the end of the project.