SIXTH FRAMEWORK PROGRAMME

GM and non GM supply chains: Their CO-EXistence and TRAceability

Outcomes of Co-Extra

GMO sampling strategies in the food and feed chain

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The sampling plan is the procedure of taking a sample, from a lot, for analysis and is the most crucial step in the "analytical chain" whenever the analyte is not homogeneously distributed in the lot. It is imperative that the sampling step is performed as accurately as possible so that the sample collected is representative of the batch of food or feed under investigation and to get the most accurate "true value". Without the implementation of a good sampling plan, misclassification of the lot could easily occur, negatively impacting sampling objectives: undesirable economic and legal impacts in trade and inaccurate information being provided to risk assessors/managers. Accordingly, the GMO sampling should be considered with the other sampling issues faced in the domain of food and feed safety and quality.

Among the steps usually employed in the evaluation of the GMO level in a lot (sampling, sample preparation and analysis), the sampling step is the major total error contributor and is dependent on the GMO level. Due to the variance associated with each step of the GMO evaluation, a 100% level of certainty is unachievable; resulting in overestimation and underestimation with inaccurate decisions producing adverse financial or social implications.

Sampling of GMO in food and feed commodities is performed by different stakeholders with a wide spectrum of goals, all of them implying different scenarios and consequently often needing different methodologies.

Commission Recommendation 2004/787/EC of 4 October 2004 provides detailed technical guidance for sampling and detection of GMOs related to Regulation (EC) No. 1830/2003 in bulk and very little and unclear details for packed products. However, among the general principles for GMO sampling, the Recommendation states that the Member States should take into account the point in the supply chain in which testing is being performed and the degree of heterogeneity, therefore indicating that sampling can be modulated depending on the situation. In respect to traceability and internal quality control purposes operators also need an array of sampling procedure throughout the food and feed chain. The Recommendation also underlines the need to use sampling proportionate to the desired specific objectives and the possibility to use sampling strategies other than those indicated in the Recommendation. In other words, it would be appropriate to, in addition to the guidelines suggested by the Recommendation, develop further "fit for purpose" sampling strategies.

Development of sampling methods has been an important goal within the Co-Extra project. In addition, a Modular Decision Support System (DSS) has been developed for producers and official control authorities, to support decisions related to the selection of "fit for purpose" sampling methods. Co-Extra goals include: (i) development of "as simplest as possible" sampling methodologies compatible with reliable results; (ii) meeting the needs of different food and feed operators; (iii) optimization of sampling in the different steps of food and feed chain, of the associated cost and degree of accuracy. This presentation will give an overview of the developments from Co-Extra project relevant to the sampling in different scenarios (field, bulk, processing and retail).

In the Commission Recommendation 2004/787/EC sampling in the field is not specifically addressed while in certain cases of co-existence it is important to determine, before harvesting in the field, the level of adventitious presence of GMOs in a non-GMO field. In the Co-Extra context, field trials were conducted in two successive years aimed at developing a reliable sampling procedure for maize plants in the field (model for fragmented landscape with very small field sizes). Every year 3600 samples were collected to determine out-crossing rate in the field, using data mining techniques. Based on the predictions of spatial variability of out-crossing rate, various possible sampling procedures were tested using the statistical Programme R and different sampling schemes were then developed and validated.

As for the food processing chain there are three types of material which may need to be analyzed for the presence of GMOs: raw materials, primary ingredients and final food products. The soybean processing chain (from grain to lecithin) has been chosen as "case study" with respect to its use in a wide range of foodstuff ingredients and additives. The study also provided a simple framework to assist in the decision making to allocate resources (broadly "sampling" and, "analysis" costs) and to balance the cost of control versus the risk associated with incorrect decisions based on test results. Applying control plans that have been optimised for efficiency between sampling and analysis for the soya bean scenario, fitness for purpose parameters can be attained more easily when sampling for soybean flour is undertaken.

Due to labelling requirements, packaged products are expected to be one of the main targets for control bodies. The problem is multi-faceted depending on many factors including particle type and size of different products. Experimental studies on GM soybean packed products were performed and data were processed via distribution-free statistical procedures supplied by software SISSI (Shortcut In Sample Size), to estimate sampling errors associated with number of incremental samples.

Dedicated software tools to support sampling and sub-sampling plans aimed at GM detection through the food and feed chain were also developed: SISSI a novel approach to estimate the optimal sample size in experimental data collection and OPACSA (OPtimal ACceptance Sampling by Attributes) a new statistical optimisation software including a cost function to find the cheapest and most reliable mode of analysis by sub-sampling.

Finally, consideration of general control plans should be undertaken where several analytes could be sampled, with low-cost sampling methodologies. In this regard, an ongoing experimental study for validating sampling methodologies for mycotoxins (Reg. 401/2006 and following) fit for purpose for GMOs is in progress. The aim of this study if to verify if the current sampling methodologies for mycotoxins (the more heterogeneously distributed analyte in a lot) could fulfill the requisite of a representative sampling also for GMOs and derived products. Initial results of this study are presented.

Commission Recommendation of 4 October 2004 on technical guidance for sampling and detection of genetically modified organisms and materials produced from genetically modified organisms as or in products in the context of Regulation (EC) No 1830/2003. (2004). Official Journal of the European Union L348:18-26.

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