GMOseek: Development of screening methods for GMOs

Area of research interest: Novel and non-traditional foods, additives and processes
Study duration: 2009-06-01
Project code: FS231070 (G03032)
Conducted by: National Institute of Biology, Slovenia
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Background

The FSA is the competent authority for the Genetically Modified (GM) Food and Feed Regulation (EC) 1829/2003 which lays down labelling requirements for genetically modified organisms (GMOs) and products containing GM material. This stipulates that any food or feed product containing a GM ingredient must declare this on the label. Currently, EU laboratories face difficult challenges in the detection of GMOs in food and feed. This is partly due to the ever increasing number and complexity of authorised GM events, but also to the increasing problem of unauthorised GMOs, for which EU validated methods of detection do not exist.

To determine whether the labelling regulations are working in practice it is necessary for robust GMO detection methods for foods to be available. The GMOseek project is primarily aimed at providing improved screening methods and strategies for the analysis and detection of GMOs including unauthorised events.

The GMOseek project is co-funded by the German organisation BVL. The research will be undertaken by a consortium of six European laboratories, with the National Institute of Biology, Slovenia, as the consortium leader.

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Research Approach

The central aim of the project was to develop a new bioinformatics tool (named GMOseek) to help enforcement laboratories to design a more efficient screening strategy for the detection of authorised and also unauthorised GMOs in parallel. The bioinformatics system consisted of (1) a software tool that generates a matrix information database (2) a mathematical algorithm that selects from the matrix an optimal set of genetic elements that need to be targeted for the detection of GMOs.

The second objective of this project was to develop new polymerase chain reaction (PCR) screening methods, which target the new genetic elements being incorporated into next-generation GMOs. DNA-based PCR amplification techniques were developed first as singleplex PCRs for single event detection. Subsequently, multiplex methods were devised for the simultaneous detection of several screening targets, in order to significantly decrease the overall number of PCR reactions needed. In addition, NASBA (Nucleic Acid Sequence Based

Amplification) Implemented Microarray Analysis (NAIMA), which is an alternative DNA-based amplification technology to PCR, was developed further in combination with microarray detection to aid the multiplex screening of GMOs.

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Results

It is recommended to set-up a website in which the GMOmatrix and the GMOseek algorithm, optimised for web interface, would be freely and constantly available to all potential users. The starting Dutch-German EUGINIUS project will generate tables similar to the GMOmatrix; this matrix adapted to the GMOseek algorithm should ensure longer term availability of the bio-informatics part of the GMOseek project. This matrix approach and its associated bio-informatics tools could also be adapted to other PCR-based analyses where screening methods are needed.

Finally, nine novel qPCR assays developed in this project have been in-house validated and one assay is close to in-house validation completion. Before these qPCR methods can be applied for routine GMO detection in enforcement laboratories, it is recommended that further experimental verification is performed to add confidence to the observed satisfactory results. Then, the methods may be tested in a small-scale group before entering a large-scale validation, or“inter-laboratory trial”, that would provide evidence of their fitness-for-purpose for GMO detection. The validated methods will then be made available to all enforcement laboratories, worldwide, to improve the experimental screening phase of GMO testing.

Research report
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