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Case study :

Seed testing of GMOs (Food crops)

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A plant, such as cotton or soyabean, is considered genetically modified when genetic material from outside of that organism is inserted into DNA sequence. Plants grown from seed harvested from genetically modified plants will also contain the genetic modification. To date, the most common genetic modifications in crops confer an herbicide or an insecticide resistance to the plant. This resistance is achieved through production of a novel protein encoded by the inserted DNA sequence. Detection methods for genetically modified organisms (GMOs) are necessary for many applications, from seed purity assessment to compliance of food labeling in several countries. Numerous analytical methods are currently used or under development to support these needs. The currently used methods are bioassays and protein- and DNA-based detection protocols. The most frequently used approach in the field of genetically modified organism (GMO) quantification in food or feed samples is based on the 5'-3'-exonuclease activity of Taq DNA polymerase on specific degradation probes. To avoid discrepancy of results between such largely different methods and, for instance, the potential resulting legal actions, compatibility of the methods is urgently needed. Performance criteria of methods allow evaluation against a common standard. The more-common performance criteria for detection methods are precision, accuracy, sensitivity, and specificity, which together specifically address other terms used to describe the performance of a method, such as applicability, selectivity, calibration, trueness, precision, recovery, operating range, limit of quantitation, limit of detection, and ruggedness.

Key words : GMOs, Bioassays and Protein, DNA.

INTRODUCTION

In plants that are genetically modified for commercial agricultural purposes, the recombinant sections of DNA that are artificially inserted into the natural plant genome have some common genetic elements. Each inserted DNA sequence consists of at least a promoter, a protein-coding site (the structural gene) and a terminator. The promoter is a sequence of DNA that acts like an “on switch” for the transcription of DNA into mRNA, the first step in the activation of the cells like protein producing tools. The terminator marks the end point for this transcription procedure. The structural gene determines the particular protein that is to be made.

Genetically modified (GM) crops are increasingly being introduced into the world’s food supply. Concerns raised by consumers and regulatory agencies in various countries have highlighted the need for reliable and accurate testing for the presence and the amount of genetically modified components.

Techniques for GMO testing :
ELISA (Enzyme linked immunosorbent assay):
Is designed to detect the presence of the novel protein encoded by the inserted DNA sequence. A number of variations of Elisa have been developed, allowing qualitative detection or quantitative measurement of either antigen or antibody the presence of antibody. Each type of Elisa can be used qualitatively to detect the presence of antibody or antigen. Alternatively, a standard curve based on known concentration of antibody or antigen is prepared, from which the unknown concentration of sample can be determined. Protein strip tests and ELISA tests are preferred for these types of applications because they allow relatively rapid turnaround times, and they require a relatively small investment in equipment and personnel.

ELISA Tests for Specific Events Currently Available for following :
Qualitative :

Soybean RR (also soymeal, full fat flour, defatted flakes), Corn RR (NK603), Cotton RR
Cry1Ab - Corn (Mon809, Mon810, Bt11, E176)
T25 - Corn (PAT, BAR, Liberty Link)
Cry3Bb - Corn (Mon863)
Cry1Ac - Cotton (Bollgard I)
Cry2A - Cotton (Bollgard II)

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