Development of molecular biology techniques for the detection of genetically modified organisms in maize food products

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In the last years, the increase in the cultivated area of genetically modified (GM) maize has become a reality. GA21, MON810 and MON863 maize crops are some of the authorized maize events for food and feed under the European Union (EU) regulations. These crops of transgenic maize bring profit towards the conventional ones, as they confer resistance to some plagues and/or herbicides [1]. Concerning the raise of production and consumption of foodstuffs derived from genetically modified organisms (GMO), the EU has established new demand levels, including the labeling requirements when the product has GMO in a proportion higher than 0.9% (Regulation (EC) N.º 1829/2003).

The need to monitor and verify the presence of biotechnology-derived material in food products demands analytical methods able to detect, to identify and to quantify either the introduced DNA or the expressed protein(s). The DNA based methods, namely the Polymerase Chain Reaction (PCR) showed to be tools of great specifity and sensitivity in the analytical control concerning the presence of GMO [1].

The goal of this work was to apply and develop PCR techniques for the detection of GM maize in raw and processed foodstuffs. The first step was the DNA extraction of the samples by two methods: CTAB and/or Wizard [2]. Yield and purity of DNA extracts were assessed by spectrophotometry, while amplifiability was evaluated by PCR targeting the invertase gene. The screening of GMO was performed by the detection of 35S promoter from the cauliflower virus. The specific detection of GMO events, such as GA21 maize, MON810 maize and MON863 maize was carried out by PCR techniques.

The results of DNA extraction showed that the CTAB method gave higher purity and DNA amplifiability in some of the samples, meaning that those extracts were more suitable for PCR amplification. However, despite the lower purity of extracts, the Wizard method gave generally higher DNA yields. The results of 35S screening sequence by PCR did not show any apparent positive sample. However, the PCR for 35S showed low sensitivity, although attempts where done to improve it. In the detection of specific GMO events, there was one positive result for the GA21 maize, three positive samples for the MON810 maize and no positive result for MON863.

References:

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