Monitoring the presence of genetically modified potato EH92-527-1 (BPS-25271-9) in commercial processed food

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Abstract

The Amflora (EH92-527-1) potato is a genetically modified (GM) potato in which only starch of the amylopectin form is produced. This has been achieved by intervening with the biosynthesis of starch in this variety of potato. The Amflora potato is solely grown for the purposes of enhancing its industrial application. Although the Amflora potato is not fit for human consumption, the presence of the potato itself or any of its derived products in the food chain cannot be excluded, it should be considerate adventitious or technically unavoidable and can be accepted in a proportion no higher than 0.9%. To achieve the goal of our work we analysed forty-five potato-derived products to evaluate transgenic potato presence by real time polymerase chain reaction, obtaining negative results. In order to verify the correct application of the law and to assure the quality for the consumer, it is necessary to continue GM monitoring to verify the adventitious presence itself in food.

Materials and Methods

Forty-five samples of potato-derived products from different markets were investigated (Table 1). DNA extraction from frozen and dried potato was carried out in accordance with CTAB method validated by European Union Reference Laboratory for GM food and feed. The DNA of each sample was examined to verify potato-DNA by Real Time PCR by amplification of UGPase gene (Savini et al., 2006, 2010). The potential presence of GM potato in food matrices was detected by PCR screening for the nos terminator (T-nos) DNA sequence of nopaline synthase from Agrobacterium tumefaciens, according to real-time PCR method for detection of T-nos (Perningeat et al., 2002).

Results

The amplification plot showed the presence of an 88bp fragment of the UGPase gene from Solanum tuberosum in all samples examined (Figure 1a). The PCR screening of nos terminator (T-nos) DNA sequence, of nopaline synthase from Agrobacterium tumefaciens, confirmed the total absence of Amflora potato in food matrices investigated, as showed in Figure 1b and Table 2.

Discussion and Conclusions

In order to verify the correct application of the law, it is required to constantly monitoring food matrices to safeguard the consumers. The European Regulations set the labelling requirements for all the GM organism-containing products (food and feed), with a tolerance threshold established at 0.9% for authorised GM organisms and at 0.5% for GM organisms under authorisation procedure (Regulation EC N.1829/2003; European Commission, 2003). Amflora is been marketed for industrial use but not authorised for human consumption, thus its presence can only be accepted with a tolerance threshold below 0.9%, as an adventitious presence. The method used for DNA-extraction of starch products from food...
matrices is particularly suitable to provide a very good performance as confirmed by UGPase endogenous gene amplification, for all sample analysed (Figure 1a and Table 2). An high-quality potato-DNA is essential in order to achieve the subsequently real time PCR assays to verify the potential presence of GM material. Results are able to confirm the total absence of Amflora for the samples analysed so far. It is necessary to continue GM monitoring so as to assure consumers about the absence of Amflora in both local and imported food products.

Table 1. Potato-derived products investigated and their country of origin.

| Potato-derived products                  | Number of samples | Country of origin (manufactured or produced) |
|-----------------------------------------|-------------------|---------------------------------------------|
| Raw potato                              | 5                 | Italy                                       |
| Potato flour                            | 5                 | Italy/Germany                               |
| Mashed potato (frozen and dried)        | 5                 | Italy/Germany/France                        |
| Crisps                                  | 5                 | Italy/Germany                               |
| Frozen fries chips                      | 5                 | Italy/Germany/Canada                        |
| Frozen raw potatoes                     | 5                 | Italy/Germany/Canada                        |
| Bread-potato                            | 5                 | Italy                                       |
| Homemade potato-sweet                    | 5                 | Italy                                       |
| Homemade potato-pasta                   | 5                 | Italy                                       |

Figure 1. Amplification plot of UDP-glucose pyrophosphorylase gene (a) and nos terminator DNA sequence (b) in all samples examined.
Table 2. Results obtained by real time polymerase chain reaction by amplification of *UDP-glucose pyrophosphorylase* gene and *nos* terminator DNA sequence in all samples investigated.

| Potato-derived products                          | Number of investigated samples | *UGPase* number of positive samples | *nos* terminator (T-nos) DNA sequence |
|-------------------------------------------------|--------------------------------|-------------------------------------|---------------------------------------|
| Raw potato                                       | 5                              | 5                                   | Absence                               |
| Potato flour                                     | 5                              | 5                                   | Absence                               |
| Mashed potato (frozen and dried)                 | 5                              | 5                                   | Absence                               |
| Crisps                                           | 5                              | 5                                   | Absence                               |
| Frozen fries chips                               | 5                              | 5                                   | Absence                               |
| Frozen raw potatoes                             | 5                              | 5                                   | Absence                               |
| Bread-potato                                     | 5                              | 5                                   | Absence                               |
| Homemade potato-sweet                            | 5                              | 5                                   | Absence                               |
| Homemade potato-pasta                            | 5                              | 5                                   | Absence                               |

*UGPase, UDP-glucose pyrophosphorylase.*

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