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EVALUATION OF THE COMPLIANCE WITH LABELLING LEGISLATION IN A GREAT DIVERSITY OF FOOD PRODUCTS SOLD COMMERCIALLY IN BRAZIL

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INTRODUCTION

In 2007, Brazil got its position as the third largest adopter of biotech crops in the world, estimated at 15.0 million hectares (14.5 million RR soybean and 500.000 Bt cotton) and also is the third largest producer of maize in the world. The first biotech maize varieties have received initial approval this year.
Due to the introduction of these genetically modified crops in brazilian market, analyses of raw materials and food products are required to verify the adequacy of the labelling legislation, regulated by the edict nº 4680/03, that stipulates a 1% threshold of GM materials, as well for monitoring the use of this technology for a possible detection of unauthorized events and adverse effects.
This study search for RR soybean, Bt 176 and MON 810 maize in a great variety of food products to verify the content of GMOs and to evaluate the compliance with brazilian legislation.

MATERIAL AND METHODS

Samples

A total of 290 samples were analysed: (47) raw soybeans, (66) soy beverages, (15) powered soy milk, (14) infant formula, (10)texturized soy protein, (23) dehydrated soup, (20) meat products, (9) vegetal products, (5) pasta, (7) snacks and cookies, (17) soy flour, (16) plain flour, (9) products containing wheat, (25) products of maize meal and (7) pet food. Most of the samples were gathered randomly from markets in some cities mainly in south and south-east regions in Brazil and some were collected from food industries.
Certified reference materials (CRM) developed by the IRMM were used as standards.

Sample preparation and DNA extraction

The processed food samples were ground in Mill and homogenized. DNA was extracted from all samples and CRMs by cetyltrimethyl ammonium bromide (CTAB) from 50-100 mg. All DNA extractions were re-suspended in 100L of water DNA grade and stored at 20ºC. DNA concentration was estimated by spectrophotometer GeneQuant.

Detection of specific GMO (Roundup Ready soybean-RRS, Bt-176 and MON 810 maize)

The samples were analysed for detection of the inserted gene construct in RRS by nested PCR and for detection of a synthetic *cryIA* (b) gene for identification of Bt-176 maize and for specific detection of the E35S promoter/hsp exon-intron casssette of MON 810 maize, also by nested-PCR.

Agarose gel electrophoresis

PCR products (12 L) were determined on a 2% agarose gel at 80V for 30 min and 100V for 90 min. The visualization was performed in a UV-transilluminator and the images were captured with a video documentation system.

Duplex real-time PCR reactions

Those positive samples for RRS were quantified by Real time PCR with TaqMan GMO 35S Soy detection kit, for amplification of a soybean *lectin* gene target and p35S target in the same tube. Reactions were carried out in 96-well microtiter plates in a total volume of 25 L with 22 L master mix, 0,5 L ampli*Taq* Gold polymerase and 2,5 L DNA. All reactions in all runs were performed in duplicate. The reactions were run on the ABI Prism 7500 Sequence Detection System with the following thermal cycling protocol: initial step at 94ºC for 9 min for activation of the Ampli*Taq* Gold polymerase and 45 cycles at 95ºC for 20:00 seconds and 60ºC for 1 minute. The content was calculated by the programme GMO Analysis Macro v.1.7.2 supplied by Applied Biosystems.

CONCLUSIONS

A total of 290 samples were analysed. In food containg soy, 87 (32,8%) have been shown to contain RR soybean, whereas no Bt 176 and MON 810 maize were found in food containing maize. Quantitative analyses revealed GM content between 0.01 and 1% in 42 (48,3%) samples and above 1% in 45 (51,7%) samples containing genetically modified soy. There was no indication of presence of GM material on the label, meaning that none of these food products has been appropriately labelled.

These results clearly demonstrates that the brazilian food industry hasn't yet adjusted to the present legislation observing the requirement's consumers, reinforcing the need of continuous monitoring programs by the regulatory authorities.

References

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RESULTS

Specific detection of GMO

The visualization on agarose gel of fragments of 169 bp indicated the presence of RRS in the composition of the products (Figure 1). From 265 products containing soy, RRS was found in 87 samples from almost all the analysed matrices. No Bt 176 or MON 810 maize in pasta, products of maize meal, dehydrated soups, cookies and pet food was detected. The results are shown in Table 1.

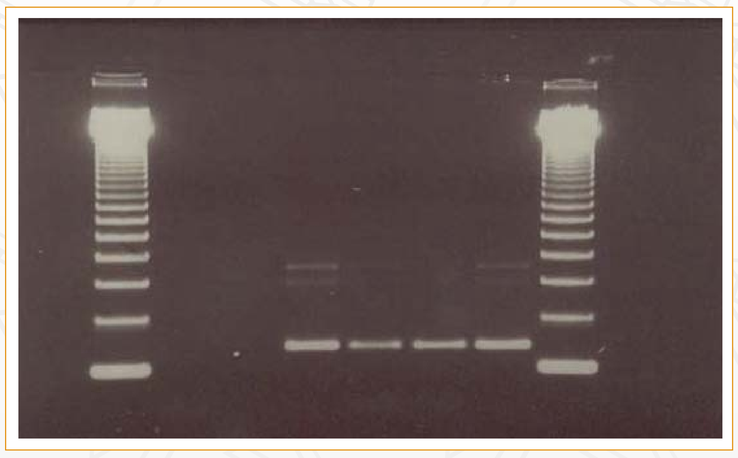


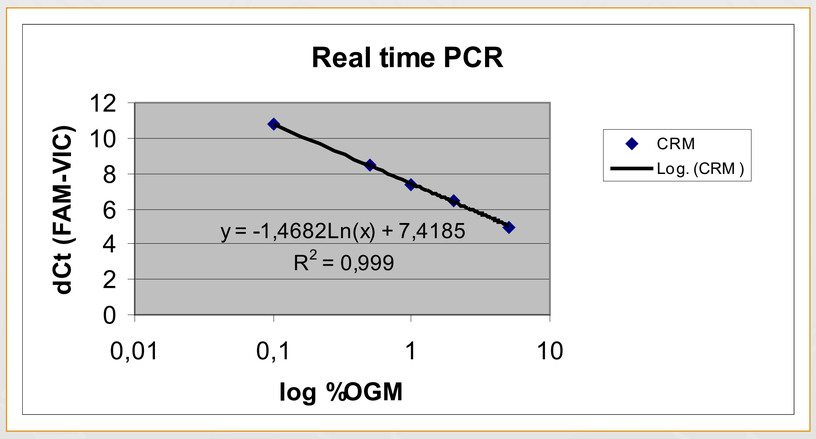
Figure 1. RR soybean detection by nested-PCR
Lanes 2 and 9: 123-bp DNA Ladder GOBCO-BRL. Lane3:PCR reagents control. Lane 4:GM-soybean negative control (0% RRS). Lane 5: GM-soybean positive control (0,1% RRS). Lane 6: powdered soy milk sample. Lane 7: powdered soy milk sample. Lane 8:dehydrated soup sample

Quantification of food products by Real Time PCR

The GM content of commercial food products, tested positive for the presence of RRS, was determined and the results are presented in Table 1.

Table 1. Detection of RRS and quantification of GM content in food products

Food products	Number of samples analysed	Number of samples positive for RRS	Number of samples with GM content <1%	Number of samples with GMcontent >1% and labelling required
Raw soybeans	47	12	5	7
Soy beverages	66	5	5	0
Powered soy milk	15	6	6	0
Infant formula	14	7	5	2
Soy protein	10	7	5	2
Soy flour	17	13	4	9
Dehydrated soup	23	5	1	4
Meat products	20	7	7	0
Vegetal products	9	4	4	0
Pasta	5	0	0	0
Snacks and cookies	7	0	0	0
Products containing wheat	9	8	0	8
Plain flour	16	12	0	12
Pet food	7	1	0	1
TOTAL	265	87	42 (48,3%)	45 (51,75%)



Log-linear regression analysis on the dCt's for CRM (0,1%,0,5%,1%,2%,5%). dCt's for analysis samples are plotted to determine their %GMO