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Application News

Microchip Electrophoresis No.B29

Qualitative Analysis of Genetically Modified Corn by Standard Method with MCE-202 "MultiNA"

The "JAS (Japanese Agricultural Standard) Analysis Inspection Handbook, Manual for Inspection and Analysis of Genetically Modified Foods," including standard methods for genetically modified agricultural products and processed goods, is open to the public on the web site of the Ministry of Agriculture, Forestry and Fisheries and the Food and Agricultural Materials Inspection Center, an independent agency.(*1)
Inspections for monitoring food labeling of genetically modified agricultural products are conducted by the independent Food and Agricultural Materials Inspection Center based on the JAS Analysis Inspection Handbook. In addition, the handbook is quoted in several places in the "Inspection Method for Food Produced by Recombinant DNA Technology" based on the Ministry of Health, Labour and Welfare notification, attesting to the fact that this analysis method has become one of the standards for inspection of genetically modified agricultural products in Japan. Furthermore, not limited to compliance through government control, the analysis method is widely used as a voluntary inspection system throughout enterprises involved in food processing and distribution to ensure observance of the food labeling system.
Here we introduce an example of detection through qualitative inspection of genetically modified corn as specified in the JAS analysis inspection handbook, using the MCE-202 "MultiNA" microchip electrophoresis DNA/RNA analyzer.

■ Experimental Procedure

Three certified standards consisting of genetically modified corn powder (MON 810 maize line) were used (Table 1). The conditions used from DNA extraction to PCR were in accordance with the "JAS Analysis Inspection Handbook, Manual for Inspection and Analysis of Genetically Modified Foods, Basic Operation Volume." (*1) The DNA was extracted from 1 g taken from each of the samples using the Qiagen DNeasy Plant Maxi kit. The extracted DNA concentration was measured, and based on this measurement, the solution was diluted to 10 ng/μL for use as a PCR template. In PCR, 2 types of primer pairs were used for detection of the endogenous corn gene SSIIb, and for detection of the recombinant MON 810 maize line. PCR was conducted from 3 points of each sample extract. In addition, PCR was also conducted on a positive control (standard plasmid DNA for corn added as a template) and negative controls (one without template DNA, the other without primer). The obtained PCR products were analyzed using the MultiNA.

Table 1 Genetically Modified Corn Samples

Lepidoptera Resistant Maize		
IRMM(*2)	CRM(*3)	MON 810 Maize Line 0 % (GVO standard ERM-BF413a)
IRMM	CRM	MON 810 Maize Line 1 % (GVO standard ERM-BF413d)
IRMM	CRM	MON 810 Maize Line 5 % (GVO standard ERM-BF413f)

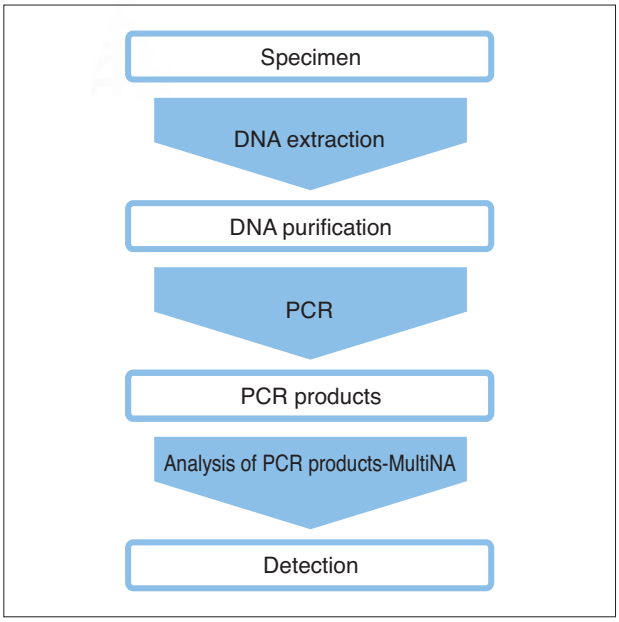

Fig. 1 Experimental Procedure for Genetically Modified Corn

(*1) Ministry of Agriculture, Forestry and Fisheries Food Label System Q&A and guideline, etc.
http://www.maff.go.jp/j/jas/hyoji/qa.html
Food and Agricultural Materials Inspection Center "Manual for Inspection and Analysis of Genetically Modified Foods" <Revised 2nd Edition>
http://www.famic.go.jp/technical_information/jashandbook/index.html
(*2) Institute for Reference Materials and Measurements (IRMM)
(*3) Certified Reference Materials (CRM)

■ Reagents / Kits

·DNA-500 Kit
(Shimadzu)
·SYBR® Gold nucleic acid gel stain
(Invitrogen)
·25 bp DNA Ladder
(Invitrogen)
·DNeasy Plant Maxi Kit
(Qiagen)

■ Analytical Conditions for PCR Products

Instrument : MCE-202 "MultiNA"
Analysis Mode : DNA-500 on-chip mode

■ Results

From Fig. 2, it is clear that the endogenous corn gene (SSIIb: 114 bp) was detected in all of the samples. This confirms that the DNA extraction and PCR were achieved without problem.
On the other hand, only in the samples containing the MON 810 maize line could the band (M 810: 113 bp) be identified. In addition, the presence/absence of assumed DNA amplification products was confirmed in the positive and negative controls, indicating that the results were accurate.
Both an electropherogram and a gel image were obtained in the analysis results using the MultiNA. Therefore, the amplification products of interest were reliably and easily identified by the presence/absence of peaks and their sizes verified two-dimensionally.

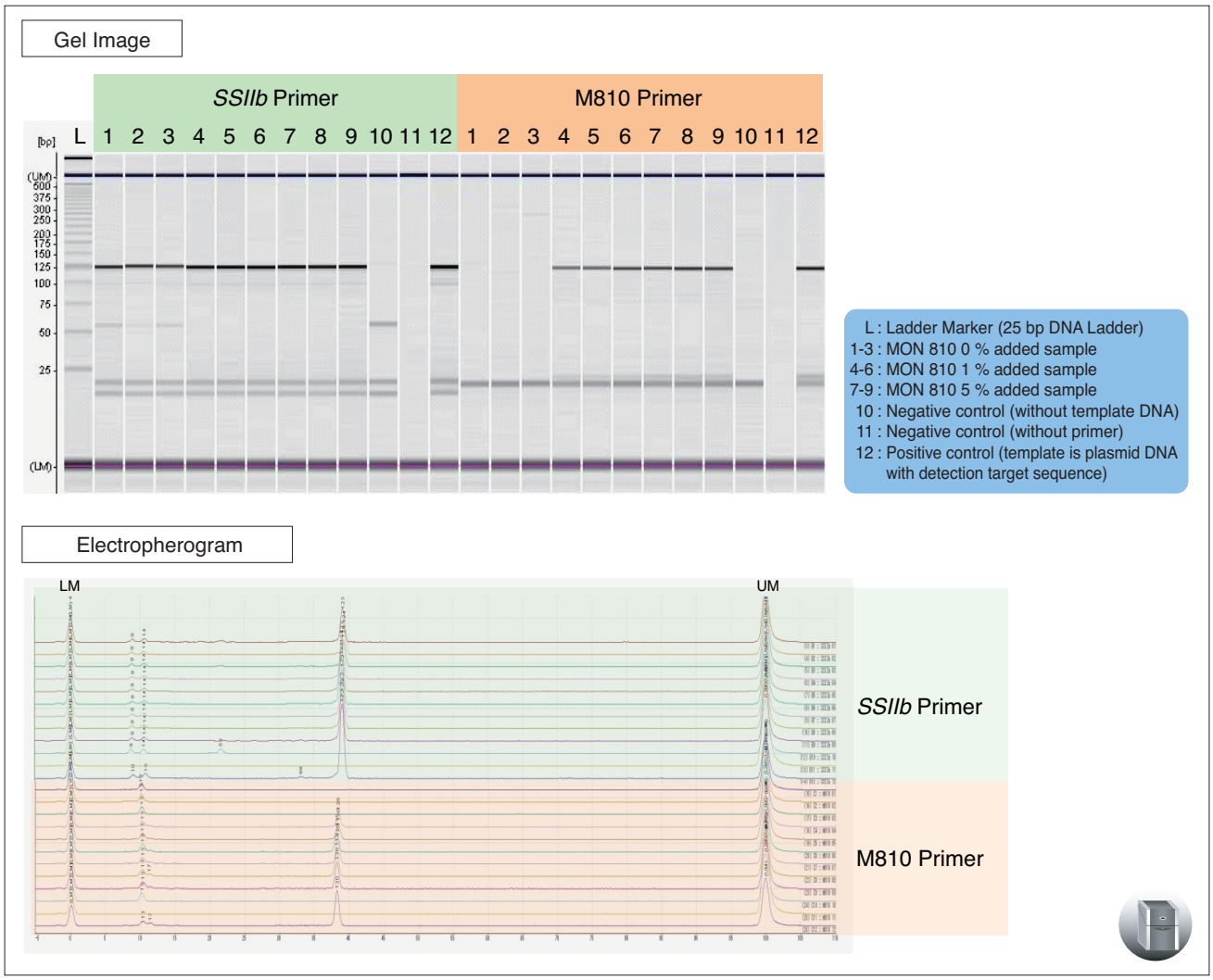

Fig. 2 Analytical Results for PCR Products from Genetically Modified Corn

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