

## Effect of sodium carboxymethyl cellulose in processed rice foods on detection of genetically modified rice-derived DNA

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### Abstract

The effect of sodium carboxymethyl cellulose (CMC), a food additive used as a thickener and emulsion stabilizer, on detection of genetically modified (GM) foods was evaluated. The addition of CMC to processed rice foods at 2% (w/w) concentration inhibited the yield of DNA in the DNA purification step by up to 40% and 70% using ion-exchange resin-type DNA purification kit and silica membrane-type DNA purification kit, respectively. The DNA yield from the rice vermicelli commodities containing CMC was significantly lower than that from the CMC-free rice vermicelli commodities. When 2% (w/w) CMC was contained in the rice flour with <5,000 copies of transgenic genes for GM rice, the false negative rate in the real-time polymerase chain reaction targeting the genes was more than 10%. The CMC attenuates the DNA purification efficiency from the rice food samples, and may interfere with the GM rice testing using DNA samples prepared from processed rice foods containing CMC.

**Keywords :** genetically modified rice, detection, food additive, sodium carboxymethylcellulose, real-time polymerase chain reaction

## I Introduction

Since the first genetically modified (GM) crop was commercialized in the 1990s, a variety of GM crops have been developed, and the global cultivation area of the GM crop has been increasing<sup>1)</sup>. Rice is an especially important staple food for the world's population. Therefore, many GM rice lines showing useful characteristics, such as increasing rice production and nutrient values, have been developed. Some of the developed GM rice lines, such as herbicide-tolerant GM rice lines, PWC16, IMINTA-1/4, CL121/141, CFX51 and LLRICE06/62/601, and insect-resistant GM rice lines,

Shanyou 63, Huahui-1/TT51-1 and Tarom molai+cry1Ab, have been evaluated for food use<sup>\*1, 2-5)</sup>.

In many countries, such as in the EU and Japan, GM foods are regulated and must be authorized after safety assessments<sup>6, 7)</sup>. Therefore, foods that are contaminated with any unauthorized GM rice lines must be detected to prevent unintentional use in foods. In 2006, the Ministry of Health, Labour and Welfare of Japan (MHLW) reported contamination with some previously unidentified and unauthorized GM rice lines in some imported processed rice foods, such as rice vermicelli<sup>\*2, 8)</sup>. In Europe, unauthorized GM rice in processed rice foods was first reported in 2005-2006<sup>\*3)</sup>. Since then,

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\*1 ISAAA. <http://www.isaaa.org/gmapprovaldatabase/crop/default.asp?CropID=17&Crop=Rice> (last accessed, April 4, 2018)

\*2 Ministry of Health, Labour and Welfare of Japan. <http://www.mhlw.go.jp/houdou/2007/01/h0126-3.html> (last accessed, April 4, 2018)

\*3 RASFF portal. <https://webgate.ec.europa.eu/rasff-window/portal/index.cfm?event=searchForm&CFID=4714270&CFTOKEN=c7abad9652b0bea4-C90BC953-95CC-6847-3722D0849461E85D&jsessionid=3506e86ab76e4c121165TR#> (last accessed, April 4, 2018)