

# Real-time and conventional PCR detection of Liberty Link<sup>®</sup> rice varieties and transgenic soy in rice sampled in the Mexican and American retail markets

Maricarmen Quirasco · Bernd Schoel ·  
Pradheep Chhalliyil · John Fagan · Amanda Gálvez

Received: 5 April 2008 / Revised: 22 June 2008 / Accepted: 25 June 2008 / Published online: 31 July 2008  
© Springer-Verlag 2008

**Abstract** Samples of rice from Mexican and USA retail stores were analyzed for the presence of transgenic (GM) events using real-time PCR. In screening for the *CaMV35S* promoter sequence (*35SP*), positive results were found in 49 and 35% of the Mexican and American samples, respectively. In further investigations in Mexican samples, 43% were positive for *P35S::bar*, with two above the quantifiable limit; these were 0.07% and 0.05% GMO. Fourteen out of the sixteen positive samples were labeled as imported from the USA. In testing samples bought in American retail shops, 24% showed positive results, all below the quantifiable range. It could be deduced that *P35S::bar* positive samples were Liberty Link<sup>®</sup> (LL) rice. In distinguishing between LL601 and LL62, end-point PCR was used, corroborating the *P35S::bar* amplicon length difference of these events. LL62 was found in one rice sample purchased in Mexico and two in the USA samples. Its presence was verified with the 35S terminator sequence. All other LL positive samples contained LL601. None of the samples analyzed showed the presence of Bt63 rice.

The LL rice varieties found have been identified as not being commercially cultivated, and so their presence requires further investigation. *35SP* was also present in samples which did not have any LL rice. Maize sequences could not be detected in any of the samples; however, soybean DNA was found in Mexican and USA rice samples. The Roundup Ready<sup>®</sup> trait was detected in trace amounts in 16 and 6% of the rice samples bought in Mexico and the USA, respectively. Real-time PCR was shown to be the method of choice for the sensitive and rapid screening of commodities and retail samples for the detection of GM and other contamination.

**Keywords** GM rice · Quantitative PCR · LLRICE601 · LLRICE62 · *P35S::bar* · Adventitious presence

## Introduction

Rice world production amounts to 417.64 million metric tons (MT) [1]. Between 2005 and 2007 the USA provided about 11% of the global rice trade [2]. Over 70% of all long-grain rice is grown and commercialized in that country [3]. In contrast, Mexican production has oscillated over the past decade, with an abrupt decrease in the past five years: in 1985 a top figure of 808 thousand MT was obtained, which subsequently sharply decreased, reaching only 287 thousand MT in 1993 [4]. After a new peak in 1997, with 469.5 thousand MT produced, by 2006 only 244.47 thousand MT were harvested [5]. The Mexican market was driven to import rice mainly from the USA, since both countries belong to the North American Free Trade Agreement (NAFTA). In 2006 rice imports totaled 785.8 thousand MT according to the USA Rice Federation [3], or 808.5 thousand MT according to the Department of

The three authors Maricarmen Quirasco, Bernd Schoel and Pradheep Chhalliyil contributed equally to this work.

**Electronic supplementary material** The online version of this article (doi:10.1007/s00216-008-2265-8) contains supplementary material, which is available to authorized users.

M. Quirasco · A. Gálvez (✉)  
Departamento de Alimentos y Biotecnología,  
Facultad de Química,  
Universidad Nacional Autónoma de México,  
04510 México, D. F., México  
e-mail: galvez@servidor.unam.mx

B. Schoel · P. Chhalliyil · J. Fagan  
Genetic ID NA, Inc.,  
P. O. Box 1810, Fairfield, IA 52556, USA