

Category	: International Rice Research Conference
Select Theme	: Pathways to health and nutrition
Endorsement email	:
Keyword 1	: Biofortification
Keyword 2	: Food safety
Keyword 3	: Nutrient-dense rice
Title of Entry	: Molecular and protein safety assessment of provitamin A biofortified rice (Golden Rice)
Presenting author	: Norman Oliva
Presenting author email	: N.Oliva@irri.org
Co author 1	: Maria Florida Cueto-Reaño
Co author 2	: Russell Reinke
Co author 3	: Inez Slamet-Loedin
Co author 4	: Donald MacKenzie
Co author 5	:
Co author 6	:
Co author 7	:
Co author 8	:
Co author 9	:
Co author 10	:
Co author 11	:
Co author 12	:
Co author 13	:
Co author 14	:
Affiliation presenting author	: International Rice Research Institute
Affiliation 1	:
Affiliation 2	:
Affiliation 3	:
Affiliation 4	:
Affiliation 5	:
Affiliation 6	:
Affiliation 7	:
Affiliation 8	:

Affiliation 9	:
Affiliation 10	:
Affiliation 11	:
Affiliation 12	:
Affiliation 13	:
Affiliation 14	:
Select only one type of presentation	: 15 minute oral presentation

Abstract : Genetically engineered GR2E rice was developed to express increased levels of provitamin A in the grain as a complementary effort to address vitamin A deficiency in populations consuming high quantities of polished rice as a staple food. Rigorous safety assessment and pre-market authorization is a mandatory requirement for all genetically engineered foods, including GR2E rice. Part of the assessment involves characterizing the inserted DNA and evaluating the potential for newly expressed proteins to induce allergic reaction or toxicity. Molecular characterization studies were conducted to determine overall integrity of the gene expression cassettes, stability, insert copy number, and absence of plasmid backbone sequences. Southern hybridization studies and nucleotide sequencing of the inserted DNA and portions of the surrounding rice genome showed that a single copy of transfer-DNA (T-DNA) without additional plasmid sequences was stably inserted at a single site within the rice genome and was inherited over multiple generations as a single genetic locus. The protein safety evaluation followed a “weight of evidence” approach that considered the history of safe use, biochemical function, amino acid sequence similarity to known allergens and toxins, in vitro digestibility, stability to heat or processing, and potential dietary exposure. The maize phytoene synthase (ZmPSY1), bacterial phytoene desaturase (CRTI), which were introduced to complete the beta-carotene biosynthetic pathway in the rice endosperm, did not display meaningful amino acid sequence similarity with known allergens or toxins, were rapidly and completely digested in the presence of simulated gastric fluid containing pepsin, and their respective enzymatic activities were completely destroyed following treatment at temperatures well below those used during cooking. The bacterial phosphomannose isomerase (PMI) protein, which was introduced as a selectable marker, has a history of safe use in wide range of food and feedstuffs derived from genetically engineered maize lines. The lack of any identifiable hazards associated with the newly expressed proteins in GR2E rice, in combination with molecular and comparative compositional analyses, provide assurance that biofortified provitamin A rice is as safe as conventional rice for use in food, feed, or for processing.

[Read more»](#)

Uploaded Files »

No files found.