

PhD: Food Science

Title: Reduction of allergenicity in peanuts through genome-editing approaches

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Objectives of the research project and interdisciplinary collaborations:

This project aims to assemble CRISPR-Cas9 vectors targeting allergenic genes in peanuts (*Arachis hypogaea*) to develop hypoallergenic varieties using biotechnological approaches. As a multidisciplinary project it will require collaborations with members of other scientific disciplinary sectors to design and validate the CRISPR-Cas9 system for precise gene editing in peanuts. Furthermore, by employing multiple gRNAs, the project will seek to simultaneously silence allergenic genes and excise specific domains responsible for IgE-recognition and immune response, while ensuring minimal impact on gene functionality.

Innovation and originality of the project in relation to the state of the art:

Peanut allergy is a significant public health concern, affecting millions of people worldwide and posing life-threatening risks. Major peanut allergens, such as *Ara h1*, *Ara h2*, *Ara h3*, and *Ara h6*, trigger severe allergic reactions. Addressing peanut allergenicity could be crucial for enhancing food security and safety. Recent studies have demonstrated the efficacy of CRISPR-Cas9 in multiplex genome-editing in plants (Minkenberg et al., 2017). Moreover, a crucial support for genome-editing in peanuts comes from the release of the peanut genome assembly (Bertioli et al., 2019), which provides valuable insights into genetic diversity and evolutionary gene relationships. Despite this, no CRISPR-Cas9 approaches have been reported in peanuts so far. Therefore, this project will leverage innovative approaches to target allergenic genes in peanuts using CRISPR-Cas9.

Grant availability:

Principal Investigator of research project “*Genomics of Cucurbita NB-LRR gene family for Implementation of Innovative R-gene Capture Strategies (CucuR-gene)*” (CUP: E53D23020840001) - PRIN (2022-PNRR). Co-proponent of two research activities for the Spoke-1 “*Plant, animal and microbial genetic resources and adaptation to climatic changes*” of “*National Research Centre for Agricultural Technologies (AgriTech)*” project (CUP: E63C22000920005).

Collaborations with foreign institutions:

The realization of the analyses will be able to make use of the collaboration with the Biotechnology Department of the BOKU University of Vienna. In which, it will be possible to carry out research periods abroad.