

Breeding Wheat and Peanut for Reduced Immunogenicity Using Conventional and Innovative Approaches

Sachin Rustgi

Department of Plant and Environmental Sciences, Clemson University, Pee Dee Research and Education Center, Florence, SC 29506

Many leading health organizations worldwide recognize food as medicine. However, approximately 10% of the global population—equivalent to 770 million people—experiences food allergies. For most plant-based food allergies, strict dietary avoidance remains the only approved treatment, supplemented by emergency medications such as epinephrine and antihistamines. Other options include a limited number of oral immunotherapies, such as early introduction of peanut immunogens; enzyme supplements for wheat allergy and gluten sensitivity; injectable biologics, including immunoglobulin E (IgE) blockers; and fecal microbiota transplant capsules. However, many of these therapies remain experimental or inaccessible to middle-income families. Specialized diets and allergen-free environments can also be costly and difficult to maintain. These challenges highlight the critical need for low-immunogenicity crops that can serve either as oral immunotherapies to promote immune desensitization or as alternative food sources to address nutritional deficiencies associated with restrictive diets, including gluten-free diets. In this presentation, I will discuss examples of reduced-immunogenicity crops developed by our team, including hypoallergenic peanuts and reduced immunogenicity wheat. I will also examine public perspectives on developing such crops through conventional crossbreeding and gene editing, offering a broader perspective on the opportunities and challenges associated with low-immunogenicity crop development.