

ICRISAT

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ICRISAT has adopted the CGIAR IA Principles which require that CGIAR Centers may register/apply for (or allow third parties to register/apply for) patents and/or PVP over the CGIAR Centers' respective Intellectual Assets if such IP protections are necessary for the further improvement of the Intellectual Assets or to enhance the scale or scope of impact on target beneficiaries, in furtherance of the CGIAR Vision. This disclosure is in fulfilment of the CGIAR IA Principles for the patent application filed by ICRISAT.

Title of Patent Application	Millet and Food Products with Reduced Lipase Activity, Genes and implementation thereof
Type of Filing	Provisional Indian Patent Application No. 202141036329
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Name of Applicants	International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) AND Pioneer Hi-Bred International
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Territories of protection (through PCT application)	Yet to be decided
Current status	Provisional Patent Application, not published

Background

Pearl millet is highly nutritious and a principal staple food crop for millions of people across the Asia and Africa. Pearl millet is a highly nutritional source of carbohydrates, protein, vitamins, and minerals such as Iron (Fe) and Zinc (Zn). Besides, being a good source of all beneficial elements, the grain is gluten-free and contains high amounts of antioxidants which have proven beneficial for the human health and well-being. It has a potential to contribute to food and nutritional security, as it is a powerhouse of nutrients. Pearl millet is recognized as an important food crop in the developing countries and is known for having superior balanced nutrients, as compared to other cereals. The functional flour market is projected to reach USD 954 billion by 2022 at a CAGR of 7.8% from 2017 to 2022. Nonetheless, pearl millet has not been able to capture any market due to the issue of rancidity.

Not only this results in food wastage, onset of rancidity due to degradation and oxidation of the several lipid molecules destroys the good fats, vitamins and in a long run could cause development of inflammatory diseases, cardiovascular illness, and even certain cancers.

Problem Statement

The low keeping quality of the flour is largely caused by the rapid development of lipid rancidity due to the activities of rancidity causing enzymes such as lipase, lipoxygenase, peroxidase, and polyphenol oxidase. Additional factors include oxygen, light, high temperature and high humidity storage conditions, exacerbate the problem. The key genetic factors to be targeted to improve the shelf-life pearl millet flour is unknown and hampers the ability of the crop breeders to develop genotypes that have enhanced shelf life.

The Invention

The disclosure relates to a gene in millets associated with shelf-life stability, rancidity and improved flavor of pearl millet flour. The disclosure relates to altering the expression or activity of one or more genes in pearl millet. This relates to induced variations using mutagenesis, transgenic and gene edited approaches in one or more genes in the nutri-cereal pearl millet. To develop a genetic solution for this problem, inactivation of candidate enzymes, that play key role in hydrolysis has shown potential to stabilize the triacylglycerol (TAG) during the milling process adding value to both economics and nutritional quality of pearl millet.

The invention would provide precise understanding of the rancidity mechanism, which is an underlying and essential trait for nutritional improvement in pearl millet flour; Identify of the candidate gene(s) for enhanced shelf life/reduced rancidity to provide knowledge to develop new genetic materials in pearl millet.

Utility/Advantages

The research outcomes from this invention would be useful in developing pearl millet with enhanced flour shelf life, which will change the way this nutriceal is viewed by processing industry and open up a large market under gluten free flour category that is not existing as of now due to issues of rancidity. This is likely to open new opportunities for enhancing the scope of its utilization as low GI, gluten-free flour, bakery & confectionary items, weaning foods, and dietary formulations for children as well as geriatrics etc. Besides, this invention will provide the pearl millet breeders and biotechnologists with the ideal toolbox to develop elite germplasm that will enhance the processing quality of this crop. Increasing the shelf-life of nutritious pearl millet grain will also offer opportunities for primary and secondary processing creating markets and enhanced profits for smallholder farmers. Reducing rancidity in millet flour will reduce waste and create a value-added product for both rural and urban consumers.

Justification and Compliance note

This invention and Patent application are the outcome of collaborative research activity between ICRISAT and Pioneer Hi-Bred International. Through IP rights, applicants intend to control this invention to fulfil their missions and mandates. The knowhow and user rights may be shared with other organizations under appropriate licensing and Material Transfer Agreements.

All our existing and proposed activities would strictly be in-line with the applicable laws. Applicants will not exercise its rights in ways that limit access to the original in-trust germplasm with ICRISAT, and will make the technology available for emergency uses as per FAO's International Treaty on Plant Genetic Resources for Food and Agriculture.