



ICRISAT scientists decode the genetics behind seed coat removal in industry-ready groundnut

The research analysed 184 groundnut accessions from the ICRISAT Gene bank and identified key genomic regions linked to blanchability.

In a significant breakthrough for groundnut improvement, scientists at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) have unravelled the genetic basis of blanchability—the ability to easily remove the seed coat—a critical trait that determines processing efficiency and product quality for food industry. Blanchability is a key requirement for the food industry.

Groundnuts used in consumer products such as chocolates, breakfast bars, and peanut butter must first undergo seed coat removal before further processing. However, many existing varieties do not allow easy removal, leading to incomplete separation, reduced processing efficiency, and low product quality. A recent ICRISAT study, published in Communications Biology and BMC Plant Biology, provides the first high-resolution insights into the genetic mechanisms controlling blanchability.

Speaking on the advance, Dr Himanshu Pathak, Director General of ICRISAT commented that this work on blanchability is a strong example of how science can directly respond to industry needs. "It reflects our broader approach of working hand-in-hand with partners to deliver solutions that are both practical and impactful". "In line with this, we recently launched CATALYST (Collaboration for Agricultural Transformation through Advanced Learning, Science & Technology) to foster deeper partnerships with industry and co-create solutions that are not only scientifically robust but also commercially relevant," said Dr Pathak.

The research analysed 184 groundnut accessions from the ICRISAT Genebank and identified key genomic regions linked to blanchability. Six practical genetic markers (KASP markers) were validated. Notably, one marker region "S17_133752226" was consistently associated with high blanchability across varieties, making it valuable for precision breeding. Dr Stanford Blade, Deputy Director General – Research & Innovation, ICRISAT, added, "Private industry and markets are key players in the agri-food value chain. Breeding efforts must align with industry requirements alongside farmers and consumers to maximize impact."

Further genome-wide analysis identified several genes associated with blanchability, including those involved in cell wall modification, metabolism, and seed coat loosening. The study also identified landraces for strong blanchability across seasons. Certain landraces such as ICG297, ICG11515, ICG14710, ICG15419, ICG7906, ICG13982, ICG12921, ICG10890, and ICG12697 performed particularly well during the rainy season, while ICG9507, ICG9315, ICG8106, ICG332, and ICG36 showed strong performance in the post-rainy season. Spanish bunch types consistently recorded over 60 per cent blanching efficiency.

Another key finding of the study is that the subspecies fastigiata exhibited higher blanchability compared to hypogaea, highlighting its strong potential for breeding programs. "The addition of blanchability further strengthens this pipeline. This work ensures that future groundnut varieties are not only high-yielding and nutritionally superior, but also aligned with industry and market needs," said Dr Manish K Pandey, Principal Scientist – Genebank & Trait Discovery, ICRISAT.

The study was supported through strong national and international collaborations, including the Indian Council of Agricultural Research, with additional funding from Council of Scientific and Industrial Research (CSIR)- University Grants Commission (UGC), Mars Inc., USA, and the Gates Foundation, USA. This research work underscores the growing need for industry-aligned agricultural research and highlights the importance of partnerships in advancing innovations that benefit farmers, processors, as well as consumers.

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