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INDIA DEVELOPS NEW GROUNDNUT LINE WITH DESIRABLE OIL QUALITY

Relevant for: Indian Economy | Topic: Major Crops, Cropping Patterns and various Agricultural Revolutions

Making hay: A groundnut vendor on the Machilipatnam-Manginapudi beach road in Krishna district. T_APPALANAIDU

Fatty acid composition defines groundnut oil quality. Six saturated fatty acids including palmitic acid constitute 10%, whereas oleic acid (monounsaturated fatty acid) together with linoleic acid (polyunsaturated fatty acid) constitutes nearly 80% of unsaturated fatty acid in groundnuts. It is highly desirable to increase the oleic acid content and reduce both linoleic acid and palmitic acid content.

Groundnuts grown in India have about 55% oleic acid, about 25% linoleic acid and around 10% palmitic acid, whereas in the U.S., several groundnut varieties have 80% oleic acid and just 2-3% linoleic acid. Efforts have been taken to increase the oleic acid content and reduce both linoleic and palmitic acid content for health benefits and to increase the shelf-life.

In close collaboration with scientists from several institutions in India and Africa, the Hyderabad-based International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) team of Dr. Rajeev K. Varshney, Pasupuleti Janila, and Manish Pandey has developed improved groundnut lines for disease resistance and high oleic acid content. In 2016, Dr. Varshney's team reported the result of development of high (up to 82%) oleic acid content lines in three popular groundnut varieties.

In 2018, Dr. S.K. Bera, Dr T. Radhakrishnan and others from Indian Council of Agricultural Research's (ICAR) Directorate of Groundnut Research, Junagadh, Gujarat, in collaboration with Dr. Varshney at ICRISAT developed a groundnut line that has up to 82% of oleic acid content, while linoleic and palmitic acid content decreased up to 89% and 39%, respectively. A U.S. groundnut variety that has high oleic acid and very less linoleic acid was used for breeding the new line.

"The new lines developed by ICAR, SAUs and ICRISAT have been extensively field tested in different parts of India and will be soon released for commercial cultivation," says Dr. Radhakrishnan, Director of ICAR-Directorate of Groundnut Research.

Since GM technology is mired in controversy, the scientists steered clear of it. "We used conventional breeding techniques and looked for genes for high oleic acid content with the help of molecular markers in the progenies to select the lines for the next generation. This way, we have reduced the time taken to develop a new line," says Dr. Pandey.

Excess consumption of palmitic acid increases the risk of cardiovascular diseases. Linoleic acid is not stable on heating and causes deterioration of foods due to oxidation with oxygen. Linoleic acid also promotes formation of trans-fat. On the other hand, oleic acid reduces the level of low density lipoprotein (LDL) cholesterol and maintains level of high density lipoproteins (HDL). Oleic acid also reduces the formation of tumour, and ameliorates inammatory diseases.

Based on whole genome sequencing of cultivated groundnut (Arachis hypogaea), ICRISAT scientists and other institutions have found 1,944 genes related to oil content and quality. These genes are responsible for fatty acid synthesis, lipid signalling and triacylglycerol (TAG)

biosynthesis. The results were publisheda few days ago in the journal Nature Genetics.

In another study published this yearin the journal Molecular Plant,ICRISAT researchers in collaboration with other institutions identified more than 2,500 oil metabolism-related genes in cultivated groundnuts.

“High quality genome sequence for both the subspecies have become available now for groundnut research community which have further provided greater insights into disease resistance mechanism and oil synthesis pathways and will accelerate development of superior groundnut varieties with higher yield, enhanced resistance to diseases and better oil quality,” says Dr. Varshney, who was a co-leader in both projects.

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