

Pomegranate cure: IIT-B taps into seed waste using green technique

USEFUL REFUSE Fungus used in making soy sauce helps extract optimum oil, fibre that fight cancer and diabetes

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MUMBAI: Being the world's largest producer of pomegranate also comes with the tag of producing its enormous organic waste, especially from the seeds which constitute 10% of the fruit's total weight. And with the right methods, one can extract oil and fibre that have proven anti-cancer, anti-diabetic and antioxidant properties from that waste.

Researchers at the Indian Institute of Technology, Bombay (IIT-B)-Monash Research Academy have proposed an environment-friendly process to tap the most out of pomegranate seed waste, using a fungus that is used by the Japanese to produce soy sauce and sake.

The fungus, *Aspergillus oryzae*, produces an enzyme called protease that if used on wasted pomegranate (that come from an annual yield of more than 2 million tonnes in India), can produce oil used in pharmaceutical and cosmetic industry, proteins rich in essential amino acids and dietary fibres.

"Waste generated by 95% of Indian industries that produce pomegranate juices for multinational companies (MNCs) based in India reaches dump yards,"

HOW THE ECO-FRIENDLY PROCESS WORKS



- Waste pomegranate seeds are placed in water at room temperature
- Oil is trapped in the protein matrix present in the pomegranate seed
- The protease enzyme breaks this matrix and releases oil
- Oil is formed on a separate layer and scooped out
- What stay behind are protein hydrolysates — free proteins with 91.6% essential amino acids
- Remaining seed waste also contains rich dietary fibres
- The proteins can be used as nutrient supplements

OTHER RESULTS

Pomegranate oil derived using protease had

2.3% higher content of conjugated fatty acids	14 times the total phenolic content	4% higher antioxidant activity than pomegranate oil extracted using hexane	53%-55% similar concentration of punicic acid as in hexane process
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The World Health Organisation (WHO) has guidelines on the consumption of essential amino acids for different age groups. A comparison of the amino acid content from protein hydrolysates from pomegranate seed waste with WHO guidelines showed that protein hydrolysates extracted by the green process satisfied the essential amino acid need of all age groups above three years, while two or three amino acids were slightly less for those below three years.

said Amit Arora, co-author and professor at the Centre for Technology Alternatives for Rural Areas, IIT-B. "Our technology will prevent fruit waste from turning into an organic pollutant."

Researchers said there is no clear market for pomegranate waste seed oil in India due to the absence of a sophisticated facility. "Products that normally have this oil are manufactured by MNCs in the US and the UK. Even the very few Indian pharmaceutical and cosmetic companies that

use the oil import it," said Arora.

At present, there are three methods of processing pomegranate seed waste. The most common one is cold pressing that requires significant energy input but yields only 40% to 50% of the oil. It is also the most cost-effective. Another process uses hexane, a toxic chemical obtained from petroleum and crude oil, which can extract 95% to 99% of the oil but has associated health hazards. An extraction process using super-critical carbon dioxide recovers 60% to 70% oil, but

the technology is expensive and so is the cost of oil.

IIT-B's green process, which uses protease, is water-based and carried out at 40-45 degrees Celsius. Researchers extracted more than 95% oil in free form, more than 90% proteins, and more than 97% fibres in the residue. "Humans consume proteins for essential amino acids. We found that the essential amino acid content [in pomegranates] is better than soya or chicken proteins," said Sachin Talekar, principal investigator, IIT-B-Monash

Research Academy. The team also found the seed residue showed improved glucose absorption capacity and glucose dialysis retardation index — useful to diabetics — compared to the raw waste.

With the government planning to set up mega food parks across the country, Arora said this zero-waste green technology can also help handle waste. "Rather than transfer the technology to companies, we would like to connect to mega food parks that will double farmers' incomes," said Arora.