

New treatment improves 'heart oil' from



"Enzymatic degumming removes gums completely, so there is no need to add neutral bleaching earth to remove the gums," says J.S. Rao of the Novozymes South Asia office in Bangalore.

To make white rice, the brown bran on the outside of the grain has to be removed. Its oil content ranges from 12 to 25% and this oil has unique health properties. Rice bran oil is the only vegetable oil to contain oryzanol - a micronutrient that has been proven to balance levels of cholesterol in the blood. Oryzanol also reduces the deposition of fat in the arteries.

Japan began producing rice bran oil 50 years ago, where it is popularly known as 'heart oil' because of its special properties. Rice bran oil also contains a good balance of saturated (20%), monounsaturated (45%) and polyunsaturated fats (35%).

The largest producer of this type of oil is India, with an annual production of 650,000 tons.

Physical refining

The chemical refining of rice bran oil generally results in considerably higher losses than observed in the refining of other vegetable oils. This is due to the presence of larger amounts of free fatty acids and non-triacylglycerol compounds. Refining losses can be considerably reduced by using physical refining with either enzymes or acid.

In physical refining, the efficient removal of gums is very important. Acid degumming is currently the most common method in India for refining rice bran oil. However, acid degumming is known to produce inconsistent degumming results and, in general, the results are less than satisfactory. The enzymatic degumming process with the enzyme Lecitase Novo from

Rice bran oil is claimed to be the healthiest oil for the heart. As demand increases, top producers in India have adopted enzymatic degumming with Lecitase® Novo to minimise losses of oil and ensure a high-quality product.

Novozymes has been shown to be superior to acid refining. Unlike acid degumming, there is no need to use additional neutral bleaching earth in the bleaching step to remove residual gums.

Lecitase Novo converts non-hydratable phospholipids into water-soluble lyso-phospholipids, which are then removed by centrifugation. The degummed oil has a lower phosphorus content than when using the conventional acid refining process. Residual phosphorus levels of 0-5 ppm are obtained after enzymatic degumming, bleaching and dewaxing. This gives a good-quality edible rice bran oil.

The enzymatic degumming process minimises losses of oil, produces consistent degumming results, reduces water consumption, and is more environmentally sound.

Indian success

The enzymatic degumming of rice bran oil has been successfully introduced in India by J.S. Rao, a sales and technical service manager at Novozymes South Asia in Bangalore, India. "Refining companies have realised that they can earn more if they take care of the quality of the rice bran oil," he says. "Many companies wanted to make higher-quality oil but didn't know how. Our enzymes helped them to solve their quality problems."

In India, the Technology Mission on Oilseeds, Pulses and Maize (TMOP&M), a body under the auspices of the Ministry of Agriculture, has sanctioned grants of INR 7,500,000 (USD 172,000) each to 15 companies for setting up a 50-ton-a-day rice bran oil refinery employing the enzymatic degumming process developed by the Indian Institute of Chemical Technology (IICT). All the projects that have received the TMOP&M grants are monitored and commissioned by the Lipid

Science & Technology Division of the IICT in Hyderabad, India. Though the grants have now stopped, this cooperation between TMOP&M and IICT has helped to popularise enzymatic degumming in the rice bran oil refining industry in India.

Here are some comments from key companies.

A.P. Solvex

A.P. Solvex Ltd. is the largest producer of rice bran oil in India, with a refining capacity of 300 tons per day. Their brand name is Ricela. Their refinery is located in Dhuri, Punjab, and was the first refinery in India to test enzymatic degumming on a plant scale in 2002.

A.R. Sharma, the managing director of A.P. Solvex, is therefore a pioneer in the Indian rice bran oil industry. He explains: "Phosphorus is the culprit and enzymatic degumming very neatly takes away the phosphorus from the oil. Our oil quality has improved since changing over from acid degumming with phosphoric acid to enzymatic degumming. In physical refining, the phosphorus content in the oil after pre-treatment should be less than 5 ppm, otherwise there is a risk of colour reversion in the deodoriser. In the case of acid degumming, normally 10-15 ppm phosphorus is left. In the case of enzymatic degumming, the residual phosphorus is almost zero. That's why the overall oil quality is better with enzymatic degumming than with acid degumming.

"Another factor is that the refining losses with enzymatic degumming are lower than with acid degumming. In the case of enzymatic degumming, the percentage losses of oil in the gums are about 0.3-0.5% compared to 1.6% with acid degumming. That amounts to a 1% increase in oil yields for us.

India



Traditional Indian vegetarian food served on banana leaves.

"The enzyme is a biochemical, so we can claim that our oil has been refined without using any inorganic chemicals. All the methods used are physical methods and no chemicals are used anywhere."

For more information, visit the A.P. Solvex website at www.ricela.com.

Bhatinda Chemicals

Bhatinda Chemicals Ltd. is the second largest producer of rice bran oil in India, with a daily production of 100 tons at the Bhatinda unit and 50 tons at their other unit, Kissan Fats Ltd in Jalalabad, west of Bhatinda. Their oil is sold under the name Home Cook. Like A.P. Solvex, they are located in the state of Punjab, India's largest rice-growing area.

Based on the initiative of managing director Rajinder Mittal, they have been using the enzymatic process since the

beginning of 2004 at the Bhatinda unit, and since September 2004 in Jalalabad.

"I see three important benefits of the new process: lower oil losses, low phosphorus content, and reduced pollution," says Ashok Mittal, general manager for R&D. "The enzymes convert the gums to lysolecithin. The oil content of this type of gum is low, so we are getting a minimal loss of oil. We save 0.8-1% in oil losses compared to our previous process with phosphoric acid.

"If you calculate chemical costs, the savings work out at more than 150 rupees per ton of oil compared to acid degumming. So this is another major benefit.

"With enzymatic degumming, the phosphorus content is 2 ppm after dewaxing compared to 8-10 ppm with acid degumming after dewaxing. This increases the stability of the oil. The quality and colour of

the oil are better. The oil is lighter in colour.

"With acid degumming, you have to wash the oil at least once with 10% water and this generates a lot of wastewater. However, with enzymatic degumming, water treatment is not necessary. Each wash removes about 0.25% of the oil, so enzymes reduce oil losses. We estimate that total oil yields increase with enzymatic degumming by 0.8-1% compared with acid degumming."

Foods, Fats & Fertilisers

One of the most recent converts to enzymatic degumming is O.P. Goenka, head of Foods, Fats & Fertilisers Ltd. in India. His company makes a rice bran oil sold under the brand name Tandul in Southern India. After conducting plant-scale trials, he plans to introduce the enzymatic process during the second half of 2005 on a new 75-ton-a-day production line for rice bran oil at the plant in Tadepalligudem in the rice-growing area of Andhra Pradesh. "The process is able to reduce the phosphorus content to almost zero before deodorisation," he states. "So the quality of the oil becomes better and colour reversion can be avoided. Many refiners in India are switching over to enzymatic degumming for the physical refining of rice bran oil." ●



"The introduction of enzymatic degumming is new thinking. It has benefited the whole rice bran oil industry," says Dr R.B.N. Prasad (fourth from the right), head of Lipid Science & Technology at the Indian Institute of Chemical Technology in Hyderabad, seen here with researchers from his division and J.S. Rao of Novozymes (fourth from the left).

FOR MORE INFORMATION
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