# Rice bran's liquid gold

**A 'balanced and versatile' cooking oil, a beneficial cosmetics ingredient and an 'economical and affordable' biofuel, rice bran oil (RBO) has a lot to offer. Charlotte Niemiec examines the growing popularity of this niche oil**

Rice is a staple for many diets across the globe. According to the Food and Agriculture Organization (FAO), rice is the second largest crop grown in the world, after corn (maize).

An April 2013 *Inform* article, 'Rice bran oil: nature's healthful oil' states that, in 2009, total world production of rice was 455.7M tonnes. FAO figures from 2011 show that the top five producers of rice are China, India, Indonesia, Bangladesh and Vietnam, which produced 202.6M tonnes, 155.7M tonnes, 65.7M tonnes, 50.6M tonnes and 42.3M tonnes, respectively.

To produce white rice – the rice most commonly sold – the brown, paddy rice (rough rice) is milled and polished. The husk that is polished off is called rice bran and is a good source of oil; the article states that rice bran contains 15% to 20% oil, depending on the cultivar, agricultural practice and extent of polishing.

Despite their huge rice production levels, not all the growing countries listed above produce rice bran oil. India produces the most, at 820,000 tonnes/year, but only 19% of RBO's potential is realised, even though rice is grown in many countries.

RBO has not enjoyed the popularity of other edible oils. According to Yi-Hsu Ju and Shaik Ramjan Vali, the authors of 'Rice bran oil as a potential resource for biodiesel: a review', the wax in RBO is difficult to remove completely, which gives the oil a haze, especially in colder climates. The authors explain that "this, along with the darker colour of the oil, has been responsible for the poor acceptance of RBO by consumers".

They continue: "Another major drawback in producing edible grade RBO from crude oil is its high [free fatty acid (FFA)] content. Freshly milled rice bran has a short shelf life because of the decomposition of lipids into FFA by lipases, making it less economical to process into edible oil for human consumption."

RBO is not a common source of edible oil compared to other traditional cereal or seed sources such as corn, cotton, sunflower or soyabean, states the report.

It is also not produced in large enough amounts to be considered a significant oil. If all the rice bran in the world was harnessed for oil extraction, the estimated potential yield of crude RBO would only be about eight million tonnes.

## A heart healthy oil

Nevertheless, RBO has enjoyed some popularity as a heart healthy oil. It contains 47% monounsaturated fats, 33% polyunsaturated fats and 20% saturated fats. It is composed of 38.4% oleic acid, 34.4% linoleic acid, 21.5% palmitic acid, 2.9% stearic acid, 2.2% α-linoleic acid and 0.6% myristic acid.

The oil has a high smoke point of 232ºC, making it suitable for high temperature cooking methods such as stir frying and deep frying, and it has a mild flavour. It is popular as a cooking oil in Asian countries such as Japan and China.

While it is used mainly for frying and cooking processes, it is also used in the preparation of nutraceutical products and there have been a number of studies into its potential as a biofuel.

The American Heart Association (AHA) has claimed RBO is the most versatile and balanced cooking oil available. A 19 September 2012 press release from the AHA revealed that a new study into RBO found it helped lower blood pressure in high blood pressure sufferers. The study involved a group of 300 people prescribed a common blood pressure medication. Those who took the medicine in conjunction with a blend of sesame and rice bran oil had more than twice the drop in blood pressure compared to either the group taking medication alone, or those only supplementing their diet with the oil blend.

Dr Devarajan Sanker, a research scientist at the Department of Cardiovascular Disease at Fukuoka University in Chikushino, Japan, says: "Additionally, [RBO] may reduce heart disease risk in other ways, including being a substitute for less healthy oils and fats in the diet."

Studies also suggest the RBO component 'gamma oryzanol' is effective in relieving hot flushes and other symptoms of menopause, while other potential benefits include modulation of pituitary secretion, inhibition of gastric acid selection, antioxidant action and inhibition of platelet aggregation. It has also showed some success in managing high fat-induced hyperlipidemia.

Finally, the biodiesel review report claims its phytic acid content of 8.7% is comparatively higher than that in other bran and seeds. Phytic acid exhibits strong anticancer activity and its hexasulphate content is claimed to inhibit the proliferation of Human Immunodeficiency Virus (HIV).

Historically, says Henk Hoogenkamp, research technician at the Nijmegen Centre for Molecular Life Science, rice bran was considered a waste product with little value because active enzymes caused rapid lipid degradation.

"However, the introduction of innovative lipase deactivation resulted in lipid stabilisation, which has allowed rice bran to move up into a higher hierarchy of the food chain," he says.

The *Inform* article explains that RBO was first extracted with food-grade hexane in India in the 1960s. It says oil extraction should be done on fresh bran or on the bran obtained soon after milling, to prevent the lipase action on bran oil and to ensure the quality of the extracted oil.

The article continues: "Refining of RBO is accomplished by two methods, one by chemical reaction with alkali, known as alkali refining/chemical refining; the other by steam stripping-vacuum distillation of FFA, known as physical refining. In addition to removing FFA, both processes involve the steps of degumming, dewaxing and bleaching.

Chemical refining involves the additional step of deodorisation."

## Use of RBO in health and cosmetics

Currently, several studies are being conducted around the world for RBO's use in cosmetics. According to rice reporting agency, Oryza, studies have shown that RBO has several beneficial properties for skin and hair.

The Solvent Extractors Association (SEA) of India states that RBO can be effective in treating itching of the skin and can be used as an anti-dandruff agent in the production of cosmetics. The association explains: "While the chemical 'tocopherol' that is found in RBO is an antioxidant belonging to the vitamin E group – which is good for the skin – another chemical, 'squalene' is beneficial in maintaining the tone of the skin."

Furthermore, cosmeticsdesign-europe.com, which provides daily news on the cosmetics industry and manufacturers in Europe, reports that a Vietnamese scientist had developed a method to make gamma oryzanol from rice bran, that can then be used in cosmetics and anti-ageing supplements. Gamma oryzanol is a complex of ferulic acid esters extracted from rice bran oil and, as such, it has biological properties similar to those of ferulic acid, which is a potent antioxidant. According to the news report, it has been used widely in manufacturing medicine, cosmetics and anti-ageing supplements for women, as well as being used as supplements to help develop muscles in the body and increase strength.

In addition, Oryza reports that a study is attempting to tap the potential of antioxidants present in rice bran to help fight colon and other kinds of cancer.

## Biofuel potential

As a potential biofuel, RBO has been largely neglected. Nevertheless, several studies have been carried out as to its potential, and biodieseltechnologiesindia.com explains that RBO is a "non-conventional, inexpensive and low-grade vegetable oil. If the by-products are derived from crude rice bran oil and the resultant oil is used as a feedstock for biodiesel, the resulting biodiesel could be quite economical and affordable."

The report claims that crude RBO is a rich source of high value-added byproduct and, therefore, use of RBO as a raw material for the production of biodiesel not only makes the process economical but also generates value-added bio-active components.

## Rice bran oil manufacturers

Dedicated manufacturers of rice bran oil are quick to point out the oil's health benefits. RiceBran technologies focuses on the processing and distribution of stabilised rice bran and other proprietary, rice bran-based ingredients and formulations.

The US company, headquartered in Phoenix, Arizona, has rice bran processing facilities in both north and south America. Its listed storage capacities are 5,000 tonnes in Dillon, Montana; 30,000 tonnes in Mermentau, Los Angeles; and 10,000 tonnes in West Sacramento, California. It has an additional plant in Arbuckle, California, but the company has not revealed its capacity.

King Rice Bran Oil, produced by the Thai Edible Oil Company, is one of the largest rice bran oil extraction plants in the world. In 1988, Thai Ruam Jai Vegetable Oil Co Ltd was founded to help the Thai Edible Oil Co expand production capacity for rice bran oil. In 2011, the latter expanded its extraction capacity to 200,000 tonnes/year of rice bran.

Other, smaller manufacturers include Surin Bran Oil Co Ltd, established in 1990 and located in Thailand. It has a 300 tonnes/day storage capacity and its rice bran oil refining plant handles 30 tonnes/day. The solvent plant of Indian company Shivangi Oils produces 200 tonnes/year of rice bran and 50 tonnes/day of RBO for refining. Its additional refinery unit, commissioned in 2008, has a capacity of 50 tonnes/day. ●

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RICE BRAN OIL HAS ANTIOXIDANT PROPERTIES AND IS CLAIMED TO HELP LOWER BLOOD PRESSURE (PHOTO: PIKKYSTOCK/ DREAMSTIME.COM)