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Popular Article

Blended rice bran and olive oil – moving towards a new cooking media

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Abstract

Vegetable oil plays a vital role in determining the human health due to its fatty acid composition. Today, a wide range of vegetable oils are available in the market but no single vegetable oil is able to meet recommendations given for healthy oil. So, blending of vegetable oils is gaining popularity to develop a healthier and stable vegetable oil so as to satisfy consumer needs. Blending has emerged as an economical way of modifying the fatty acid composition and physicochemical characteristics besides enhancement in oxidative stability. Rice bran oil has been proved best oil for blending due to its nutrient composition. Besides, the most recent approach has also been developed to increase oleic acid content of vegetable oil by means of direct blending so as to improve the oxidative stability of vegetable oils rich in polyunsaturated fatty acids. So, olive oil can be used for blending as it contains highest amount of oleic acid. In the present paper, status of rice bran oil and olive oil in India and health benefits of these oils have been reviewed and findings of our research study on blended rice bran and olive oil have also been summarized.

Keywords: Vegetable oil, Rice bran oil, Olive oil and Blending.

Introduction

Dietary fat in the form of edible vegetable oils is an integral to our diets, and comprises of an important source of calorie density in the human diet. In India vegetable oil is a main source of dietary fat. Vegetable oil plays a vital role in determining the cholesterol levels in the blood due to its fatty acid composition. In the body, fatty acids, used for the generation of cellular energy and biosynthesis of membrane lipids and lipid mediators, are essential in the development of central nervous system, modulate lipoprotein metabolism and risk for diet-related non-communicable diseases, namely, coronary heart disease (CHD), diabetes and cancers. High intakes of saturated fatty acids (SFA) increase blood levels of total and low density lipoprotein cholesterol (LDL-C) and accelerates the process of atherosclerosis. On the other hand monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) have the opposite effects (Ajay and Prabhakaran, 2010). The major cholesterol fraction, LDL-C is a strong atherogen since it favors deposition in tissues including blood vessels. Whereas high density lipoprotein (HDL) scavenges cholesterol from the blood and tissues and delivers to the liver where it is processed for excretion. The triglycerides are also important since they influence lipid deposition and clotting mechanisms. Thus, circulating levels of LDL and HDL cholesterol and triglycerides are measures of the risk of atherosclerosis (Vijaylaxmi *et al*., 2007).

Besides, the vegetable oils have nutritional value and health benefits due to the presence of essential fatty acids and many micronutrients as unsaponifiable matter such as tocopherols, tocotrienols, β-carotene, oryzanol, squalene etc, which have been reported for health benefits (Khan *et al*., 2011). Essential fatty acids are the precursors for prostaglandins which in turn play a key role in regulating many physiological processes in the body, such as controlling blood pressure,

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lowering blood cholesterol, preventing vascular damage in the brain and blood clot in the arteries (Neitzel, 2010). No doubt that dietary fat performs many important physiological roles but still it is desirable to limit the consumption of fats and oils. The quantity and quality of dietary fats and oils intake play a very important role in causing many of the diseases. The Indian Council of Medical Research (ICMR) has suggested desirable fat intake by providing 20 per cent energy in a normal diet which ensure 8-10 per cent energy from SFAs, and PUFAs each and 10-12 per cent energy from MUFAs (ICMR, 2010). Whereas, The World Health Organization (WHO) has recommended the total fat intake to be in the range of 30-35 percent with saturated fatty acids <10 per cent, polyunsaturated ted fatty acids 6-11 per cent and mono-unsatured fatty acids 10-14 percent (WHO, 2008).

A wide range of vegetable oils is available in the market. However, single vegetable oils are not up to standards to meet consumer satisfaction in terms of their physicochemical properties or for the texture and stability of the food products (Reyes-Hernandez *et al*., 2007). To combat this problem, blending of vegetable oils is gaining popularity in the oil industry to satisfy consumer needs. Several research studies have demonstrated the quality and properties of blended oils like sunflower and rice bran oil, sunflower and palm olein oil, soybean and palm olein oil, rice bran and mustard oil, coconut and groundnut oil, sesame and coconut oil (Bhatnagar *et al.,* 2009; Kennedy *et al.,* 2010; Siddique *et al.,* 2010 and Khan *et al.,* 2011), but no study has been reported to document the health benefits of blended rice bran and olive oil. In the present paper, status of rice bran oil (RBO) and olive oil (OO) in India and the health benefits of these oils have been reviewed and findings of our research study on blended rice bran and olive oil have also been summarized.

Blending – An emerging trend

Choice of healthy cooking oil has been a controversial subject since ideas keep on changing as new evidence accumulates. The food value of the edible oils depends on the chemical properties like iodine value, peroxide value, oxidative stability, acidity etc., as well as on some physical properties like solidification temperature, color, appearance etc. (Shibasaki and Yamane, 2000). To enhance the oxidative stability and plasticity of oil hydrogenation was developed. But it is now a well established fact that it produces trans fatty acids which have harmful effects on human health. These oils solidify in the food under cold conditions and thus discourage the consumer from using these oils. In fact it degrades the food's aesthetic value too (Siddique *et al*., 2010).

Short term scientific studies have found that vegetable oils e.g. soybean, sunflower, safflower, cottonseed had the ability to reduce total cholesterol but in due course of time evidence began to accumulate establishing that although PUFAs were effective in reducing the LDL-C but these were ineffective in controlling triglycerides and VLDL-C. Further, a very high content of PUFAs had the undesirable effect of reducing the 'good HDL-C' as well (Ghafoorunissa *et al*., 2002). The excessive intake of these oils could impair the ability of antioxidants in the human system to control free radicals and thereby enhance the risk of cardio-vascular disease (CVD) including hypertension, diabetes mellitus, hyperlipidemia, atherosclerosis, certain cancers and contribute to the ageing problem (WHO, 2008). It further came to light that since these oils contain very high level of PUFAs, therefore, the rate of oxidation of such oils is also very high as compared to those with high MUFAs and SFAs profiles. The shelf life of vegetable oils in food uses and their applicability in industrial situations is greatly dependent on their oxidative stabilities (Hooper *et al*., 2006).

So, the new concept with regard to cooking oil which is gaining popularity worldwide is blending of vegetable oils due to advantages like to improve thermal stability, oxidative stability, and nutritional benefits (Gulla and Waghray, 2011). The oxidative

stability, iodine value and peroxide value can be improved in this way to get good and desirable blends (Nor Aini and Sabariah, 2005). According to PFA (Prevention of Food Adulteration Act) 4th Amendment Rules 1992, blending of any two vegetable oils (wherein the component oil used in the admixture is not less than 20%) has been permitted so as to increase the overall availability of oils of consumers' choice and to ensure optimal health benefits (PFA, 1954). To improve the oxidative stability of vegetable oils rich in polyunsaturated fatty acids, the most recent approach has been developed to increase oleic acid content of vegetable oil by means of direct blending of oils, genetic modifications and compositional changes via chemical means (Aluyor and Jesu, 2008). Oleic acid is more stable towards oxidation both at ambient storage temperatures and at the high temperatures that prevail during the cooking and frying of food. Therefore, oils with high amounts of oleic acid are slower in developing oxidative rancidity during shelf life or oxidative decomposition during frying than those oils that contain high amounts of PUFAs (Abdulkarim and Ghazali, 2012).

Rice bran oil

India is the second largest producer of this non-conventional oil in the world (Ramesh and Murughan, 2008). India produces 120 million tonnes of paddy annually which contain 5-6 % of rice bran, leading to production of 6-7 million tonnes of rice bran oil. The technology for refining of rice bran has been standardized recently by Council of Scientific and Industrial Research (CSIR) and has already been tested. In India, about eight units are existing at present and another 4 such units are under construction (Usha and Premi, 2011). RBO proved to be the only edible vegetable oil with the fatty acid profile that is closest to the recommendations made by organizations like the WHO (Kusum *et al*., 2011). Oryzanol, which is a unique component of rice bran oil, is well known for its scientifically proven beneficial impact on raising good cholesterol (HDL-C) while reducing the bad cholesterol (LDL-C) particularly the triglycerides and VLDL-C. The natural antioxidants besides controlling blood cholesterol level also help in maintaining blood pressure and lowering blood glucose level via increasing the insulin sensitivity (Kuriyan *et al.,* 2005). Oryzanol is also beneficial in a range of other ailments including gastrointestinal disorders and nerve imbalance. It is also known to have a significant effect on menopause by alleviating the menopausal symptoms like hot flashes (Patel and Naik, 2004). Rice bran oil's other components like tocotrienols and squalene have powerful anti-cancer and anti-ageing properties (Sierra *et al*., 2005).

The high oxidative stability of RBO makes it preferred oil for frying and baking applications (Usha and Premi, 2011). Studies have shown that snacks prepared in rice bran oil absorb 12-25 percent less oil than those prepared in groundnut oil. It is the best oil for deep-frying and everyday cooking. An additional advantage of RBO is that eatables fry faster in RBO and absorb less oil while it also has an excellent keeping quality and oxidative stability (Sugano and Tsuji, 2008) Besides, blending of oil with RBO has also been found to improve the stability of the blend during frying and storage (Gopal *et al*., 2005). Despite of large production and health benefits, RBO is less popular in Indian households due to lack of awareness about this vegetable oil.

Olive oil

India is only a consumer and not a producer of olive oil. India presently imports its olive oil requirement from countries largely forming part of the EU (Waterman, 2007). As per the Indian Olive Association (IOA), India presently consumes 4,500 tons of Olive oil per year. The consumption has grown by 73% in the last two years. Further, IOA forecasts that the consumption of Olive oil in India is expected to grow to 42,218 tons by 2012, translating a whopping 75% CAGR growth over

the next four years (Ghosh *et al*., 2011). Olive oil has generated immense interest amongst the higher income group in India (around 35 million) as studies have been proven that it works very well in lowering cardiac diseases substantially (Bermudez *et al*., 2011).

Olive oil contains a wide variety of valuable antioxidants that are not found in other oils. Hydroxytyrosol is thought to be the main antioxidant compound in olives and believed to play a significant role in the many health benefits attributed to olive oil (Turner *et al*., 2005). Olive oil contains the monounsaturated fatty acid oleic acid, antioxidants such as vitamin E and carotenoids and oleuropein, a chemical that may help prevent the oxidation of LDL particles (Coni *et al.,* 2000). Consumption of olive oil can provide heart health benefits such as favourable effects on cholesterol regulation and LDL cholesterol oxidation and it also exerts anti-inflammatory, antithrombotic, antihypertensive as well as vaso-dilatory effects both in animals and in humans (Fito *et al*., 2005; Ostrowska *et al*., 2006 and Covas, 2007). Monounsaturated fatty acids are highest in olive oil 67.0 per cent In recent years there has been an interest in monounsaturated fatty acids as a suitable replacement for saturated fatty acids. Their net effect on serum lipids and proteins is not much different from polyunsaturated fatty acids but they are not as susceptible to oxidation which may play a role in artherogenesis (Samieri *et al*., 2011).

Blended rice bran and olive oil

Keeping in mind the nutritional value of RBO and OO, the blending of these oils was done in two ratios i.e. 80:20 and 70:30 to develop healthier and stable blended oil. We found that RBO+OO in the ratio of 80:20 contained 21.1 percent SFA, 42 percent MUFA and 36.9 percent PUFA whereas the percentage of SFA, MUFA and PUFA present in RBO+OO (70:30) was 19, 47.6 and 33.4 respectively. Oleic content of RBO+OO (47.6%) in the ratio of 70:30 was higher than RBO+OO (42%) in the ratio of 80:20. The percentage of oleic acid in both ratios was higher than RBO (38.0%) and lower than OO (68.5%). Oleic acid had been described to reduce the cardiovascular risk by reducing blood lipids, mainly cholesterol (Lopez-Huertas, 2010 and Stephens *et al*., 2010). The amount of linoleic acid in RBO+OO (36.9%) in the ratio of 80:20 was higher than RBO+OO (33.4%) in the ratio of 70:30 but the percentage of linoleic acid in both ratios was lower than RBO (46.6%) and higher than OO (15.6%). Scientific studies have demonstrated the potential beneficial effects of PUFA for chronic diseases including cancer, insulin resistance and cardiovascular disease (Ruxton *et al*., 2004; Gibson *et al*., 2011 and Anderson and David, 2009). Results showed that blending improved the fatty acid ratio of RBO+OO i.e. 1:2:1.7 and 1:2.5:1.7 in the ratio of 80:20 and 70:30 respectively. In terms of physicochemical properties RBO+OO (70:30) showed appropriate smoke point (200°C) and frying temperature (175°C), and had low acid value (0.19 mg KOH/g) as well as a low percentage of free fatty acids (0.09%). Also, in terms of oxidative stability and antioxidant activity, RBO+OO (70:30) showed least percent increase (30.3 %) in peroxide formation after 28 days of incubation period and had the highest content of total natural antioxidants (2525.0 mg/kg) except RBO (2968.3 mg/kg) and highest radical scavenging activity (67.7 %).

Conclusion

Thus, blending of non conventional oil (RBO) with traditional oil (olive oil) to make stable and healthier blended oil can be done at reduced cost. However, proper promotion of blended rice bran and olive oil as health oil remains the most important factor in increasing its acceptability as cooking oil among the masses. Moreover, as India imports considerable quantity of edible oil, use of domestic rice bran oil for blending will help in import substitution, thus

saving valuable foreign exchange**.** With rapid urbanization, rising income levels and the spread of mass communication tools such as satellite television and the internet, the future of healthy cooking oil industry looks bright in India. But to realize the full growth potential, the players have to raise awareness among the rapidly growing population about healthy oils.

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