

CHAPTER 1

INTRODUCTION

Rice (the grass family *Oryza sativa*) is a unique crop of great antiquity and akin to progress in human cultivation. It is the grain with the second-highest worldwide production, after corn. As a main source of nourishment for over half the world's population, rice is by far one of the most important commercial food crops. It is cultivated in more than 100 countries on every continent except Antarctica. Asia, where people typically eat rice two or three times daily, grows and consumes 91 percent of the world's rice (International Rice Research Institute, 2009).

Rice farming has been traced back to around 5000 BC and more than 140,000 varieties of cultivated rice are thought to exist today, but the exact number remains a mystery. Yield of rice worldwide is approximately 535 million tons annually and 65 kilograms of rice are milled annually for every person on earth. Currently, Sri Lanka produces about 3.9 million metric tons of rice per year, occupying nearly 17 % of the total agricultural land (FAOSTAT, 2013).

The rice seed (paddy) mainly consists of the husk (hull), rice bran, rice germ (embryo) and white rice (endosperm). Rice bran is the by-product of the rice milling process. Pericarp, seed coat, nucellus and aleurone layer are the constituents of rice bran. Rice bran and rice germ are rich in protein, lipids, dietary fiber, vitamins and minerals. These components lead to a high demand for those as feed. Rice bran, mixed in adequate quantities with other ingredients, can be used to feed domestic animals.

Rice bran contains 15-20% of oil. Rice bran oil is a good resource of vegetable oil with unsaturated fatty acids and many valuable components. It is an edible oil because of its high oleic acid content (about 50%) and high linoleic acid content (about 40%). Unsaponifiable ingredients such as oryzanol, a mixture of ferulic acid

esters of sitosterol and cycloartenol, are unique to rice bran oil and have ability in reducing blood serum cholesterol level. Free-radicals may cause cancer and cardiovascular disease and Oryzanol, which is a natural antioxidant, fights free radicals. The presence of tocopherols gives high oxidative stability to the oil. Tocotrienol, a type of vitamin E, helps inhibit cholesterol synthesis and phytosterol, helps decrease cholesterol absorption (Rajarajan & Gopalakrishna, 2009).

The rice bran when exposed to damp atmosphere readily absorbs moisture. The lipase enzyme present in the bran becomes very active and splits the oil into free fatty acids, making oil unfit for refining and edible purpose. Steaming, hot air drying in a fixed bed, refrigeration and chemical stabilizations are effective methods of bran pretreatment, in order to inactivate the lipolytic enzymes (lipases) present in native rice bran (Amarasinghe & Gangodavilage, 2004).

In Japan, U.S., and Thailand, Rice Bran Oil or Oryza Sativa Bran Oil is well-known as an ingredient in cosmetics and spa products because it is high in natural antioxidants. This benefit leads to slower skin degeneration and therefore it is anti-aging in a natural way.



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The main objective of this research is the extraction of oil from different varieties of rice bran available in Sri Lanka using Iso propyl alcohol as the solvent and analyzing their properties, so that the effect by the different variety is identified.

Single stage extraction has been practiced in the soxhlet extraction apparatus to determine the oil yield from bran varieties using Iso propyl alcohol as the solvent. Three stage cross-flow extraction was tested as the second phase of the project. Furthermore, batch experiments were carried out to determine the Mass Transfer Coefficient for rice bran oil extraction. The oil was analyzed using Gas Chromatography and the properties were analyzed.

This thesis starts with the critical analysis of the rice bran oil extraction, composition, properties and uses based on the findings from literature. In Chapter 3, the

procedures followed in the experiments are described. The results are discussed in Chapter 4 and the conclusion and suggestions are noted in Chapter 5. The reference list, other related information and detailed calculations, etc. are given at the end of the thesis as appendices.



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