CHAPTER 5

CONCLUSION

Rice bran contains about 12-25 % oil and this value varies depending on the variety of bran. Nearly 98 wt. % of the available oil is extractable and solvent extraction is an effective method for rice bran oil extraction. There is a wide range of uses for rice bran oil and it's by products.

Lipase promotes the hydrolysis of the oil in the bran into glycerol and free fatty acids and stabilization of bran is required prior to oil extraction. Extraction and refining of rice bran oil using Iso Propyl Alcohol for six different varieties of oil has been addressed by this work to a great extent. Steaming has been used for stabilization and extracted oil percentage varied between 10-19 % of the six varieties. Genetic differences, degree of polishing and porosity of the bran particle are the main causes for difference in oil yields.

Analysis of oil in terms of free fatty acid content, saponification value, unsaponifiable matter, Iodine value and specific gravity showed differences mainly due to genetic and physiological characteristics of the paddy. Small variations of the results for the same type is primarily due to human error. The fatty acid composition obtained via the GC is quite similar in various types; except for minute differences in the values and fatty acid types. Genetic variations of the types could be the reason for this difference.

Extraction time is an important aspect for solvent diffusivity through bran. The oil extraction rate reduces with time arriving at a constant value at the end. Mass transfer coefficient can be calculated using the concept of a thin film and different varieties have different coefficients as diffusion of the solute does not take place in the same way in all types. The mass transfer coefficient values obtained for two different types of bran were almost the same as the saturation concentrations were close. If the

volume of solvent, mass of the pellets, radius and length of a pellet and the plot of concentration vs. time for a certain type is given, the concentration at any time can be determined.

Regeneration of the solvent takes place in cross flow extraction and since similar purity is attained for the second and third extractions, this is an effective extraction technique. In cross flow extraction, percentage of oil extracted reduces from the first to the last stage at any variety. From stage one to three, solute composition in both extract and raffinate phases reduces while the solvent composition increases. However, this is ideal only when there is only one component to be extracted, for multi component system extractions, countercurrent extraction can be used.

Parboiled bran has lower rate of lipolysis compared to the raw bran and this is due to inactivation of the lipolytic activity during boiling in parboiling treatment. Further the parboiled bran has higher amount of extractable oil content and lesser amount of free fatty acids. Parboiling could help in lesser breakage of kernels and it is high in protein, fat, fiber and ash. However, Parboiled bran gives darker oil than the raw bran and it could have problems such as increased toxin producing capacity and self-ignition in the dryer by sticking to dryer surfaces.

Rice Bran Oil is one of nature best-kept secrets. It has applications in both edible and non-edible industries. The byproducts of rice bran oil such as wax are also versatile. The increase in the petroleum price and the environmental advantages has made the researchers find a solution through rice bran oil to produce bio-diesel. LD356, out of 6 tested varieties, seems to be the most suited for biofuel production, from the varieties tested. However, use of edible oil for fuels is in debate for developing countries today.

Nutritionally important phytoceuticals in rice bran oil makes it glow in the pharmaceutical industry. High oleic and low linolenic contents are favored with high unsaponifiable matter content. BW364 which gives the highest unsaponifiable matter content has the best potential for pharmaceutical production.

Rice bran oil is full of antioxidants and it is known as the 'worlds healthiest oil'. When comparing the fatty acid compositions of LD356 and AT307 for food applications, LD356 seem to be the best option. From the 6 types of bran tested, LD356, BG360 and BG352 is the order of suitability in descending form for food when the unsaponifiable matter and FFA content is taken into consideration.

As a skin and hair beauty enhancer rice bran oil is used for the cosmetic and personal care industry, throughout the world. When comparing the fatty acid composition of LD356 and AT307, the latter seem to be a better option for spa and personal care products. BG352 is the variety which has average values in saponification value, Iodine value and unsaponifiable matter and can be considered as the acceptable type for this use. Rice bran wax is highly recommended for food and cosmetic applications in terms of coating.

Number of suggestions can be made to improve this work:

I. To carry out GC analysis and cross flow extractions for the types BG360, BG450, BW364 and BG352 as well.
II. To determine the mass transfer coefficient of oil obtained from types BG360, BG450, BW364 and LD356 as well.
III. To develop a computer model to determine optimal operating conditions for batch extraction process.
IV. To analyze the wax to investigate suitability for pharmaceutical, food and cosmetic applications.
V. To test the extracted rice bran oil for the unsaponifiable content in detail.