

Extraction of Gamma Oryzanol from Rice Bran Lecithin

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Abstract - Rice Bran oil is uncommon among the edible oil due to its high source of nutritionally and commercially important phytochemicals like oryzanol, lecithin, tocopherols, etc. The by-products obtained from the Rice Bran oil Refining are available as waste in the market, hence this waste is obtained at lower price which also contains Rice Bran oil to a few extent. The by-product mainly includes wax and lecithin. This research work is based on the extraction of gamma oryzanol which occurs in Rice Bran oil at the level of 1-2% by liquid-liquid extraction method and its characterisation by thin layer chromatography.

Key Words: Rice Bran Oil, Lecithin, Gamma Oryzanol, Liquid-Liquid Extraction.

1. INTRODUCTION

Rice Bran oil is mainly extracted from the rice bran by means of solvent extraction process using the food grade n-hexane.⁽¹⁾ The colour of crude rice bran oil is dark greenish brown or light yellow depending on the condition of the bran, extraction method, and composition of the bran. This crude rice bran oil obtained is subjected to either chemical or physical refining.⁽²⁾ Refining of the crude rice bran oil involves dewaxing, degumming, neutralisation of free fatty acid, bleaching and steam deodourisation.⁽³⁾

The phospholipids in rice oil are similar in composition to other oil sources, this may be recovered as rice bran lecithin. The different process used in the refining caused high refining loss in the form of wax sludge, gum sludge and soap stock.⁽⁴⁾ The residue obtained has many biochemicals like tocopherols, lecithin, vitamin E, wax and oryzanol.⁽⁵⁾

Gamma oryzanol is phytochemical, has antioxidant activities and potential health benefits. Gamma oryzanol is a group of ferulic acid esters of phytosterols and triterpene alcohols that serve as a natural antioxidant that has been used widely in food, cosmetic and pharmaceuticals industries.⁽⁶⁾⁽⁷⁾

The article describes the extraction and its characterisation of gamma oryzanol by the TLC method.

2. MATERIALS AND METHODS

2.1 Materials.

The Rice Bran lecithin was donated by the local oil company. Acetone and Petroleum Ether, used for the de-oiling of the

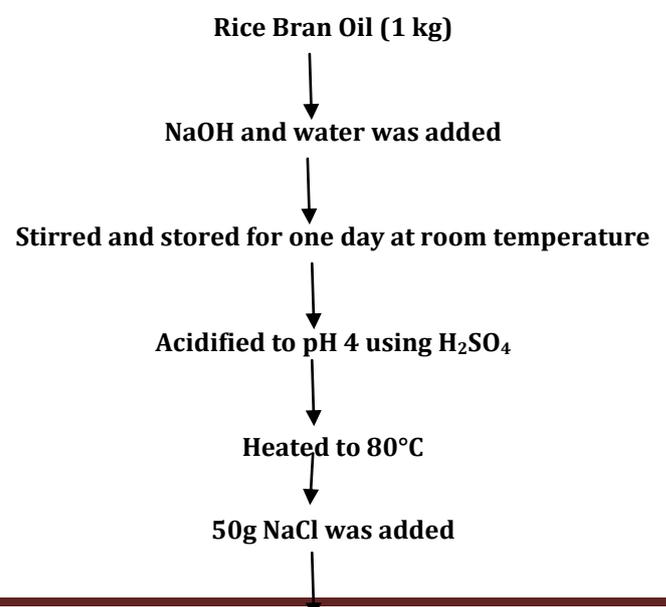
lecithin, was purchased from the chemicals. Sodium Hydroxide, Sulphuric acid, methanol were used in the extraction of the gamma oryzanol. n-hexane and ethylacetate were used for the TLC method. All the chemicals used were of analytical grade and were used as received without further purification.

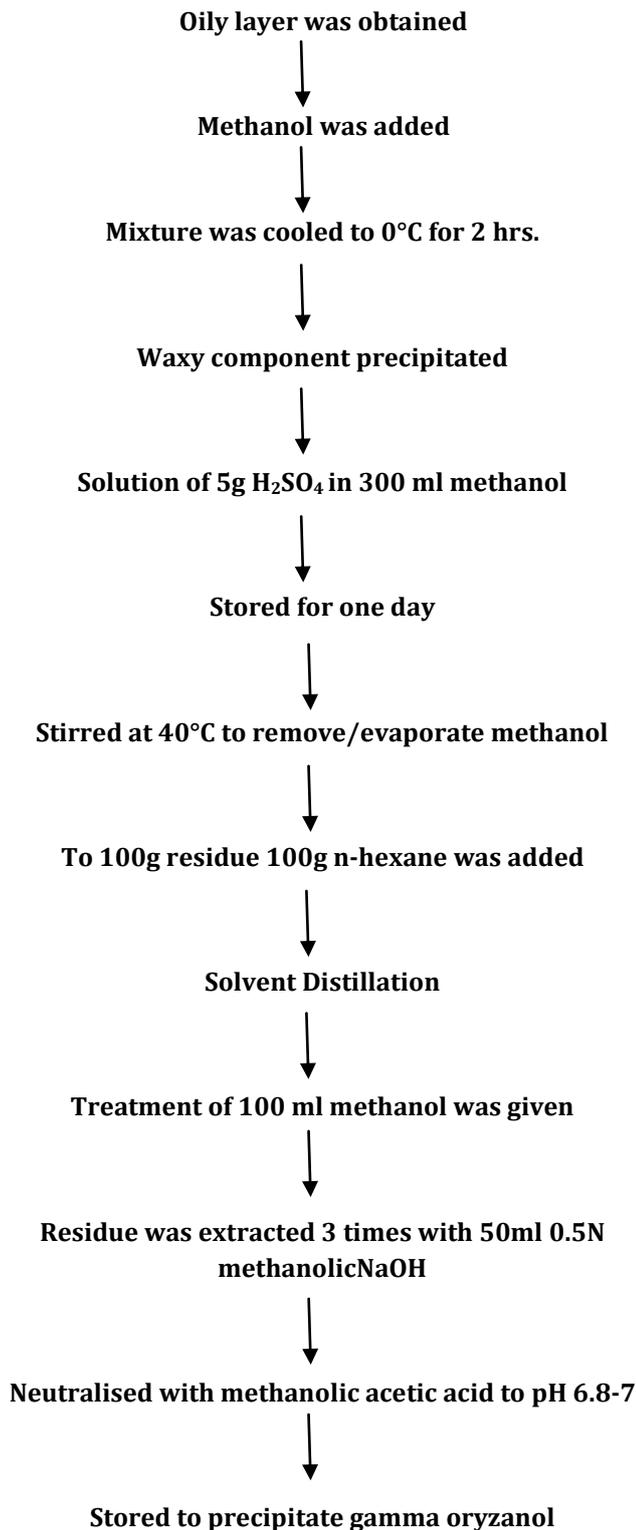
2.2 Extraction of oil from Lecithin (De-oiling of Lecithin)⁽⁸⁾⁽⁹⁾⁽¹⁰⁾

Rice bran lecithin was first heated to 40°C-50°C and then petroleum ether was added followed by agitation. Acetone was then added to this mixture and was agitated for about 30 min. This mixture was kept undisturbed for one night to allow the solid residue to settle. The above liquid layer was separated and filtered. This Liquid layer was centrifuged at 3500 rpm. Two layers were formed, the lower layer was of oil which was separated and taken to simple distillation process to remove the traces of solvent. The processed oil was then acid degummed using phosphoric acid to remove any gums.

2.3 Extraction of gamma oryzanol from processed oil.⁽¹⁾⁽⁷⁾⁽¹¹⁾⁽¹²⁾⁽¹³⁾

Gamma oryzanol can be extracted by liquid-liquid extraction method by using organic solvent or by using supercritical extraction method. The following procedure was followed to extract gamma oryzanol from the oil.





3. CHARACTERISATION

Table 1: Analysis of lecithin

Properties	Values
Acid Value	39.7
Saponification Value	115.192
Iodine Value	7.423
pH	5

The yield of the oil from lecithin was found to be 13.37%.

The yield of gamma oryzanol was found to be 2.2%.

4. RESULTS

Analysis by TLC:

The TLC (Thin Layer Chromatography) is carried out to confirm the presence of gamma Oryzanol:

1. In this method two phases were taken stationary phase and mobile phase.
2. Hexane + ethyl ether is taken as the mobile phase and TLC plate is used as the stationary phase.
3. TLC Plate is generally coated with the silica gel.
4. One side is taken as the base side and mark with pencil from about 1 cm from bottom.
5. The sample which is to be analyzed is applied on the line.
6. The TLC plate is then kept into the closed chamber consisting solvent (mobile phase).
7. The level of solvent should be lower than that of the pencil mark to avoid dissolution.
8. Solvent is saturated.
9. After that keeping plate, the beaker is closed, solvent travels upwards via capillary action.
10. The TLC plate is then dried and observed in presence of the Ultraviolet light.
11. Black spots are seen and presence of Oryzanol is confirmed.

γ -Oryzanol was successfully extracted.

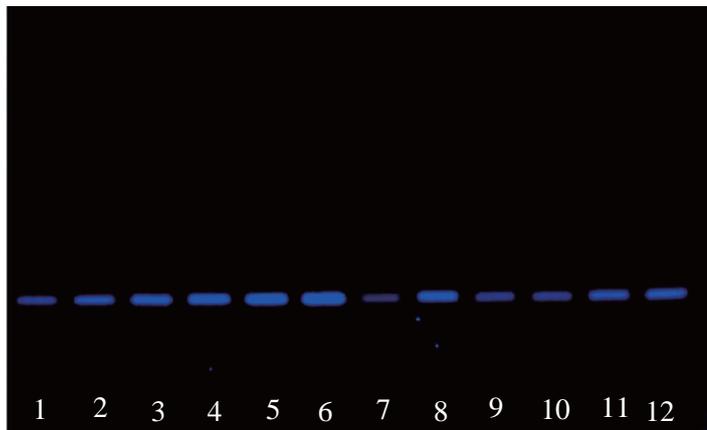


Figure 1: TLC-Photo documentation of γ -Oryzanol

5. CONCLUSIONS

Oryzanol is the high value compound that can be isolated from the oil obtained from deoiling from lecithin and soap stocks produced during the process of chemical refining. The advanced processes like supercritical extraction and fluid extraction can be used for the gamma oryzanol extraction. By using the solvents Petroleum ether: Acetone (1:3) the yield of the oil from the de oiling process of lecithin can be increased. Oryzanol is the high value products having many pharmaceutical uses.

India has become the second largest producer of rice bran oil which uniquely contains γ oryzanol. This high value compound can be isolated from physical refined oil and from the residual soap stock produced during chemical refining of the oil. Therefore, processors of rice bran oil should exploit this situation for their economic advantage to produce high value products for pharmaceutical and nutraceutical use. The new separation process like supercritical and fluid extraction can be utilized for γ -oryzanol extraction. Also, more R&D work should be undertaken for development of a low-cost refining process (for RBO) retaining maximum percentage of γ -oryzanol in the refined oil.

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REFERENCES

[1] Comparison of alternative solvents for oil extraction, Johnson LA & E.W. Lusas, J Am oil chemsoc. 60(1983) 229-242

[2] Extraction and purification of oryzanol from Rice bran oil and Rice bran soapstock, A.V. Narayan, R.S. Barhate

and K.S.M.S. Raghavrao, JAOCS, vol. 83 no.8(2006).663670.

[3] Rice Bran Oil, Frank T. Orthoefer, Alton-e-Bailey,J.W. Wiley Sons,Inc New York, 5ed, vol.2 1996.

[4] Value added products from Rice Bran Oil industry, Gopalkrishna AG, SAARC oils and fats (aug 2003)20-23.

[5] Value addition in paddy processing SAARC oils and fats, A.R. Sharma, SAARC oils and fats (June-July) 25-26.

[6] Antioxidant activity of gamma oryzanol: Mechanism of action and its Effect on oxidative stability of pharmaceutical oils, Juliano C; Cossu M; Alamanni M C;PiuL,Int. J. Pharma 299(2005), 146-154.

[7] Recovery of gamma oryzanol from Rice Bran Acid oil by Acid-Base extraction method with the assistance of response surface methodology, PirapornSombutsuwan, AkkaradechNakornsaded, Journal of Oleo Science 67, (2018) 1405_1415.

[8] Rice Bran Lecithin: Compositional, Nutritional, and Functional characteristics, Ram Chandra Reddy Jala and R.B.N. Prasad; Center for Lipid Research, CSIR Indian Institute of Chemical Technology, Hyderabad India, 35-55.

[9] Tool box for modification of lecithin, Steven D. Doig, Rob MMDiks, Eur.J.Lipid Science Technology .105 (2003) 368-376.

[10] Modification of Lecithin by physical, chemical, and enzymatic methods, Amit Joshi, Swarupa G. Paratkar, Bhaskar N. Thorat, Eur.J. Lipid Sci, Technology. 108 (2006) 363373.

[11] Extraction of gamma oryzanol from Rice bran oil, Renata Heidtmann-Bemvenuti, NathaliSairo Nora, Eliana Badiate-Furlong, Cienc, agrotech, Laurus Vv.36, n.6, (dec 2012) p 665-673.

[12] Comparision of supercritical fluid and solvent extraction method in extracting gamma oryzanol from Rice Bran, Zhimin Xu and Godlr Samuel J, J Am oil chemSoc 77 (2000) 547-557.

[13] Gamma oryzanol from Rice Bran Oil, M. Patel and S.N. Naik, Journal of scientific and Industrial Research, Vol.63, (july 2004), 569-578.