Rice bran

by Endah Uad

Submission date: 11-Aug-2023 11:00AM (UTC+0700)
Submission ID: 2144256043
File name: Sulistiawati_Suhartanti-2011-Rice_Bran_Oil.pdf (509.06K)
Word count: 1901
Character count: 9530

Rice Bran Oil Processing from IR64 Rice Bran by Fermentation with Yeast

Endah Sulistiawati and Dwi Suhartanti

Chemical Engineering Study Program, University of Ahmad Dahlan
Biology Study Program, University of Ahmad Dahlan
UAD Campus III, Jl. Prof. Soepomo, Janturan, Warungboto, Yogyakarta 55164
Tel. (0274) 563515, Fax.(0274)564604
Email: endah100@yahoo.com

Abstract. In the rice milling process, a byproduct obtained in the form of bran (8-12%) which is the epidermis. Rice bran contains 10-13% oil, with the content of unsaturated fatty acids are high (80 percent). One way to enhance the benefits of bran is to separate the oil to be used as cooking oil. The objective of this research was determining the optimum condition for producing rice bran oil by fermentation.
Fifty grams of rice bran was added with 50 ml of warm water, then added yeast as the ratio (1:1:0.1; w: v: w), incubated during 21 hours. After the fermentation process completed, all the materials were added with 50% ethanol, filtered, then distilled.
This research concluded that the optimum condition for producing the rice bran oil is fermented with bread yeast during 21 hours, which was 26.882 g of 50 g bran, 2.5 times better than the control (without yeast) which produce only 10 g of oil. Second oil gained was 24.913 g of bran using tempeh yeast.

Keywords: *bread yeast, IR 64, rice bran oil, tape yeast, tempeh yeast.*

1 Introduction

In the process of a rice mill grinder, a byproduct obtained in the form of bran 8-12% which is the cuticle. Besides these results actually have a use-value and economic well if handled with care to increase the value added in agro-industry system of rice in the countryside. Bran oil contains 10-13 percent achieved by the content of unsaturated fatty acids are high at 80%.

Rice bran oil [synonyms: Rice oil; *Oryza sativa* L] means the oil derived from the layers around the endosperm of rice. Making process of rice bran oil still using conventional methods of solvent extraction, or heating such as by making the process of other cooking oil (for examples: palm oil, soybean oil, coconut oil) [3]. Although there is another way of provocation by the VCO used in the making, it is necessary to do the process of making rice bran oil by using services microorganisms especially yeast, so that the quality and quantity of rice bran oil obtained will be better [5].

Pure coconut oil processing performed by the Philippine community with traditional fermentation methods, the way fermented for 24-36 hours, and laboratory testing showed that pure coconut oil is very high quality of Lauric acid containing about 50-55% [5].

Microbes have a significant role of the cell can be utilized in the field of biotechnology and activities as well as compounds produced components can be utilized. Some of microorganism produces microbial enzymes. There are several microorganisms that have a useful enzyme to break down complex compounds such as polysaccharides, proteins, and fats. Leaven bread is the main source of supply of the enzyme invertase, maltase, and protease zymase [4]. Enzyme-producing microbes can separate or break the protein in organic materials that contain oil. Enzymatic manufacturing process can be done with a simple way, namely by making use of microbes in tempeh yeast [7].

Jahani et.al have researched the response surface methodology, was used to determine the optimum processing conditions for enzymatic degumming of rice bran oil. Reaction time, enzyme dosage, level of water added and temperature were the factors investigated with respect to phosphorus and free fatty acids contents. Applying desirability function method, optimum operating conditions were found to be reaction time of 4.07 h, enzyme dosage of 50 mg/kg, added water of 1.5 ml/100 g and temperature of 49.2 °C. At this optimum point, phosphorous and free fatty acids contents of degummed oil were found to be 8.86 mg/kg and 2.01 g/100 g as oleic acid, respectively [8].

2 Research Methods

The raw materials in this research were rice bran type of IR64, bread yeast, tape yeast, tempeh yeast, and aquadest. The materials used for the analysis of Saponification Value and Free Fatty Acid were KOH, alcohol, phenolphthalein indicator (pp), and NaOH.

Fifty grams of rice bran was added with 50 ml of warm water (aquadest), then added yeast as the ratio (1:1:0,1; w: v: w), incubated during 21 hours, at room temperature and neutral pH. After the fermentation process completed, all the materials were added with 200 ml of 50% ethanol, were mixed well and afterwards filtered. After filtering the mixtures, the filtrate that contains oil, alcohol, and water were distilled at 78ºC temperature to separate the alcohol from oil and water mixture. The mixture of oil and water were dried in oven at 110ºC until constant weight to obtain the crude rice bran oil (RBO). Then, RBO were analyzed saponification value (SV) and free fatty acid (FFA) content.

3 Results and Discussion

Rice bran was fermented by three kinds of yeast. There were Bread yeast, Tempeh yeast, and Tape yeast. The time of fermentation was 21 hours, at room temperature and neutral pH. After all the processes finished, the results of rice bran oil was measured, in grams. All results as shown in the table 1 and figure 1.

ISBN 978-979-98300-1-2

Table 1 Rice bran oil results (in grams) from IR64 rice bran by fermentation with yeast (fermentation time 21 hours, room temperature, neutral pH)

	Sample			Mean
Yeast	1	2	3	
Control	10.7	9.2	10.1	10
Bread yeast	28.366	27.136	25.144	26.882
Tempeh yeast	25.438	24.813	24.488	24.913
Tape yeast	21.069	22.014	21.474	21.519

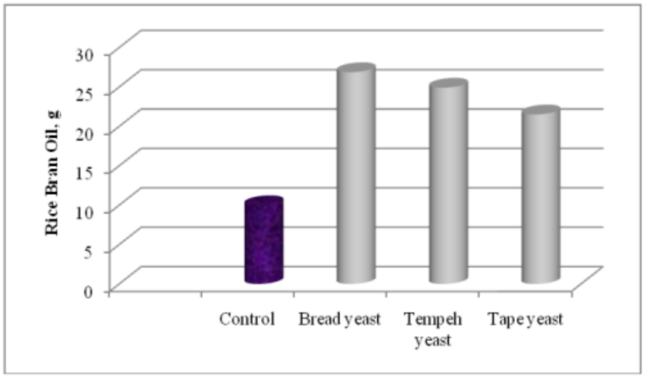

Figure 1 Rice bran oil result (g)

Figure 1 shows that the most rice bran oil is produced bread yeast. The control of 50 g rice bran gave average yields only 10 g of oil. Leaven bread is the main source of supply of the enzyme invertase, maltase, and protease zymase [4]. Protease enzyme produced by bread yeast will describe proteins that surrounded the oil molecules, so the oil can be produced more. Enzyme-producing by microbes that can separate or break the protein in organic materials contain oil. Enzymatic manufacturing process can be done with a simple way, namely by making use of microbes in tempeh yeast [7]. Fermentation process is influenced by the type of microbes and substrate used [2,5].

The Saponification Value of crude RBO was analyzed, in mg KOH/g oil. The results can be shown as the table 2 and figure 2. According to Codex [9], the Saponification Value of commercial RBO is in the range180-199 mg KOH/g oil. So, crude RBO from this research was out of the range. In the next time, it needs purifying of crude RBO.

Table 2 Saponification Value (SV) of crude RBO using the three kinds of yeast (fermentation time 21 hours, room temperature and neutral pH)

Yeast	Sample			Mean SV, (mg KOH/ g oil)
	1	2	3	
Control				51.12
Bread yeast	67.712	66.187	66.966	66.955
Tempeh yeast	77.657	77.032	76.614	77.101
Tape yeast	333.611	332.957	332.543	333.037

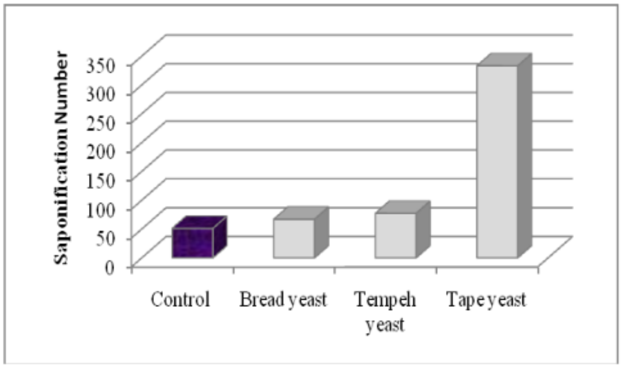

Figure 2 Saponification Value of crude RBO using the three kinds of yeast

From Figure 2 it appears that the highest Saponification Value is resulted from fermentation by tape yeast, the number was 333.077. In the tape yeast, there is a mix of microbial populations, in which there are species of the genus *Aspergillus*, *Saccharomyces*, *Candida*, *Hansenula*, and the bacteria *Acetobacter*. The genus live together in synergy in the fermentation of rice bran [1,2]. Oil fermentation can be done by using enzymes or by microbes inoculum that produces the protease enzyme. Enzymes is necessary to hydrolyze proteins or damaging surrounding globula fat, and macromolecules that bind cellulose especially globula fat, hemicellulose, and pectin. These enzymes, among others can be obtained from bread yeast, tempeh yeast, and tape yeast.

Table 3 Free fatty acid of resulted RBO

Yeast	Sample			Mean FFA, %
	1	2	3	
Control				11.10
Bread yeast	5.59	5.77	5.81	5.26
Tempeh yeast	6.49	6.54	6.72	6.58
Tape yeast	9.62	9.83	9.79	9.75

ISBN 978-979-98300-1-2

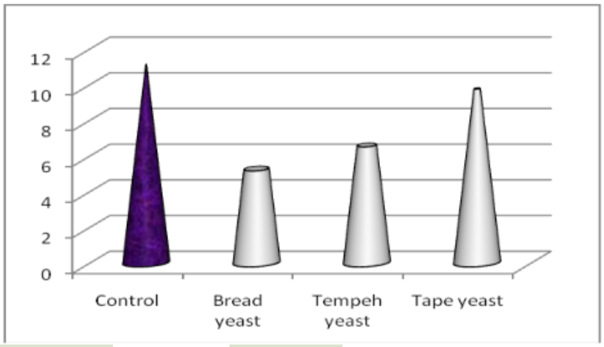

Figure 3 Free Fatty Acids numbers of rice bran oil produced using yeast fermentation

Figure 3 shows that the highest FFA in RBO was contained in rice bran oil control (with no yeast treatment). The lowest FFA was contained in RBO from bread yeast fermentation, 5.26%. In wheat germ oil, the free fatty acid (FFA) content of the crude oil is usually very high and quite variable (5–25% is typical), depending upon the conditions of germ separation, germ storage, and oil extraction. FFA often contributes to bitter and soapy flavor in food. Wheat germ oil is usually dark-colored and may have strong odor and flavor depending on the oxidative condition of the oil. Therefore, it is desirable to remove FFA as much as possible [6]. The crude RBO from this research had dark color, and it needed purifying. The research of Jahani et al. that used enzymatic degumming process gave free fatty acids contents of degummed oil was 2.01 g/100 g as oleic acid [8].

4 Conclusion

From this research, it was concluded that the best condition for producing the rice bran oil was fermentation with bread yeast during 21 hours (at room temperature and neutral pH), which resulted 26.882 g of 50 g bran. It was 2.5 times better than the control (without yeast) which produced only 10 g of oil. The second oil gained was 24.913 g of RBO using tempeh yeast. The third was 21.519 g using tape yeast. The highest saponification value was obtained by fermentation with tape yeast. The lowest FFA was fermentation using bread yeast.

5 References

[1] Atlas, R.M., *Principles of Microbiology*, 2 ed, pp. 820-827, Wm.C. Brown Publishing, Tokyo, 1996.
[2] Dwidjoseputro, "*Dasar-Dasar Mikrobiologi*", ed 13. pp.146-155, Penerbit Djambatan, 1998.
[3] Hadipernata, M., *Mengolah Dedak Menjadi Minyak (Rice Bran Oil)*, Warta Penelitian dan Pengembangan Pertanian, **29** (4), 8-11, 2007.
[4] Medicafarma, *Yeast*, http://medicafarma.blogspot.com/2008/06/pembuatan-ragi.html, (2008).
[5] Suhartanti, Dwi, *Panduan Praktis Pembuatan VCO Menggunakan Modifikasi Metode Antara Penggojokan dan Pancingan*, Unit Transfer Teknologi UAD-Dirjen

Dikti, Yogyakarta, 2006.
[6] Wang, T., and Johnson, L.A., *Refining High-FreeFatty Acid Wheat Germ Oil*, JAOCS, **78**(1), 71-76, 2001.
[7] Yunandar, *Membuat Virgin Coconut Oil dengan Ragi Tempe*, STPP Manokwari http://www.stpp-manokwari.ac.id, (2006).
[8] Jahani , M., Alizadeh, M., Pirozifard, M., and Qudsevali, A., *Optimization of enzymatic degumming process for rice bran oil using response surface methodology*, Food Science and Technology, **41**(10), 1892-1898, 2008.
[9] Codex, *Codex Standards for Named Vegetable Oils*, www.codexalimentarius.net/.../CXS_210e.pdf (September 2011).

Acknowledgments

On this occasion the author would like to thank to DP2M-Higher Education which has provided Competitive Grant funding for this research.

Rice bran

ORIGINALITY REPORT

20%	15%	14%	10%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Mehran Jahani, M. Alizadeh, M. Pirozifard, A. Qudsevali. "Optimization of enzymatic degumming process for rice bran oil using response surface methodology", LWT - Food Science and Technology, 2008 Publication	4%
2	Tong Wang. "Refining high-free fatty acid wheat germ oil", Journal of the American Oil Chemists Society, 01/2001 Publication	4%
3	docplayer.net Internet Source	4%
4	www.science.gov Internet Source	2%
5	Submitted to School of Business and Management ITB Student Paper	2%
6	Submitted to BRAC University Student Paper	1%

7	Eglal G. Salem, Ahmed El Hissewy, Neveen F. Agamy, Doaa Abd El Barry. "Assessment of the quality of bran and bran oil produced from some Egyptian rice varieties", Journal of the Egyptian Public Health Association, 2014 Publication	<1 %
8	jurnal.poliupg.ac.id Internet Source	<1 %
9	www.degruyter.com Internet Source	<1 %
10	Chih-Hung Wang. "Designing supercritical carbon dioxide extraction of rice bran oil that contain oryzanols using response surface methodology", Journal of Separation Science, 05/2008 Publication	<1 %
11	Erica L. Bakota, Jill K. Winkler-Moser, Sean X. Liu. "Evaluation of a rice bran oil-derived spread as a functional ingredient", European Journal of Lipid Science and Technology, 2014 Publication	<1 %
12	journal.uad.ac.id Internet Source	<1 %

Exclude quotes Off

Exclude matches < 1 words

Exclude bibliography On