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Effect of Storage Rice Bran on Antioxidant Activity Hydrophilic Extract

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Abstract.

The utilization of rice bran on the rice mills in Java, in general, is not taken immediately after coming out of the mill. This study aims to determine the effect of storage time of bran to the yield, total phenol and antioxidant activity of the extract hydrophilic. Total phenolic content of hydrophilic bran extracts analyzed using the Folin-Ciocalteu method while testing the antioxidant activity using DPPH free radical fishing methods (2.2 diphenyl-1-picrylhydrazyl). Storage time in this study conducted over four weeks. Each sample was extracted with ethanol hydrophilic components. The hydrophilic extract was analyzed yield, total phenol, and antioxidant activity. The results showed that in the first week of storage bran has the highest total phenol (498.8467 EAG mg / g) and the highest antioxidant activity (80.7825%). While in the fourth week of storage has the highest yield (11.2575%). The higher the value of total phenols hydrophilic extract of bran in the first week, the higher the ability to inhibit free radicals.

Keywords: antioxidant activity, bran, hydrophilic extracts, storage, total phenol, yield

1. Introduction

Rice bran is known is a byproduct of rice milling. Bran consists of layers of the rice grains are aleurone/rice husk and endosperm fraction. In the rice milling process in Indonesia bran produced in the milling process both [1]. Sukoharjo district including rice granary areas in Central Java, so the amount of bran production in line with the amount of rice production. Production of rice in 2016 as many as 391 675 tonnes of a grain of harvest area of 54 339 ha and 392 587 tonne increase in 2017, or an increase of 2.48 quintal/ha (CBS, 2017). The grain production if milled rice will yield about 55% or 215 412 tons of rice. Bran produced about 10-15% of rice or reaching around 21 541 tonnes. The rice bran has a huge potential to be developed so as to increase the added value.

During this time the majority of bran in Sukoharjo district used as animal feed. Astawan, states that the nutrients and functional characteristics possessed bran potential to be used as a functional food and food ingredient. The main problem in the use of bran is easy to rancidity due to reactions that lead to rancidity hydrolytic and oxidative rancidity. Bran stabilization efforts

can be made through the inactivation of lipase and lipoxygenase, such as by adjusting the pH, dry heat, steam heating, the use of microwave energy, the use of ethanol vapor, to the use of antioxidants.

The results of the study have revealed that bran is known to contain high bioactive components [2]. Hartati [3] declare that several varieties of rice bran extract showed that total phenolic content ranged from 60.61 to 2794.28 ± 2280.00 ± 181.83 pg Error Acid Equivalent (EAG) / g bran. The antioxidant activity of the ward (scavenging) free radical (DPPH) high of 41.28 ± 0.60%. The extraction is done using known toxic methanol. Required solvent cheaper, safer and friendlier to the environment, namely ethanol. Sukoharjo district is also known to have the ethanol industry center in the District of Mojolaban. Ethanol results of the domestic industry and SMEs (small and medium micro enterprises) need to be developed in a positive direction to avoid misuse of ethanol. One such use is used as a solvent. The use of ethanol as a solvent requires optimization to extract the bioactive components of rice bran. Therefore we need this study. Extracts obtained still require further testing includes testing the content of bioactive components and antioxidant activity. Extract in vivo testing using experimental animals is also required.

Objective To determine the effect of storage time of bran to the yield, total phenol and antioxidant activity of the extract hydrophilic.

2. Materials and Methods

2.1. Materials and Equipments

The main material used in this study is the bran varieties of IR 64. The materials used for the extraction and analysis covering the 96% ethanol, DPPH solution (2.2 diphenyl-1-picrylhydrazyl), Folin-Ciocalteu solution, Na_2CO_3 7.5%.

Equipment used for the extraction of bran includes Duran bottle, flask, funnel, filter paper, test tubes, test tube rack, aluminum foil UV-Vis spectrophotometer, water bath.

2.2. Research methods

Analysis procedures

1. Yield Analysis Procedure

Determination% yield taking into account the extraction and bran samples used in the extraction. To calculate the% yield using the following formula:

$$\text{The yield (\%)} = berat\ total\ terekstraksi / berat\ bekatul\ awal \times 100\%$$

2. Test Procedure Total Phenol with TPC [4]
   a. Taking 1 ml of bran extract, diluted in 10 ml flask, of dilution of 1 (P1) was taken 1 ml diluted again in the flask 10 ml to dilution 2 (P2), up to dilution 3 (P3).
   b. Each dilution was tested in total phenol with the TPC method in duplicate.
   c. Taking 0.12 ml samples of each dilution.
   d. Add 0.6 ml of Folin-Ciocalteu, then adding 0.96 ml of Na_2CO_3 7.5% (75g / L).
   e. Vortex, then heated in a water bath temperature of 50 C for 5 minutes.

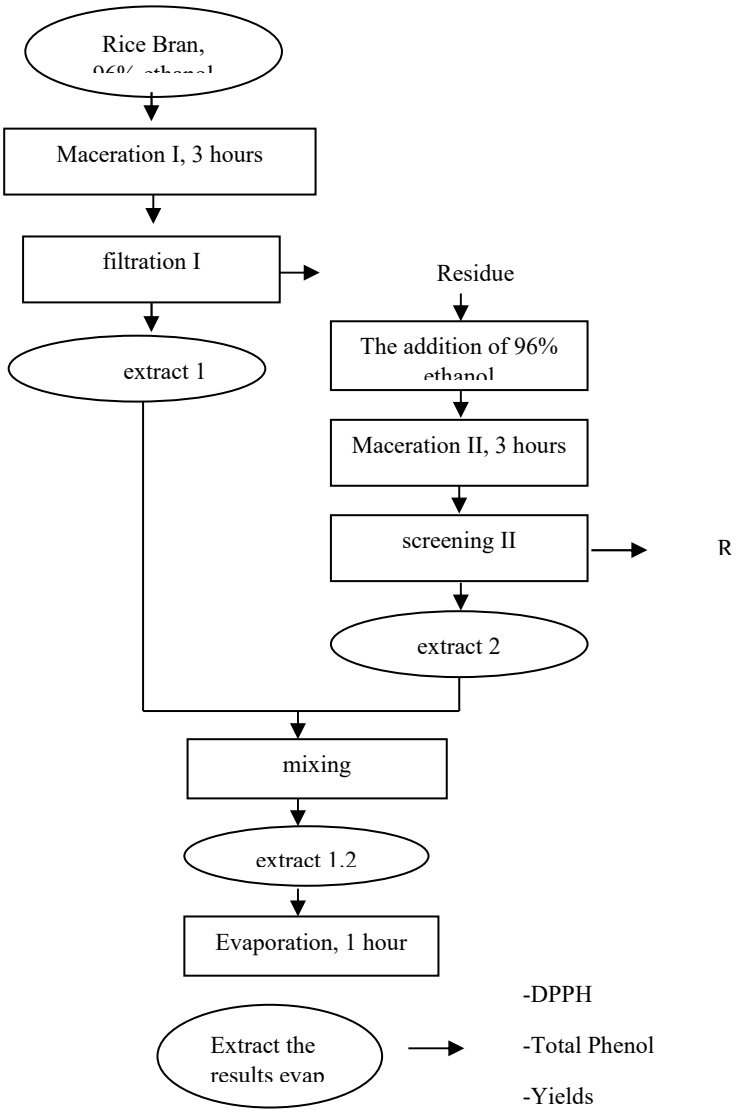
f. Measure the UV-Vis spectrophotometer at a wavelength of 750 nm.

3. DPPH Test Analysis Procedure (2.2 diphenyl-1- picrylhydrazyl) (Sompong et al., 2011):
   a. Taking 1 ml of bran extract, diluted in 10 ml flask, of dilution of 1 (P1) was taken 1 ml diluted again in the flask 10 ml to dilution 2 (P2), up to dilution 3 (P3)
   b. From each dilution tested by Duplo DPPH
   c. 0.3 ml of extract plus 1.5 ml of DPPH 0,16nm then vortex and antioxidant activity observed using UV-Vis spectrophotometer at a wavelength of 515 nm
   d. Noting the results of the absorbance of each sample.

2.3. Stages Research

The Stages of the research conducted are making rice bran the extracts is then followed by the analysis of yield, total phenol, and antioxidant activity. Extraction is done by maceration terraced rice bran by using ethanol solvent. Ethanol is used as a solvent able to extract more good antioxidant compounds in the form of antioxidants polar and non-polar. Furthermore, bran added solvent ethanol (1: 6) was then performed story maceration for 3 hours. Once macerated samples were filtered and the solvent evaporated with a rotary vacuum evaporator until the solvent does not drip. Flow diagram of the stages of research can be seen in Figure 1.

Figure 1. Stages Research



2.4. Data analysis

The data were the yield, total phenol and antioxidant activity were analyzed using analysis of variance completely randomized design (CRD). Data processing includes the analysis of variance (ANOVA). Data processing is done by using SPSS version 21. To see the difference among the treatments carried out a further test using the Duncan test at a 5% level.

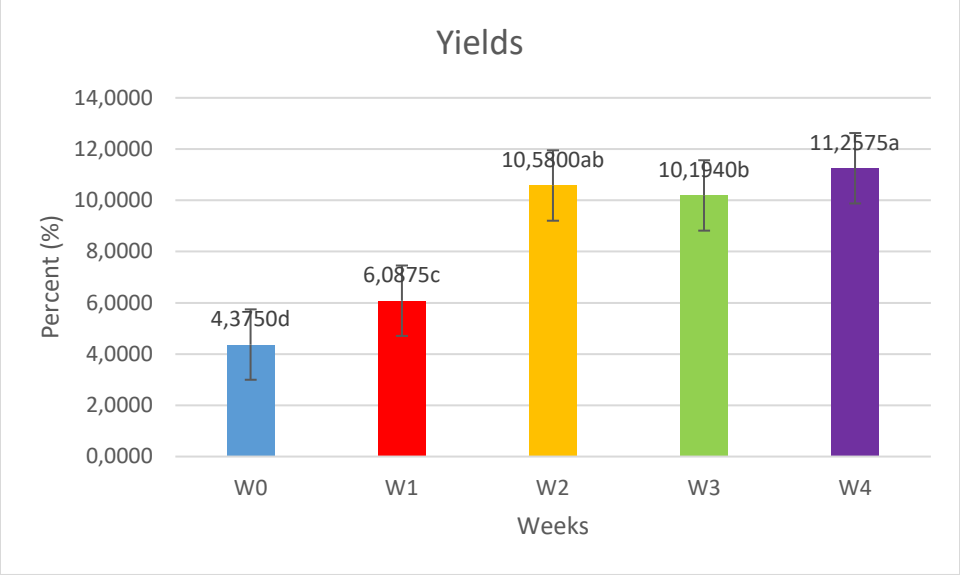
3. Results and Discussion

Bran extract obtained from the extraction process using ethanol tested yield value and chemical characteristics which include total phenol and antioxidant activity of the extract hydrophilic.

3.1. The yield

Statistical analysis of the effect of rice bran storage to yield hydrophilic extracts show that the week four significantly different from the other except at week two was not significantly different. In the fourth week of storage has the highest yield (11.2575%), then successively in week two (10.5800%), at week three (10.1940%), the first week (6.0875%) and to zero (4.3750%). Results of statistical analysis yield a hydrophilic extract of bran that can be seen in Figure 2.

Figure 2. Results of Hydrophilic Bran Extract Yield Analysis After Storage At Week Four



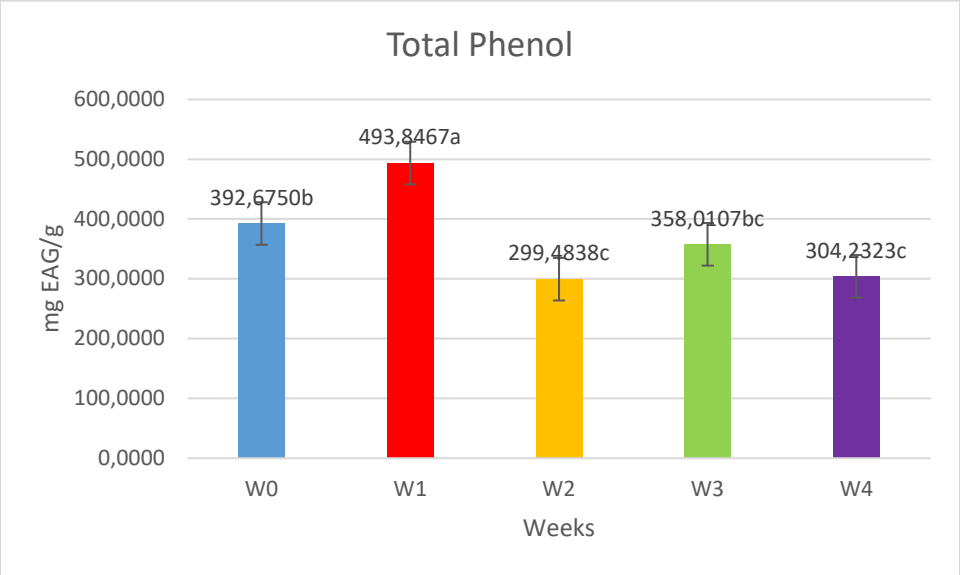
Description: W0: Week to zero; W1: the first week; W2: second week; W3: Sunday to three; W4: week four

Based on the results of the analysis of hydrophilic bran extract yield value resulting in saving of up to four weeks to have a lower value than the study 37.79 ± 3.89% [5]. Differences in yield value can be caused by several factors, including the method of extraction, the type of solvent, temperature and time of extraction, and the extracted sample size [6]. Bran extract yield value according to some previous studies ranged from 9-24% [7]. High yield value in the sample is likely due to less optimal evaporation process so that there is still residual solvent contained in the extract and take calculated as weight extract.

3.2. Total phenol

The content of total phenols hydrophilic bran extracts analyzed using the Folin-Ciocalteu method. Statistical analysis showed that the total phenol storage bran extract in the first week was significantly different from the results in the other week. Total phenol at week the zeroes significantly different from week to two and four. Storage in the first week has a total phenol highest (498.8467 mg EAG / g), and then successively at week zero (392.6750 mg EAG / g), the third week (358.0107 mg EAG / g), week four (304.2323 mg EAG / g) and second (299.4838 EAG mg / g). Results of the statistical analysis of total phenols hydrophilic bran extracts can be seen in Figure 3.

Figure 3. Results of Analysis of Total Phenol extract Hydrophilic Bekatul After Storage At Week Four



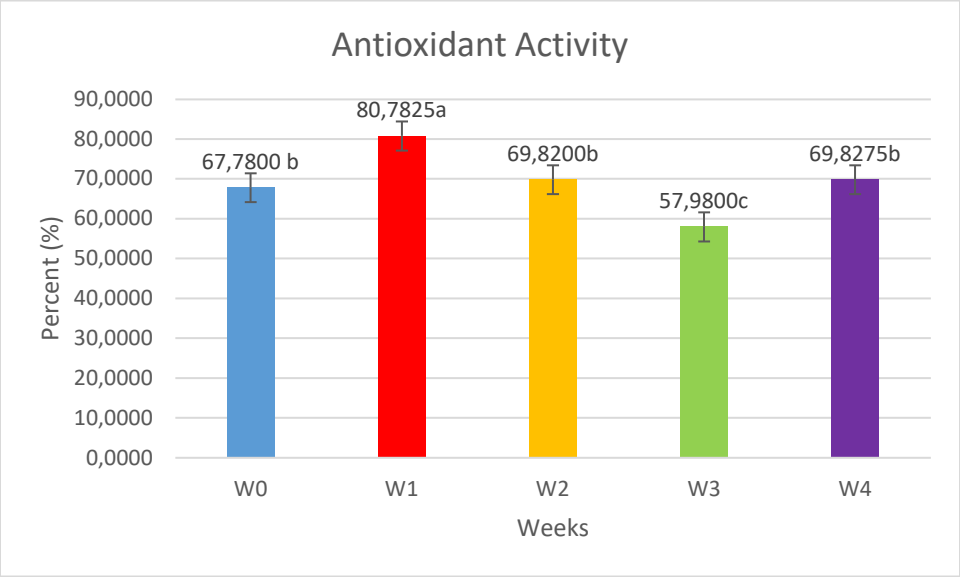
Description: W0: Week to zero; W1: the first week; W2: second week; W3: Sunday to three; W4: week four

The total value of phenol extract rice bran lower hydrophilic rather than literature can be caused by several things including the quality of rice bran and rice bran rice varieties which were obtained. Phenol compound is one of the secondary metabolites, which occur due to environmental conditions that do not support such a strong light, low temperature, infectious diseases, and pests, as well as nutritional deficiencies [8]. Phenol compounds are more soluble in polar solvents [9] so that the presence of polar groups in ethanol led to many phenolic compounds dissolved in the extract participate. According to research Zaidel [7] bran is extracted with the solvent ethanol that has a higher total phenol than n-hexane or methanol. And Hartati [9]stated that the methanol extract some varieties of rice bran showed that total phenolic content ranged from 2280.

3.3. The antioxidant activity

Testing hydrophilic antioxidant activity of extracts of rice bran performed using fishing methods DPPH free radical (2.2 diphenyl-1-picrylhydrazyl). Statistical analysis showed that the antioxidant activity of the extracted storage hydrophilic bran weeks zero, two and four are not significantly different, but significantly different from the yield in the first and third the weeks. Storage in the first week has the highest yield (80.7825%), followed by consecutive week four (69.8275%), week two (69.8200%), week to zero (67.7800%) and third (57.9800%). Statistical analysis hydrophilic antioxidant activity of rice bran extracts can be seen in Figure 4.

Figure 4. Results of Analysis Extract Hydrophilic Antioxidant Activity Bekatul After Storage At Week Four



Description: W0: Week to zero; W1: the first week; W2: second week; W3: Sunday to three; W4: week four

The antioxidant activity of the extract of bran analysis showed a high value, which reached 90.47%. It's not much different from the research conducted by Zaidel [7] which states that the value of rice bran extract antioxidant activity was 92.96%. The antioxidant value obtained from this study is higher than some other studies show that the antioxidant activity of rice bran extract ranged between 49-57%[9]. The high antioxidant activity of the extracts of bran because many brans the extracts contains antioxidant compounds such as tocopherol, tocotrienol, γ-oryzanol, and the phenol compound. According to Xu [10] phenol antioxidant activity four times higher than the γ-oryzanol, while γ-oryzanol has antioxidant activity ten times higher than the tocopherol. Inside there is also a bran extract tocotrienol antioxidant activity of compounds 40-60 times higher than the tocopherol [11]. Their combination of several antioxidant compounds that causes the value of rice bran extract antioxidant activity is very high. According to Hartati[3] stated that the methanol extract some varieties of rice bran showed that the antioxidant activity ward (scavenging) free radical (DPPH) high of 41.28 ± 0.60%.

4. Conclusion

The longer the storage increase the yield. Morever, the content of total phenol antioxidant activity affects the hydrophilic extract of rice bran. The lower the value of total phenols hydrophilic extract of bran, the higher the ability to inhibit free radicals. Phenol content and antioxidant activity of bran hydrophilic extract the highest in the first week of storage then decreased.

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