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The effect of drying expired sausage waste on its nutrition content

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ABSTRACT

Expired sausage waste can pollute the environment and is a good source of nutrition so that in this study it is used as an alternative raw material feed. The method used in this study is an experimental method with Factorial Completely Randomized Design (CRD) with 2 factors, namely temperature and time. The result obtained from this study was the best drying with temperature of 60 C for 20 hours which resulted in the best effect on water content reduction of 10.80%, 10.33% protein content, 13.22% fat content, 6.79% ash content, TBA (Thiobarbituric acid) value of 0.613 mg malonaldehyde/kg.

Key words : *Expired sausage waste, Recycling, Alternative feed, Raw material*

Introduction

The production of the processed meat industry in Indonesia has experienced a significant increase. Data obtained from one of the food processing industry in this case the type of sausage there is a production of 22,400 tons per year or a production of about 62 tons per day with total sausage waste expiring on average by 5% per day with a total of 3.1 tons per day. Expired sausages are sausages that are not suitable for consumption or sausages that have experienced a consumption limit (Fitriadi *et al.,* 2015). If the waste is not managed properly, it will cause disease and pollute the environment, so it needs to be processed to be useful material.

Expired sausage is an alternative feed raw material. The weakness of expired sausages is the availability of fluctuations and rapid degradation of nutrients by decomposing bacteria so that they are not utilized (Desrosier, 1988). The use of the drying method will affect the quality of the product produced. There are two drying methods used in the processing of food products namely natural and artificial (Argyropoulos *et al.,* 2011; Babu *et al.,* 2018; Purwaningsih, 2012). The application of using this drying method is influenced by several factors namely temperature, drying time and type of material to be dried (Pareek and Kaushik, 2012). The less nutrient content is lost, the more effective the drying method is carried out (Zhang *et al.,* 2019). This will provide added value to the product produced, namely fish feed substituted with expired sausage waste.

Materials and Methods

The study used an experimental method which consists of time and temperature of expired sausage

drying. The drying temperature and time were determined with 9 treatments, namely temperature of 40, 60 and 80 °C and time of 20, 25 and 30 hours and 3 replications. The variables observed in Stage 1 were water content, protein, fat, ash, amino acid and TBA value (Thiobarbituric acid) (Lutoshkin *et al.,* 2016). The data obtained from the study were then analyzed statistically by using one way ANOVA test.

Results

Nutritional Value of Expired Sausage Flour

Expired sausage waste is waste that has good protein content. Sausage waste if it is not used, it will pollute the environment and its nutritional value is not utilized. Based on the result of amino acid analysis using high performance liquid chromatography (hplc) method, it was found 20 types of amino acid consisting of 10 types of essential amino acid and 10 types of non-essential amino acid. Essential amino acids found in expired sausages were leucine 2.5%, methionine 1.7%, arginine 2.7%, isoleucine 2.8%, phenylalanine 1.8%, valine 2.6%, threonine 2.2%, lysine 3.7%, tryptophan 0.8% and histidine 1.2%. Non-essential amino acids found in expired sausage flour are asparginine 0.6%, glutamine 0.3%, aspartate 0.3%, glutamate 3.7%, serine 0.1%, glycine 4.3%, alanine 2.8% proline 2%, cystine 0.6% and tyrosine 1.4%.

Chemical Characteristics of Expired Sausage Flour

The chemical characteristics of expired sausage flour obtained through Stage I study were oven drying with temperature and time to result in the best drying. The data of drying result is presented in Table 1 and Table 2.

From the data in Table 1 and Table 2, it can be observed that the best drying temperature and time are 60 °C and 20 hours respectively. Moisture content of the sausage flour ranged from 1.42 to 34.33%, while the range of moisture content which is good for feed ingredients is around 10%. The best moisture content in this study, obtained at temperature of 60 °C in 20 hours, is 10.80% and the highest moisture content at temperature of 40 °C in 20 hours is 34.33%.

The results of statistical analysis show that temperature is very influential on the moisture content of expired sausage flour. It shows that the higher the drying temperature, the faster it can reduce moisture content. It is in line with the opinion of Atmaka *et al.* (1996) which states that temperature, drying air and humidity are factors that determine the drying process. Likewise the properties of dried materials such as initial moisture content, size and partial pressure of the materials will affect the drying process. Further explanation by Masduki *et al.,* (2014) stating that drying of seaweed (*Sargassum*

Table 1. Data of oven drying temperature.

Temperature (°C)	Water			Protein			Ash			Fat		
	Time (hour)			Time (hour)			Time (hour)			Time (hour)		
	20	25	30	20	25	30	20	25	30	20	25	30
40	34.3^{c}	33.5^{b}	32.2^{a}	9.8^{a}	9.9^{a}	9.9^{a}	3.0^{c}	4.1^{b}	4.5^{a}	25.8^{c}	24.4^{b}	22.2^{a}
60	10.8^{a}	8.5^{b}	6.2^{c}	10.1^{a}	10.3^{a}	10.3^{a}	4.6^{b}	5.7^{a}	5.9^{a}	20.6^{b}	20.6^{b}	19.1^{a}
80	2.4^{a}	1.9^{b}	1.4^{b}	7.6^{a}	7.1^{b}	6.3^{b}	6.3^{a}	6.5^{a}	6.7^{a}	16.0^{c}	15.4^{b}	13.2^{a}
The best temperature (°C)	60	60	40	60	60	60	80	60	80	60	60	80

Table 2. Data of oven drying time.

Time (hour)	Water			Protein			Ash			Fat		
	Temperature (°C)			Temperature (°C)			Temperature (°C)			Temperature (°C)		
	40	60	80	40	60	80	40	60	80	40	60	80
20	34.3^{c}	10.8^{a}	2.4^{b}	9.8^{b}	10.1^{a}	7.6^{a}	3.0^{a}	4.6^{b}	6.3^{c}	25.8^{c}	20.6^{b}	16.0^{a}
25	33.5^{c}	8.5^{a}	1.9^{b}	9.9^{a}	10.3^{a}	7.1^{b}	4.1^{a}	5.7^{b}	6.5^{c}	24.4^{c}	20.6^{b}	15.4^{a}
30	32.2^{c}	6.2^{a}	1.4^{b}	9.9^{a}	10.3^{a}	6.3^{b}	4.5^{a}	5.9^{b}	6.7^{b}	22.2^{c}	19.1^{b}	13.2^{a}
Best time (hour)	30	20	20	25	20	20	20	20	30	20	20	20

polycystum) by using oven at 60 °C reduces moisture content faster than wind drying for 5 to 6 days and sun drying for 3 to 4 days. Oven drying is likely to provide more stable temperature compared to sun drying and wind drying.

Thiobarbituric Acid (TBA) Test

Analysis of TBA value (Thiobarbituric acid) of expired sausage flour was performed on expired sausage flour with the best drying in the first stage. This analysis aims to find out the rancidity in the expired sausage flour. Rancidity that occurs is caused by the reaction of fat oxidation. The result of TBA value analysis of expired sausage flour was 0.613 mg malonaldehyde/kg. Jhon *et al.* (2004) states that TBA value of good quality products is less than 2 mg malonaldehyde/kg. Further explanation by Chen *et al.* (1996) stating that the maximum TBA level for livestock and fisheries is 1 – 2 malonaldehyde/kg.

Conclusion

Based on the study results, it can be concluded as follows: Characteristics of temperature and time considered the best in the production of expired sausage flour was by oven drying at 60 °C for 20 hours producing the best expired sausage flour with the following chemical compositions: 10.80% moisture content, 10.11% protein content, 20.60% fat content, 4.60% ash content and TBA (Thiobarbituric acid) content of 0.613 malonaldehyde/kg.

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