Color appearance and chemical characteristic of vacuum fryer cooked Pemalang typical snack ogel-ogel

To cite this article: S Susanti *et al* 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **803** 012046

Color appearance and chemical characteristic of vacuum fryer cooked Pemalang typical snack ogel-ogel

S Susanti[1], M Murni[2], A Silviana[3], and F Arifan[4]
[1]Food Technology, Department of Agriculture, Animal and Agricultural Sciences Faculty, Diponegoro University, Semarang, Indonesia.
[2]Departemen of Machine Engineering, Diponegoro University, Semarang, Indonesia.
[3]Law Faculty, Diponegoro University, Semarang, Indonesia.
[4]Chemical Engineering, Vocation School, Diponegoro University, Semarang

E-mail: sitisusanti@live.undip.ac.id

Abstract. Ogel-Ogel which are Pemalang typical snacks so far have been less able to full fill the Indonesian National Standard on the quality of extruded snacks (SNI-01-2886-2015) due to their conventional frying techniques (manual deep frying). This study was aimed to evaluate the color appearance and chemical characteristics of Ogel-Ogel as a result of the application of the automatic frying system with a vacuum technique (vacuum frying) in the production process. The results show that Ogel-Ogel fried by the vacuum frying technique had a significantly brighter color display with lower in the fat content and TBA value, while protein content was higher compared to deep frying techniques. Meanwhile other chemical characteristics such as water content, carbohydrates, and ash did not show significant differences as a result of different frying techniques. Thus Ogel-Ogel as a Pemalang typical snack cooked with a vacuum fryer has a brighter color display with chemical characteristics that are more in line with SNI as an extruded snack. Thus, it has a potency to be the featured product from Pemalang area.

1. Introduction

Culinary is one of the attractions of an area, especially if it is associated with the world of tourism. One of the areas in the north coast of Java Island which is famous for its unique culinary delights is Pemalang. Pemalang culinary that have been known by the public include Lotek, Bongko Mento, Sate Loso, Lontong Dekem, Grombyang, Apem Comal, Kamir, Lemburi Crab, Tofu Pletok, Bakso Balungan, Pecak Eel, Usek, and Ogel-Ogel [1]. Different with others typical Pemalang culinary that have been known for a long time, Ogel-Ogel is a new favorite snack that often be bought by travelers in Pemalang City as a food souvenir. As a small oval cracker, it has size about 2-3 cm in length, brownish white in color and a savory in taste. It is made from rice flour dough mixed with sugar, salt, eggs, and certain some seasonings which is it has a crunchy texture.

In the food field, ogel-ogel includes extrudate snacks group which are food that goes through an extrusion process with raw materials made from flour or starch and can be added with other permitted food ingredients with or without going through the frying process (SNI, 2015). The advantages of the extrusion process are a very distinctive product shape, many variations, large capacity, highly in quality and productivity [2]. Beside processing stage, cooking will also affect the quality of the final product [3]. So far, Ogel-Ogel has been processed by deep frying method which is used a big pan with an abundant volume of oil and a very high frying temperature.

Generally, frying can change the physical and chemical quality of products such as gelatinization, protein denaturation and water evaporation [4] It can transfer a product mass characterized by oil absorption and water migration which evaporates through cooking oil [3]. Moreover, deep frying is generally carried out under atmospheric pressure conditions. In the other hand, another frying methods are carried out at a higher pressure than atmospheric pressure and some are in a vacuum. Different methods and conditions in the frying process will affect the quality of the final product [5]. From a physical and chemical perspective, the vacuum frying method will produce a final product that is low in oil, higher in fiber and vitamins. In addition, the color, taste and aroma remain original, do not change much and are more durable [6].

This study was aimed to evaluate the quality of Ogel-Ogel from its physical and chemical aspects as a typical Pemalang snack which is fried in a vacuum fryer. It was expected, by using vacuum frying method, Ogel-Ogel will be produced healthier, can meet the standards for extrudate food, and finally become regional superior quality products.

2. Materials and Method

2.1 Production of Ogel-Ogel snack

Ogel-Ogel was made by two small scale industries in food sector of Pemalang City. The main ingredient of these snacks is glutinous rice flour which was mixed with other ingredients such as eggs, sugar, salt, and certain seasoning formulas into a wet dough. The dough then put into an extruder without heating. The dough comes out of the extruder was printed to resemble a caterpillar shape then fried using a vacuum fryer which is set at a temperature of 80^{o}C with a pressure of 70-72 cm Hg for 40 minutes. The fried Ogel-Ogel was then analyzed for its chemical characteristics which include the value of Thiobarbituric Acid (TBA), carbohydrates, protein, fat, water, ash, and salt content.

2.2 Analysis of Ogel-Ogel chemical characteristics

TBA value was determined directly in trichloracetic acid extract of snack [7]. The carbohydrate content in the form of reducing sugars and starch was analyzed using the Nelson-Samogyi method by spectrophotometry [8]. Protein content was measured as dissolved proteins based on the Lowry-Folin method with a spectrophotometer [9]. Fat content was analyzed by the Folch method [10]. The moisture content is determined by weighing 2 g of the sample. The sample was put in an oven at 105^{o}C for 3 hours. Then it was removed from the oven and cooled in a desiccator for 30 minutes. The sample weight was weighed. This treatment was carried out several times until the sample weight was constant. The percentage of water content was calculated as percentage of the difference between the initial weight and the final weight toward the sample weight total. Ash content was measured by weighing 2 g of the sample and then put in a porcelain cup. Sample was annealed in the furnace at 550^{o}C and then cooled in a desiccator. The cooled and stable ash product was weighed and calculated as the percentage toward the sample weight. Salt content (NaCl) was determined by the Kohman method [11].

2.3 Statistical Analysis

Data were analyzed statistically using the Independent Sample T-test method to determine the differences between categories with a significance level of 5% using assistance of SPSS 16.0 computer program.

3. Results and Discussion

Production process of Ogel-Ogel was carried out semi-automatically wherein the dough mixing used a mixer while the dough molding used an extruder machine without cooking. Although the dough mixing and molding by automatic tools, the frying process was still done manually. The dough come out from the extruder molding machine was immediately cooked by deep frying technique which is a frying pan full with cooking oil soaked the raw product and then frying process was run with a large enough fire. Deep frying technique has several advantages in cooking method such as food is evenly

cooked and its efficiency is achieved because frying can be done faster [12]. However, due to the very large in cooking oil volume, high cooking temperature, and also manual stirring and turning, deep frying method often obtained the final product that poor in brown color uniformity level with the high fat content. Such condition usually occurred when rising demand in the market was imbalanced to the number of fryers. The laborer fatigue made the turning or stirring of frying process was inconsistent while the temperature conditions cannot be adjusted toward the rate of material turning. Thus, the deep frying technique carried out by producers cannot guarantee the product quality both from physical and chemical aspects.

Unsatisfaction toward the final product quality that caused by frying technique, encouraged the utilization of another frying method that is vacuum frying. Vacuum fryer is a machine for frying various kinds of food with the high quality [13]. Principally, vacuum frying absorbs moisture in high speed that cause material pores do not close quickly [14] In addition, this machine also arranges the balance of temperature and vacuum pressure [13]. To produce food with good quality such as color, aroma, taste and texture, the temperature setting should not exceed than 90˚C and the vacuum pressure must between 65 - 76 cmHg. To support the vacuum pump operation, there is a water reservoir in the vacuum fryer. Under vacuum conditions, the frying temperature can be reduced to 70- 85 ° C due to a decrease in the boiling point of water. With a frying system like this, food products that are easily damaged due to high cooking temperatures can be fried properly in order to get the dry and crunchy products, without undergo nutritional damage and flavor as is the case in ordinary frying. Generally, low-pressure frying will produce snacks with a crunchier texture and more attractive color as can be seen in Figure 1. Ogel-Ogel that is fried in a vacuum fryer appears to be a brighter color compared to those fried in deep frying where the product appears more brownish in color.

Another important aspect of vacuum frying product is products contain less oil and are more porous (lighter) and generally have better rehydration power. Ogel-Ogel as extruded snack cooked with the vacuum frying technique had a significantly lower fat content with a lower TBA value (Table 1). TBA value is a parameter that describes the level of rancidity of food as a result of fatty acid oxidation [15]. The higher TBA value, the greater level of fat damage. The low-fat content in Ogel-Ogel cooked with vacuum fryer reduces the risk of fat damage due to oxidation resulting in a lower TBA value during the rancidity test.

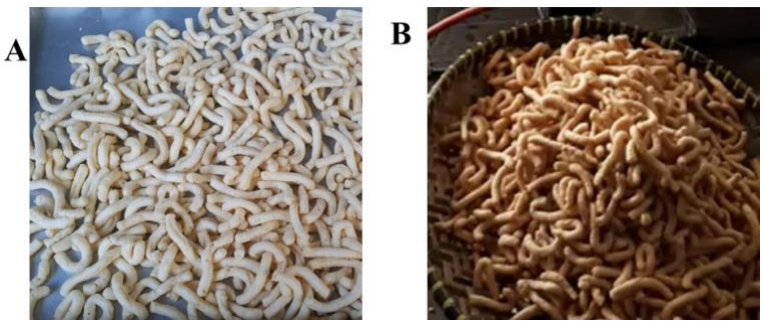

Figure 1. Color of Ogel-Ogel resulted from the vacuum frying (A) in comparison to the deep-frying method (B).

Table 1. Chemical characteristic of Ogel-Ogel product in different frying technique

Parameters	Deep frying	Vacuum frying	Standard
TBA (mg MA/kg)*	2.16±0.87	1.12±0.77	Max. 3
Carbohydrate (%)	44.75±3.43	45.35±2.41	-
Protein (%)*	13.52±0.97	16.32±0.67	-
Fat (%)*	47.42±2.89	33.42±2.82	Max. 38
Moisture (%)	2.51±2.89	1.31±2.19	Max. 4
Ash (%)	0.08±0.01	0.07±0.06	Max. 0.1

Salt-NaCl (%)	1.87±0.34	1.47±0.32	Max. 2.5

Data about *deep* dan *vacuum frying* category were expressed as means ± STDEV. *Significant different on some chemical parameters between *deep and vacuum frying* (P≤0.05). Standard based on SNI 01-2886-2015

Other chemical quality was also indicated by the significantly higher product protein content in Ogel-Ogel which was fried in a vacuum fryer (Table 1). A decrease in frying temperature as a result of increased pressure due to vacuum techniques causes protein denaturation due to heat to decrease [16]. Other chemical characteristics of Ogel-Ogel such as salinity (NaCl), moisture, and ash content did not show any significant differences as a result of the frying technique in this study. Overall, Ogel-Ogel produced by applying the vacuum frying technique can better meet the quality of extruded snack products as required by SNI-2886-2015 (Table 1). With the increasing quality, it is expected that Ogel-Ogel will have more potential as a superior product origin from the District of Pemalang in the local food sector of Indonesia.

4. Conclusion

Ogel-Ogel as a typical Pemalang snack cooked in a vacuum fryer has a brighter color appearance with chemical characteristics that are more in line with SNI regarding extruded snacks. Thus Ogel-Ogel has the potential to be a superior product in the Pemalang area

Acknowledgement

Authors would like to thank the Directorate General of Research Reinforcement and Development, Ministry of Research, Technology and Higher Education of the Republic of Indonesia for funding these activities through the PPUD program.

References

[1] Susanti RA 2014 Arty. **3** 1
[2] Hermanianto *et al* 2000 Bul. Teknol. dan lndustri Pangan. **11** 1
[3] Mellema M 2003 *Trends Food Sci Technol*. **14** 364
[4] Gadiraju TV *et al* 2015 *Nutrients.* **7** 8424
[5] Pankaj SK and Keener KM 2017 *Curr. Opin. Food Sci.* **16** 74
[6] Safari A *et al* 2018 *J. Food Eng.* **230** 114
[7] Vyncke W 1970 *Eur J Lipid Sci Technol* **72** 1084
[8] Gusakov A V *et al* 2011 *Eurasian J. Anal. Chem* **2011** 283658
[9] Waterborg J H 2009 The Lowry Method for Protein Quantitation. In: Walker J M (eds) The Protein Protocols Handbook (Springer Protocols Handbooks) Humana Press, Totowa, NJ pp7-10
[10] Steenhuis I H M *et al* 1996 *Nutr Health.* **10** 331
[11] Packard Jr V S 1971 *J. Milk Food Technol.* **34** 529
[12] Erickson MD, 2007 Deep Frying: Chemistry, Nutrition, and Practical Applications. Aocs Press, Urbana, Illinois.
[13] Diamante LM *et al* 2015 *Int Food Res J.* **22** 1
[14] Dueik V and Bouchon P 2011 Food Rev. Int. **27** 408
[15] Barden L and Decker E A 2016 *Crit Rev Food Sci Nutr*. **56** 2467
[16] Zielbauer BI *et al* 2016 Food Biophys. **11** 34