

PAPER • OPEN ACCESS

Nutrition Analysis of "Ogel-ogel" –typical snack originally from Pemalang, Central Java Province, Indonesia

To cite this article: L D Saraswati *et al* 2019 *J. Phys.: Conf. Ser.* **1217** 012049

View the [article online](#) for updates and enhancements.



IOP | ebooks™

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the **collection** - download the first chapter of every title for free.

Nutrition Analysis of “*Ogel-ogel*” –typical snack originally from Pemalang, Central Java Province, Indonesia

L D Saraswati^{1*}, F Arifan², F Muhammad³, D Arumavriante⁴ and C Nissa⁴

¹Department of Epidemiology, Faculty of Public Health, Diponegoro University

²Programme Diploma of Chemical Engineering, Faculty of Vocational School, Diponegoro University

³Department of Biology, Faculty of Science and Mathematics, Diponegoro University

⁴Department of Nutrition, Faculty of Medicine, Diponegoro University

*Corresponding author

Lintang Dian Saraswati

Jl. Prof Soedarto, SH, Tembalang, Semarang 50275, Indonesia

E-mail: lintang.saraswati@live.undip.ac.id

Abstract. *Ogel-ogel* is a unique food in Pemalang with a crispy textured within a distinctive cheese flavor. *Ogel-ogel* made from glutinous rice flour mixed with egg, cheese, sugar, and salt. Then the dough is printed like a caterpillar writhing using a special tool and then fried. The study aimed to examine the nutrition content and the total amount of bacteria in *ogel-ogel*. The test included nutritional content test such as carbohydrate content test used *luff schrooll* method, protein used *kjedahl* method, fat used *sokletasi* method, rancid used TBA (Thiobarbituric Acid) method with interval 5 days for 20 days, microbiology test used ALT method (Total Plate Count) with PCA media (Plate Count Agar), free fatty acid test by titration method used *NaOH*. The test results showed that *ogel-ogel* contain carbohydrate equal to 11.1%, protein 13%, fat 47%, (the result of rancidity), amount of bacteria as much as 1.13×10^4 CFU/ml, and free fatty acid test result. Based on the test, it can be concluded that *Ogel-ogel* is safe to be consumed because it is in the standard range of BPOM No. 16 of 2016 which is in the range 10^7 - 10^8 CFU/ml for the category of typical bakery products (sweet, salty and savory).

1. Introduction

Located in the north coast of Central Java province, Pemalang has many various types of Micro, Small, and Medium Enterprises (MSMEs) including producing its signature dish. The signature dish is food, including snack and beverages made from several ingredients which traditionally consumed and developed in some region. Due to increasing its citizen's economic development, local government and academics take part in supporting MSMEs in every sector. One of its main purposes is to represent the local identity of a region, consumerism behavior, culture transfer, and as a heritage to the future generation [1]. Furthermore, traditional food usually was bought as a gift to friends, colleague, and family from another cities. One of the well known signature snack is *ogel-ogel*.

Ogel-ogel is one kind of Pemalang's traditional food made from white glutinous rice flour and other ingredients such as egg, cheese, sugar, and salt. Glutinous rice flour has a greater amylopectin content compared to other flours. Therefore it has a smoother texture and easy to consume. Eggs are an animal protein that acts as a binding agent for other ingredients with less budget. While cheese has a great



savory flavor, made from fermented milk which is rich in protein, peptides, amino acids, short, medium and long chain fatty acids, vitamins, minerals, and probiotic bacteria [2].

Since made from nutritious ingredients, ogel-ogel certainly has also nutrition content. Food is consumed to produce energy, to make a good immune, to run activities, and to stay healthy. It is delivered in 3 times meals and two times snacks every day which covers energy, carbohydrate, protein and fat a persons need. Ogel-ogel, which is categorized as snacks has not analyzed its nutrition content to decide the quantity of portion size does every person need to meet it requirements. Both of these are written in nutrition fact labels in its packaging.

2. Methods

2.1. Carbohydrate Analysis (Luff schoorll)

2.1.1. Materials

The material used in this analysis are phenol 5%, concentrated sulfuric acid, distilled water, Pb acetate, Sodium carbonate, luff schoorll, KI 20%, 0.1N Na-thiosulfate, a hexane solvent, and ogel-ogel sample taken from Pemalang Regency.

2.1.2. Tools

Tools used in this analysis are erlenmeyer, measuring cup, goblet, pipette, stove, and pan.

2.1.3. Procedures

The procedure is carried out in determining carbohydrate levels using the AOAC 2005 procedure. The procedure is as follow as: first, smooth over the 5g of ogel-ogel then weigh the smooth ogel-ogel and put into a 250 ml beaker, then dissolve with 100 ml of distilled water and add Pb acetate for clarification. Furthermore, a solution of Na_2CO_3 was added to remove the excess of Pb and added with 250 ml of distilled water to the previous beaker. After that, 25 ml of the solution is taken and then put into erlenmeyer and added with 25 ml of luff schoorll solution. Then a blanko treatment was made consisting of 25 ml of luff schoorll solution and 25 ml of distilled water. After adding a few boiling stones, erlenmeyer is connected to the cooling and boiled for 10 minutes. After that, it was cooled and added 5 ml of 20% KI and added 25 ml of 26.5% H_2SO_4 . The liberated iodine is titrated with 0.1N Na-Thiosulfate solution using a 2-3% starch indicator. Titration ends after white color appear of the milk. Finally, observe the results of the luff schoorll test. For the calculation of sugar levels after inversion we can use the formula below:

$$(1) \text{ Level of sugar (\%)} = \frac{(\text{titration blanko} - \text{titration sample}) \times \text{dilution factor}}{\text{mg sample}} \times 100\%$$

2.2. Protein Analysis (Kjeldahl)

2.2.1. Tools and Materials

The material used in this analysis are phenol 5%, concentrated sulfuric acid, distilled water, Pb acetate, Sodium carbonate, luff schoorll, KI 20%, 0.1N Na-thiosulfate, a hexane solvent, and ogel-ogel sample taken from Pemalang Regency.

2.2.2. Procedures

The tools and materials used in this kjeldahl method are pedal tube, digestion block, scrubber cup, FOSS digestor, a set of distillation equipment, 100 ml kjeldahl flask, a set of distillation tools, burette, beaker glass, erlenmeyer, 100 ml measuring flask, glass measure 100 ml, 100 ml volume pipette, test tube, analytic scale, funnel, watch glass, mortar, and vaporizer, ogel sample taken from Pemalang

Regency, Kjeldahl tablet, concentrated sulfuric acid, aquades, 40% NaOH, solution 3% boric acid, and 0.1 N. HCl

2.3. Protein Analysis (Kjeldahl)

2.3.1. Tools and Materials

The tools and materials used in this kjeldahl method are pedal tube, digestion block, scrubber cup, FOSS digester, a set of distillation equipment, 100 ml kjeldahl flask, a set of distillation tools, burette, beaker glass, erlenmeyer, 100 ml measuring flask, glass measure 100 ml, 100 ml volume pipette, test tube, analytic scale, funnel, watch glass, mortar, and vaporizer, ogel sample taken from Pemalang Regency, Kjeldahl tablet, concentrated sulfuric acid, aquades, 40% NaOH, solution 3% boric acid, and 0.1 N. HCl

2.3.2. Procedures

A 0.05g of ogel-ogel is inserted into the pedal tube and placed in a digestion block, then added 0.5 kjeldahl tablets (containing K_2SO_4 and $CuSO_4$) and 15 ml of concentrated sulfuric acid, then shake the solution until mixed and stand it for 5 minutes. The scrubber cup is attached to the digestion block and placed in the FOSS digester. Then, the sample was reconstructed for approximately 3 hours, after adding 25 ml of distilled water. The next step is distillation which is done by adding 40% of NaOH solution. The ammonia gas produced is stored in 3% boric acid solution. Then the sample titrated using the same method but without using the sample. Then observe the results of the kjeldahl test and we calculate the result of the test using the formula below:

$$(1) \text{ Level of N (\%)} = \frac{\text{volume HCl} \times \text{NHCl} \times 14,007 \times 100}{\text{amount of sample (mg)}}$$

$$(2) \text{ Level of protein (\%)} = \text{N} \times \text{correction factor}$$

2.4. Fat Analysis (Sokletasi)

2.4.1. Tools and Materials

The tools used in determining this fat content are filter paper, condenser, fat flask, soklet, and hexane (fat solvent). The material used was an ogel-ogel sample taken from Pemalang Regency.

2.4.2. Procedures

The procedure of determining this fat content is as follow as: 1) Prepare a fat flask that is by the soklet extraction tool. 2) Dry the fat flask into an oven at 105°C for approximately for 30 minutes. 3) Cooling the fat flask again for about 15 minutes in a desiccator and then weigh it. 4) Weighing on a 1 gram sample in filter paper, pinned, tied with fat-free woolen cotton. 5) Entering the fat solvent in enough fat flask, and put it in the soklet extraction device and pair it. 6) Heating and extracting fat pumpkin 3 to 4 hours (5-6 times). And we got "X". 7) Distill the solvent, lift the pumpkin and then dry it in an oven at 105°C until the weight is constant. 8) Cooling in the desiccator for approximately for 30 minutes and weigh again. Finally, observe the result of the test, and we can calculate using the formula below:

$$(1) \text{ Level of fat (\%)} = \frac{\text{amount of (g)}}{\text{amount of sampel (g)}} \times 100\%$$

2.5. Total Plate Number (ALT)

2.5.1. Tools and Materials

The tools used in this ALT method are glass preparations, bonsen, stoves, pans, mortar, analytic scales, spirits, autoclave, 100 ml erlenmeyer, test tubes, tube racks, micro pipettes (0.1 ml and 0.01 ml), solder plate, OC, and incubator. The material used in this study is ogel-ogel which is sold from all souvenir shops in Pemalang by taking 5g of ogel-ogel that has been mashed and NaCl solution.

2.5.2. Procedures

2.5.2.1. Sterilization

All planted tools and saucers of 15-20 ml plate count agar (PCA) media are sterilized using autoclave at 121°C for 15 minutes with a pressure of 1 atm.

2.5.2.2. Sample Homogenisation

Weighing the 5g of the sample and then pureing it and putting it into 50 ml NaCl solution in erlenmeyer, then the sample is homogenized (shaken). Then obtained a 10^{-1} dilution sample suspension.

2.5.2.3. Sample dilution

The 10^{-1} dilution sample using a 0.1 ml micro pipette was put into a test tube 1 (10^{-2} dilution sample suspension). Then the solution in the test tube one was taken with a 0.1 ml micro pipette and then put into a test tube 2 (suspension of the 10^{-3} dilution sample) and taken again using a 0.1 ml pipette and put into the test tube 3 (suspension of the 10^{-4} dilution sample)

2.5.2.4. Planting

The sample solution in the test tubes 1, 2, and three was inserted into each cup which had been poured 5-20 ml of PCA media. The pouring is near the fire. Then shake or rotated the cup, so the sample solution is distributed in the cup, then wait until the media solidifies, and put into plastic and put the plastic into an incubator with the position of the plastic is upside down with a temperature of 36-37°C for 24-48 hours.

2.5.2.5. Observations

Observe and calculate the colony using the colony counter. Do step number 4 for three times or as known as triple.

2.5.2.6. Calculation

Calculate the result by using the SPC (standard plate counts) calculations.

2.6. Rancidity Analysis (Thiobarbituric Acid)

2.6.1. Tools and Materials

The tools and materials used in this rancidity analysis are scales, waring blenders, 1000ml distillation flasks, 50 ml erlenmeyer, sieves, water baths, spectrophotometers, ogel samples from Pemalang District, aquades, concentrated HCl, boiling stones, antifoam, and TBA reagent.

2.6.2. Procedures

1. Weigh the ingredients (the water content should be known) as much as about 3g then put it in a waring blender and add 50 ml of distilled water and crush for approximately 2 minutes.
2. Move quantitatively into a 1000 ml distillation flask while washing with 48.5 ml of distilled water. Then add 1.5 ml of 4 N HCl (1 part concentrated HCl in 2 parts water) until the pH becomes 1.5.
3. Add boiling stones and a little antifoam preventive and plug to the flask distillation to the distillation apparatus. Distillation is carried out by heating as high as possible so that a 50ml distillation is obtained during 10 minutes heating.

4. Stir the distillate and then strain and remove as much as 5ml into the erlenmeyer 0.02 M thiobarbituric-acid in 90% glacial acetic acid. The dissolution process is accelerated by heating on a water bath and then mixing the solution into the erlenmeyer which is covered in boiling water for 35 minutes.

5. After that, make a blanko (the same procedure without material).

6. After cooling with water, read the optical density with a spectrometer at a wavelength of 528 nm with a blanko solution as a zero point.

7. Optical density (A = Absorbancy) is used as a high comparative scale of rancidity.

According to Kusrahayu et al. (2009) the determination of thiobarbiturate acid numbers we can use the formula below:

$$\text{Number of TBA} = \frac{3}{\text{amount of sample (gram)}} A \times 7,8$$

A = Absorbance at a wavelength of 528 nm

7,8 = Amount of TBA mg malonaldehyde/kg sample

3 = The Iodine number is the degree of fat unsaturation

3. Result and Discussion

Analysis of nutrient content in samples of ogel-ogel that taken from Pemalang District was carried out in the food nutrition analysis laboratory, Muhammadiyah University Semarang. Nutritional analysis is done by repeating twice (duplo) so that the results obtained are more reliable. The results of the analysis of nutrients are listed in table 1. and then the results of the analysis will be explained one by one below.

Table 1. Results of analyzing nutrient content of ogel

Sample	Carbohydrate (%)	Protein (%)	Fat(%)
Ogel-ogel 1	43,880	12,88	46,351
Ogel-ogel 2	44,706	13,483	47,757
Average	44	13	47

Based on table 1. The average of carbohydrate content in ogel-ogel is 44%, protein nutrition is 13%, and fat nutrition is 47%. The highest nutrient in ogel-ogel is fat. Ogelugel which is considered to be a source of fat, are cheese and eggs and a frying method that uses a deep frying method. The main source of ingredients that contain carbohydrates is glutinous rice flour, while for sources of protein contained in ogel-ogel are eggs and cheese.

3. 1. Carbohydrate Levels

Carbohydrates are compounds formed from molecules of carbon, hydrogen and oxygen. As one type of nutrient, the main function of carbohydrates is to produce energy in the body. Each 1 gram of carbohydrate consumed will produce energy of 4 kcal and the energy produced from the oxidation (burning) process of this carbohydrate will be used by our body to perform various functions such as breathing, contraction of the heart and muscles and to carry out various physical activities such as exercise or work.

The results show that the average of carbohydrate content in ogel-ogel is 44%, which means that every 100 g ogel-ogel contains 44 g of carbohydrates. The main source of carbohydrates contained in ogel-ogel is glutinous rice flour as the main base ingredient of ogel-ogel. The content of carbohydrates in ogel-ogel weighing 100 g can supply 90.8% of carbohydrate that needed by our body (48.25 g) for 1 serving of intermittent food that is recommended for people with 2150 kcal needs. Ogel-ogel is included in snacks that can be used to supply the nutrients that needed in our body. Based on the DBMP (list of exchange food ingredients) 2010, glutinous rice flour contains 79.5 g carbohydrates / 100 g [3]. In 100 g ogel-ogel made from glutinous rice flour around 42.85 g with the amount of carbohydrates mentioned above when analyzing nutrient contents, if calculated the nutrient content is in accordance with the existing ingredients. The flour contains quite a lot of carbohydrate which is

able to be digested by humans in general. This is what causes the high carbohydrates contained in ogel-ogel products.

3. 2. Protein levels

Protein is a nitrogen-containing food substance which is believed to be an important factor for body function. Protein molecules contain carbon, hydrogen, oxygen, nitrogen, and has an important role in the structure and function of all living organisms and viruses, which most proteins are enzymes or enzyme subunits.

The results of the researching with the kjeldahl method with two times repetition is the average of protein content in ogel-ogel is 13%, which meant that every 100 g of ogel-ogel contained 13 g of protein. Protein in ogel-ogel can supply one's protein needs by 76% for two times intermittent meals in one day (17.1 g) for people with energy needs of 2150 kcal per day. Eating ogel-ogel can supply the daily protein needs for someone, especially animal protein because ogel-ogel contains a source of animal protein in the form of eggs and cheese. When calculated by the ingredient content of nutrients in the DBMP (list of exchange food ingredients) 2010, [4] ogel contains nutrients that are by the nutritional content of the raw material. According to DBMP, cheese (the basic ingredient of cow's milk) contains a protein of 11.4 g / 100 g while chicken eggs contain 7.6 g of protein/seeds (60 g). The results are directly proportional to the theory that is considered that when cooking does not damage the nutritional content of material usually due to the correct cooking technique.

3. 3. Fat levels

Fat is a source of energy that is very important and needed by humans, especially used in daily activities. Humans have a body that requires balanced fat levels. This is to make energy reserves remain. The data shows that the average of fat content in ogel-ogel is 47%, which means that every 100 g of ogel contains 47 g / 100 g of fat. One pack of 100g ogel-ogel can supply 78.3% of the daily fat requirement (60 g) which must be consumed by people with an energy requirement of 2150 kcal. The source of fat contained in ogel-ogel is eggs and cheese, and the cooking uses a deep frying method, the deep frying method is used a lot of oil in a ratio of 1: 6 so that it soaks the food to be fried [5]. On ogel-ogel products though ogel-ogel is processed by frying, ogel-ogel is not necessarily able to cause diseases associated with fat accumulation if not consumed excessively. Based on the 2010 DBMP (exchange food ingredients list), palm oil contains 1 g of fat / ml while cheese and eggs which are other sources of fat each contain fat of 7.9 g / 100 g and 6.4 g / seed [4]. high probability the fat content in the raw material for making ogel is the cause of the high fat ogel content. The results of nutritional analysis in the laboratory in accordance with the information available on DBMP is considered when cooking there is no error in the technique of ogel-ogel cooking.

3. 4. Total Of Bacteria

The ALT method (Total Plate Number) is one of the most common methods used to determine the number of bacteria contained in food product. In this test using PCA media (plate count agar) which was recommended for samples of food, drinks, dirty water, and clinical samples [6]. In total bacterial testing this time was done with 3 times repetition (triplo) with dilution 3 times (10⁻², 10⁻³, and 10⁻⁴). The results of this test can be seen in table 2.

Table 2. Total bacteria of ogel-ogel

Sample	10 ⁻²	10 ⁻³	10 ⁻⁴	Result (CFU/ml)
Ogel-ogel1	11	0	0	1,1x10 ⁻⁴
Ogel-ogel2	22	1	0	2,2x10 ⁻⁴
Ogel-ogel3	1	0	0	0,1x10 ⁻⁴
Average				1,13x10 ⁻⁴

Table 2. shows that generally ogel-ogel food contains bacteria as much as 1.13×10^4 CFU / ml. Based on the Regulation of the Head of the Republic of Indonesia Drug and Food Control Agency (BPOM) No. 16 of 2016 concerning microbiological criteria in special bakery products (sweet, salty, savory) ALT contamination must be in the standard 107-108 CFU / ml range. Therefore ogel-ogel products are declared safe for consumption [7].

Based on Undang-Undang No. 18 of 2012 Article 1 paragraph 5 concerning food, food security are the conditions and efforts needed to prevent food from the possibility of biological, chemical and other contaminants that can interfere, harm and endanger human health and do not conflict with religion, belief, and community culture so that it is safe for consumption, while based on Undang-Undang No. 28 of 2012 Article 86 paragraph 1 states that what is meant by "Standards for Food Safety and Food Quality" are specifications or standardized technical requirements regarding food safety and food quality, for example, shape, color, taste, odor, or composition prepared based on criteria certain in accordance with the development of science and technology and other related aspects [8].

Ogel-ogel is declared safe for consumption by consumers based on the number of bacteria contained. This is supported by the production process from material selection to a distribution which is accordance with existing standards. The ogel-ogel owner claimed that the ingredients that used must be the best quality, so far the ogel-ogel owner always provides the raw material specifications to the partner in the hope of the ingredients as desired. During the production process, ogel-ogel employees apply standard procedures when working such as using PPE (Personal Protective Equipment), maintaining the cleanliness of the production area, maintaining the cleanliness of products and packaging during the packaging process to the distribution process. Ogel-ogel packaging is done using two types of packaging, primary and secondary. This secondary package made from cardboard helps to keep the product from contaminating material during the distribution process. Based on Government Regulation No.28 of 2004 guidelines for good production of processed food which reads: a) prevent contamination of processed food by biological, chemical contamination and other objects that can interfere, harm and endanger health; b) turn off or prevent the life of pathogenic microorganisms, and reduce the number of other microorganisms; and c) controlling the process, including the selection of raw materials, use of food additives, processing, packaging, storage or transportation, ogel has carried out the guidelines [8].

3. 5. Rancidity Test

Thiobarbituric Acid (TBA) is a method used to determine the rancidity of a food product. The quality of food will decrease if the rancidity level in food increases because it contains aldehyde in the form of malonaldehyde. Malonaldehyde compounds are markers of damage to a fried food product. The higher the malonaldehyde number, the higher the TBA number, the more damaged the quality of the food product. The damage of fried food can be determined by the degree of rancidity that can be expressed as a thiobarbituric acid number [9].

After researching the rancidity of the Pemalang Ogel-ogel typical food product, it was found that the tiobarbiturateogel-ogel acid number was 2.1645 mg malonaldehyde/ kg of ingredients so that the ogel-ogel can supply the maximum rancidity set by the National Standardization Agency (1991) namely 3mg malonaldehyde/kg of ingredients [10]. The ogel-ogel frying process is carried out as much as two times using palm oil. Palm oil used by ogel-ogel producers is the best palm oil in Pemalang with a characteristic golden yellow, normal flavor, with the results of products that are dry, crisp, and savory, not easy to smoke, not easily rancid, not easily discolored, and not easily become thick in accordance with the guidelines for how to choose cooking oil set by BPOM RI 2015 [5]. Cooking oil is only used as much as 2 times frying pan and replaced with the new oil. In addition, the primary packaging ogel-ogel using ocher type is thick enough that it is pressed together using a sealer that will be tightly closed so that microbial contamination can be minimized. These steps are carried out to maintain the quality of ogles so that they are not quickly rancid, feasible, and safe for everyone.

4. Conclusion

The conclusion that can be drawn from this researching is that ogel-ogel contains the highest nutrient in the form of fat by 47%, then carbohydrate 44%, and protein 13%. The ogel-ogel product is declared safe for consumption based on the number of microbes contained in it at 1.13×10^4 CFU / ml because it's still within the standard range 107 - 108 CFU / ml based on the Regulation of the Head of BPOM RI No. 16 of 2016 concerning microbiological criteria in processed foods in special bakery products (sweet, salty, savory) and the degree of rancidity with the number of thiobarbituric acid of 2.1645 mg malonaldehyde / kg of ingredients that are still below the maximum limit based on the National Standardization Agency (1991) 3 mg malonaldehyde / kg of ingredients.

Acknowledgments

All authors acknowledge the Ministry of Research Technology and Higher Education for funding this research and community services (number: 103-40/UN7.4.3/PM/2018). The authors also thank the study participants and Kebondalem Sub District of Semarang for their cooperation in facilitating the study. The assistance of Putri Septyarini and Astri Aditya in enrollment of study participants, and in data collection are also highly appreciated.

5. References

- [1] Byrne D V, Waehrens S S and O'Sullivan M G 2013 *J. Sci. Food Agric.* **93** 3414–9
- [2] Sgarbi E, Lazzi C, Tabanelli G, Gatti M, Neviani E and Gardini F 2013 *J. Dairy Sci.* **96** 4223–34
- [3] Wang Z F, Xu T, Wang C Y and Deng N 2018 *Food Sci. Nutr.* **6** 1387–93
- [4] Khan M N, Kalsoom S and Khan A A 2017 *Pakistan J. Med. Sci.* **33** 1273–8
- [5] Bouchon P 2009 *Advances in food and nutrition research* **57** 209–34
- [6] Bajwa A, Tan S, Mehta R and Bahreyni B 2013 *Sensors* **13** 8188–98
- [7] Casperson S L, Johnson L and Roemmich J N 2017 *Appetite* **112** 143–9
- [8] Pei X, Li N, Guo Y, Liu X, Yan L, Li Y, Yang S, Hu J, Zhu J and Yang D 2015 *Int. J. Environ. Res. Public Health* **12** 10662–70
- [9] Zeb A and Ullah F 2016 *J. Anal. Methods Chem.* **2016** 1–5
- [10] Xia Q, Liu C, Liu J, Pan W, Lu X, Yang J, Chen W and Zheng L 2016 *J. Sci. Food Agric.* **96** 1821–7