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The Potential of Engay Food Enriched with Asian Scallops Flour for Dysphagia Food Alternative

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Abstract

Engay food is a Japanese term for a modified texture food for elderly people with dysphagia. The enrichment of the nutritional value of food is carried out by adding the calcium found in the scallop shells. This study aimed to investigate the chemical, physical, and sensory properties of engay food enrich with scallop shell flour. The food formulation consisted of milkfish and the addition of scallop shell flour as much as 0%, 2%, 4%, 6%, and 8% of the basic ingredients with 5 repetitions. The result showed, the best formulation of engay food from chemical, physical, and sensory was the concentration of 4% scallop shell flour with the calcium content of 0.099 mg / 100g, water content 68.97%, ash content 0.98%, fat 1.39%, protein 9.00%, carbohydrates 19.66% and contains 562 cal / 100g. L* 30.8, a* 2.4, b* 13.9, °Chroma 14.07, and °Hue 80.27 with the type of yellow-red color, cohesiveness value 0.334 J / m2, adhesion value 0.034 mJ, and gumminess value 206.176 N/m2. High calcium engay food with milkfish as the main ingredient can be used as an alternative food for elderly people with dysphagia because it meets the requirements for food categories level 4-5 based on IDDSI recommendation.

Keywords: Asian moonscallops eggshells, calcium, dysphagia, elderly people, engay food

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INTRODUCTION

Texture-modified food (TMF) or food with modified textures is food that is processed by refining or chopping food so that the texture becomes softer and easier to consume (Nayoan, 2017). Engay food is a Japanese term for food with a modified texture intended for elderly people with dysphagia. The term was popularized at the APAC "Healthy Ageing Summit" in Singapore in 2018 by Naomi Suzuki of NutriCo Japan (Flyod, 2018). Dysphagia is a condition of difficulty swallowing due to decreased function of the oral organs, usually experienced in the elderly age group (Loret, 2015).

Engay food consists of a mixture of meat (chicken, beef, or fish) that has been chopped and disputed or mashed with the addition of a thickening agent. The addition of thickening agents or preservatives can thicken food products and aims to improve nutrition and extend shelf life (Villiers et al., 2019). Engay food does not have a significant difference in taste, aroma, and color, compared to food in general, however, it has a more friendly texture for the elderly with dysphagia. Foods with a soft texture (all ingredients are mashed) that can be consumed by dysphagia sufferers, so can improve nutritional intake (Ulrich and Crichton, 2015).

According to the Indonesian Ministry of Health (Kemenkes, 2013), old ages are divided into pre-elderly (45-59 years), elderly (≥ 60 years), high-risk elderly (pre-elderly and elderly with health problems. Elderly people with dysphagia have a risk of experiencing malnutrition, pneumonia, aspiration, and other chronic diseases

(Munawirah, 2017). Decreased appetite caused by dysphagia can disrupt the nutritional status of the elderly (Engelheart and Brummer, 2018). Garcia et al. (2018), Keller et al. (2012), Sukkar et al. (2018), agreed to state that engay food will reduce the risk of death caused by conditions of difficulty swallowing or dysphagia in the elderly and will improve the well-being of patients with dysphagia conditions. Engay food is a solution to overcome malnutrition in the elderly caused by dysphagia conditions.

Based on statistical data (Badan Pusat Statistik, 2018), the number of elderly people in Indonesia is estimated to reach 63 million in 2045. This needs to be a concern because currently TMF products to fulfill elderly nutrition cannot be found in the market. According to AKG data or Nutritional Adequacy Rate (2013), the amount of nutrition needed for men aged 50 years and over requires 2325 kcal, while for women it needs at least 1900 kcal. Calorie requirements can be higher or lower depending on the health condition of each person. Calorie needs must be met to maintain health.

The protein needs of the elderly aged over 50 years with the male gender are 60-65 g per day, while for the female gender it is 55-60 g per day (RDA, 2013). This high enough need can be met by consuming foods that contain high protein. One source of animal protein that is easy to find is milkfish (*Chanos chanos*). In 100 g of milkfish meat, there is 129 kcal of energy, 20 g of protein, 4.8 g of fat, 20 mg of calcium (Nusantari et al., 2016). Enrichment of nutritional value in engay food products can be done by adding various kinds of vitamins and minerals, especially those needed by the elderly. One of the minerals needed is calcium. Calcium is present in several ingredients including scallop shell so that engay food products can not only prevent malnutrition but also prevent the risk of osteoporosis in the elderly.

Firdaus and Aminah (2018) reported that the scallop shell contains at least 18% calcium which can be used as a potential source of calcium. The calcium content in the body of the elderly will shrink by 30% at the age of 50 years and increase to 50% when they reach the age of 70 years (Syahputra et al., 2016). Elderly women need at least 500 mg of calcium intake per day (Prasetya et al., 2015).

Based on this, the scallop shell flour has the potential to enrich calcium in engay food products. Improvement of nutritional status in the elderly can be improved by fulfilling nutrition through engay food products. The formulation of engay food with scallop shell flour will affect the sensory, physical and chemical characteristics of engay food. This study aims to determine the chemical, physical, and sensory characteristics of engay food enriched with scallop shell flour. Thus, a research study is needed to study the proper formulation so that the best engay food product is obtained based on the addition of scallop shell flour.

RESEARCH METHOD

Material

The materials needed in this study are white and brown, medium-sized, cleaned and cleaned scallop shells (*Amusium pleuronectes*) obtained from traditional market Semarang City, 200 g fresh thornless milkfish meat (*Chanos chanos* Forssk.) obtained from the market Semarang City, vitamin D 400 IU (Gracia Pharmindo, Indonesia), tapioca flour with the brand 'Pak Tani Gunung' 5%, 10% mashed potato, CH_3COOH 2N (Merck, Germany), NaOH (Merck, Germany), murexid powder (PT. Has Chemindo, Bekasi), H_2SO_4 (Merck, Germany), $CaCl_2.2H_2O$ (Merck, Germany), petroleum benzene (Merck, Germany), HCl (Merck, Germany), 95% alcohol (Onemed, Jayamas Medica,

Sidoarjo), distilled water (Shagufta Laboratory, Bandung), starch indicators, PP, MR, and BTB (Merck, Germany).

Preparation of Scallop Shell Flour (Modification of Agustini et al., 2011)

Preparation of scallop shell flour modified the method of Agustini et al. (2011) by hydrolysis using CH_3COOH 2N for 4 hours at 50 °C in a water bath. Furthermore, the shells were dried using a cabinet dryer at a temperature of 50°C for 3 hours, and flouring was carried out using a disk mill. The fine grains of the scallop shells were sieved using an 80 mesh siever.

Preparation of Engay Food enriched with scallop shell flour (Modification of Viganó et al., 2011)

The milkfish was prepared with sorted and cleaned of scales, then the bones are taken to get the milkfish fillet. Engay food preparation modified the method of Viganó et al. (2011). Engay food is formulated with 200 g of milkfish meat and the scallop shell flour is added according to the treatment (0%, 2%, 4%, 6%, 8%), seasonings with salt and fine pepper, and 5% of thickening agent in the form of dissolved starch and mashed potatoes as much as 10% of the basic ingredients. Heat to 90 °C for 30 minutes, before the molding process is done, cooled for 20 minutes then stored in the freezer. For the analysis, the frozen sample has been used.

Calcium content analysis (Rahayu et al., 2011)

Ash as much as 5 g of the sample, then the ash is put into a volumetric flask. Added 1 ml of murexid solution, and added distilled water to taste. Add 2 12 of 0.1 N NaOH, add more distilled water until the volume reaches 50 ml. Dilution of 1 ml of the sample solution in a 25 ml volumetric flask, add distilled water to the limit mark, then put it in the cuvette and read the absorbance at the maximum wave using spectophotometer UV-Vis (Type AMV10, AMTAST). The absorbance value obtained was used to calculate the calcium concentration in engay food by using the linear regression equation of the standard curve that has been made.

Color analysis (Swandari et al., 2017)

The color was analyzed using a colorimeter (WR10 Portable, FRU) with the sample stages prepared on a plastic base and having a flat surface. The sensor light on the colorimeter was directed at the engay food surface then the chromaticity coordinates (L* a* b*) are read and recorded as the intensity of the engay food color brightness, the value of L * a * b * is used to calculate ° Hue which functions to determine the color type with the formula : Color type = archtangent (b*/a*)

Texture analysis uses a texture analyzer (Engelen, 2018) and the spoon test method (Cichero et al., 2013)

The texture was analyzed using a texture analyzer (CT3, Brookfield) with a prepared sample of engay food sample was flanked by two rings 3 cm in diameter and pressed by a TA 10 size probe with the required load force (trigger) of 20.0 gf and deformation of 8.00 mm from the original size with the speed of 1 mm/s. The force required for compression is measured and recorded as a hardness value. The hardness value is indicated by the absolute (+) peak (greatest force) with the unit parameter is gram force (gf).

The texture was analyzed using a spoon or fork by placing the engay food sample on the spoon, if the spoon was tilted or rotated, the sample will fall. The sample was said to be included in the TMF category (level 4 = puree, level 5 = minced and moist food, according to IDDSI, 2016) if the residue left on the spoon was only a little but not sticky. If pressed with your thumb that is placed on the fork hard, foods with the TMF category can cause the thumb to experience blanching or bleaching because the

arteries are put under pressure. The pressure on the white thumb that was placed on the fork is equal to the pressure used by the tongue to swallow food or equal to 17 kPa.

Sensory Analysis (SNI 01-2346-2006, BSN, 2006)

Sensory testing uses the hedonic test (SNI 01-2346-2006, BSN, 2006) to assess panelists' acceptance of the color, taste, aroma, and texture of engay food. This study used 3 trained panelists. The test was carried out using a questionnaire with parameters using a numerical scale ranging from 1 to 5 (1 = very dislike, 2 = dislike, 3 = neutral, 4 = like, 5 = very like). Sample preparation was done by baking using a pan with a temperature of 95 °C for 10 minutes.

Proximate Analysis

From the tests that have been done above, engay food will be obtained with the best formulation which will then be tested for its nutritional content through proximate tests, including Energy Analysis with the method of Saraswati et al., (1994) using the Indonesian Food Composition Table, Water Content Analysis (AOAC, 2005), Ash content (AOAC, 2005), Kjedhal micro method protein content (AOAC, 2005), carbohydrate content with different methods (Sudarmadji et al., 1989), and fat soxhlet method (AOAC, 2005).

Research design

This study used a completely randomized design (CRD) with a single factor. With the formulation of 200 grams of milkfish as the basic ingredient and adding 0%, 2%, 4%, 6%, and 8% of scallop shell flour from the basic ingredients, with 5 repetitions.

Data analysis

The data obtained were analyzed by means of variance (ANOVA). This analysis was used to test the real differences of each treatment carried out in the study, Duncan's trial with a p-value <0.05. Data from sensory test results were tested using the Non-Parametric Friedmann test, using Wilcoxon.

RESULTS AND DISCUSSION

Chemical Characteristics

Engay Food Calcium Content

According to Miles et al. (2019), the need for calcium and protein in the elderly is very high and must be met. Lack of calcium can cause muscle weakness that can lead to dysphagia in the elderly (Schafer et al., 2016). In this study, the addition of scallop shell flour to engay food was carried out to increase its calcium content. The scallop shell has a calcium content of 18% (Firdaus and Aminah, 2018). The average value of calcium levels can be seen in Figure 1.

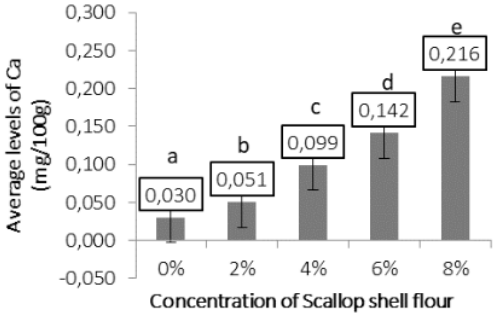


Figure 1. Average levels of calcium engay food with the addition of scallop shells.

The highest average level of calcium engay food was found in the treatment with the addition of 8% scallop shell flour (0.216 mg / 100g. The results of statistical tests using ANOVA obtained p-value = 0.000 <0.05, so it can be concluded that there is an effect of the concentration of adding scallop shell flour to the calcium levels of engay food. The results of the post-ANOVA follow-up test using Duncan with p-value = 0.05 showed a very significant difference between treatments. So it can be said that the higher the concentration of adding scallop shell flour, the higher the calcium content. This is in line with research conducted by Agustini et al. (2011), cookies enriched with scallop shell flour as much as 0%, 5%, and 7.5% had calcium content of 5.44%, 6.27%, 6.57% respectively. Ratnawati et al. (2014) in their research stated that the formulation of cookies with modified scallop shell flour had a higher calcium content than the control treatment, which was 17.23 mg / 100g.

Nurliana and Putri (2015) in their research stated that there was an effect of adding the clamshell shell flour formulations and tapioca flour to cracker preparations. The best calcium content was obtained with the formulation of 20% scallop shell flour: 47% tapioca flour, namely 5.47 mg / L. The higher the concentration of tapioca flour that was added, the lower the concentration of scallop shell flour which resulted in a decrease in calcium levels. Firdaus and Aminah (2018), which stated that the addition of scallop shell flour to extrudate products with concentrations of 0%, 5%, and 10% had calcium content of 0.11%, 1.29%, and 3.80%. Currently, there is no certain limit or standard for the amount of calcium in engay food products.

Water content, ash content, fat, protein, carbohydrates, and energy

Engay food with the addition of 4% scallop shell flour was the best treatment. Therefore, a proximate analysis was carried out to see the water, ash, fat, protein, and carbohydrate content of the sample. The results obtained, engay food has an average water content of 68.97%, ash content of 0.98%, fat content of 1.39%, protein content of 9.00%, carbohydrate content of 19.66%. The mean values of water, ash, fat, protein, and carbohydrate content can be seen in Table 1.

Table 1. Average values of water, ash, fat, protein, and carbohydrate content of engay food with the best treatment.

Rep.	Water (%)	Ash (%)	Fat (%)	Protein (%)	Carbohydrate (%)	Energy (cal/100g)
1	69.03	0.99	1.41	8.89	19.68	561
2	68.92	0.97	1.36	9.10	19.65	563
mean	68.97±0.08	0.98±0.01	1.39±0.04	9.00±0.15	19.66±0.02	562±1.41

The high water content in engay food can be influenced by the water content of the basic ingredients, the use of tapioca flour or starch as a thickening agent, and the processing process. Sumartini et al., (2014) stated that fresh milkfish has a high water content, which is around 73, 8%, while the water content of the scallop shell flour was 2.20% (Agustini et al., 2011), the water content of potatoes ranged from 83-86%. The high water content in ingredients affects the moisture content of engay food. The high starch content in tapioca flour is able to bind large amounts of water. This is in line with research conducted by Lekahena (2016) which states that the more tapioca flour is added to fish nuggets, the higher the water content. The processing process can also affect moisture content. Engay food is processed by a steaming process to solidify the texture. The steaming process causes the water content to increase and will affect the gumminess, cohesiveness, and adhesion of food products. The high water content will

affect the gelatinization process of food ingredients. Currently, there is no specific standard regarding the content of engay food, but engay food with levels 4-6 is almost the same as processed nuggets. Based on SNI 7758: 2013 concerning fish nuggets, the maximum water content of fish nuggets is 60%. However, fish nuggets tend to have a dense texture, whereas engay food has a soft texture.

The ash content in engay food with the best treatment can indicate the presence of mineral content, in this case the presence of calcium. Based on SNI 7758: 2013, the maximum ash content of fish nuggets is 2.5%. The ash content of engay food with the best treatment meets the requirements for the ash content of fish nuggets.

The fat content in engay food is very low. This can be affected by the fat content of the basic ingredients and the processing process. Fresh milkfish has a very small fat content, namely 2.8 g / 100 g, while the scallop shell flour contains 2.44% fat (Agustini et al., 2011). The steaming process can cause the fat content in fish to decrease. This is due to the loss of tissue fluid from the fish meat which eventually releases fat in the fish (Dhanapal et al., 2012). Based on SNI 7758: 2013, the maximum fat content of fish nuggets is 15%. The fat content of engay food with the best treatment meets the requirements for the fat content of fish nuggets.

The protein content in engay food has met the requirements of SNI 7758: 2013, with a protein content of at least 5%. The protein content in engay food is influenced by the protein content of the basic ingredients and the processing process. Fresh milkfish contains 20.5 g of protein, but the protein content of engay food is still very little. This is influenced by the steaming process. According to Sundari et al., (2015) steaming time and temperature can cause a decrease in the protein content of foodstuffs due to protein denaturation resulting in coagulation and reducing its solubility. Rothenberg et al. (2007) in their research stated that texture-modified food made from beef has an average protein content of 15 g/100g.

Based on calculations using the Indonesian Food Composition Table (TKPI, 2018), the amount of protein contained in 100 g of engay food is 33.24 g/100g. The daily requirement for protein in the elderly is 55-65 g/day, so the number of servings that must be consumed to meet these needs is 200 g of engay food. The high carbohydrate content in engay food with the best treatment is caused by the carbohydrate content in the ingredients. Milkfish does not contain carbohydrates, but engay food uses potatoes as one of the ingredients. Potatoes contain 17g/100g carbohydrates so that which affects the carbohydrate content of engay food.

The amount of energy or calories contained in 100 g of engay food when calculated using the Indonesian Food Composition Table (TKPI, 2018) is 562 cal/100g. The amount of energy per 100 g of engay food is smaller than the amount of energy from texture modified food made from beef, which is around 220 kcal/100g (Rothenberg et al., 2007)

Physical Characteristics

Engay Food Color Characteristics

Color is an indicator in assessing the quality of food products. Color brightness is able to show the color intensity and the presence of a product's color (Adawiyah, 2013). Color brightness is influenced by factors of the light source illuminating the product, absorption and spectrum reflection properties, environmental conditions, the condition of the subject who sees the product, the basic ingredients of the product, and the processing process. Average levels of calcium engay food with the addition of

scallop shells. The average value of Chroma and Hue levels can be seen in Figure 2 and Figure 3.

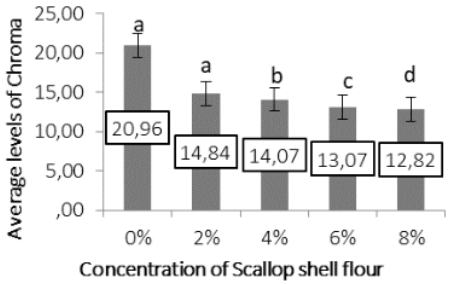


Figure 2. Average levels of Chroma

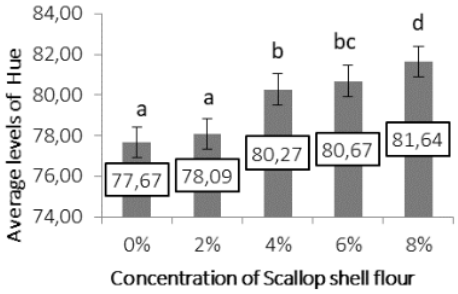


Figure 3. Average levels of Hue

The chroma value indicated saturation degree of engay food. If the chroma value on the chromameter screen increases, the engay food color shown will be bright, whereas if the chroma value goes down it will show faded. The highest chroma engay food value was found in the control treatment (0%), which was 20.96. From Figure 2, it can be seen that there was a decrease in the chroma value between the control and engay food treated with the addition of 2%, 4%, 6%, and 8% of scallop shell flour.

The hue value shows the color angle, if the hue is 0 * then it shows a color that tends to be medium red if the hue is ≤90 ° it will show a color that tends to be yellow (Swandari et al., 2017). The highest value of hue engay food was found in the concentration of addition of 8% scallop shell flour, which was 81.64.

The color type is obtained from °Hue, if the ° Hue value ranges from 18°-54° then, the type of color is red (red), 54 ° -90 °, then the type of color is reddish yellow (yellow-red) (Hutching, 1999). Engay food color coordinates can be seen in the Table 2.

Table 2. Coordinates of engay food colors

Concentration	L*	a*	b*	C	°H	Color type
0%	26.1	4.58	20.3	20.97°	77.67°	*Yellow-Red*
2%	29.7	2.8	14.6	14.84°	78.09°	*Yellow-Red*
4%	30.8	2.4	13.9	14.07°	80.27°	*Yellow-Red*
6%	31.2	2.22	12.9	13.07°	80.67°	*Yellow-Red*
8%	32.3	1.86	12.7	12.82°	81.65°	*Yellow-Red*
mean	30.0±2.11	2.76±0.94	14.91±2.86	15.17±2.99	79.76±2.11	

Note: L* = bright intensity, a* = the present of red color, b* = the present of yellow color, C = *Chroma,* °H = *Hue*

The results of statistical tests using ANOVA, obtained p-value = 0.000 <0.05, so it can be concluded that there is an effect of adding scallop shell flour to the chroma value and the value of hue engay food. The results of the post-ANOVA test using Duncan with p-value = 0.05 showed that the control treatment and the 2% concentration were not significantly different, while there was a significant difference between the 2%, 4%, 6%, and 8% treatments. The more the hue value increases, the chroma value decreases, which means that the intensity of the engay food color gets darker while the color is in a yellowish position with the yellow-red color type. Engay food surface color and texture can be seen in Figure 4.

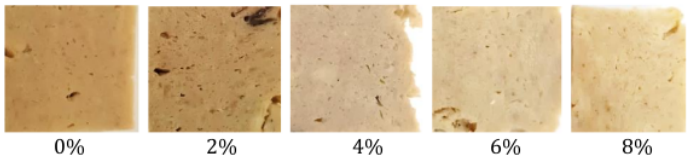


Figure 4. Engay food surface color and texture

The yellow-red color is thought to be influenced by the presence of beta carotenoid pigments found in potatoes and milkfish (Bello et al., 2013). So far, there is no standard regarding the color of engay food, because the color of engay food will change along with the use of ingredients and processing.

Engay Food Texture

According to research conducted by IDDSI (2016), the right foods for elderly people with dysphagia are at levels 4 (puree) to 5 (minced and moist). Texture classification can be tested using a spoon test, while the value of gumminess, adhesion, and cohesiveness is measured using a Texture Analyzer. The results of the engay food texture test are presented in Figure 5, Figure 6, and Figure 7.

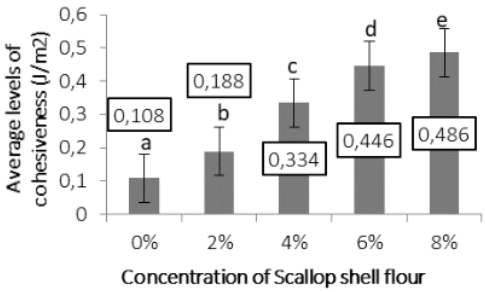


Figure 5. Average cohesiveness value of engay food with the addition of scallop shells.

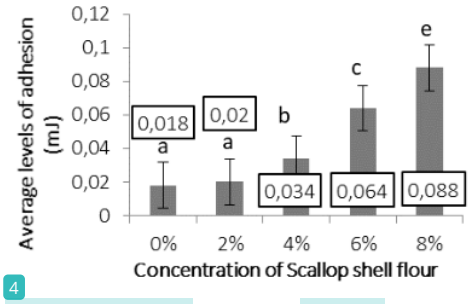


Figure 6. Average adhesion value of engay food with the addition of scallop shells.

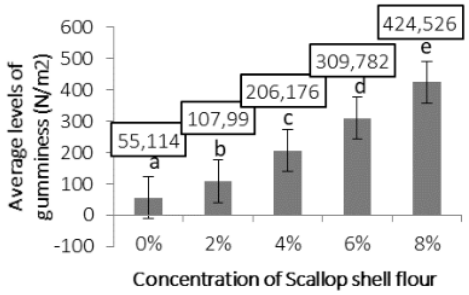
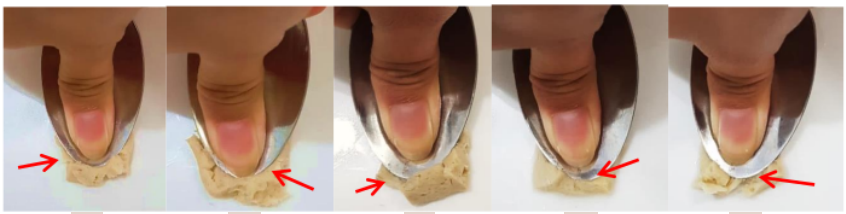


Figure 7. Average gumminess value of engay food with the addition of scallop shells.

The highest mean values of cohesiveness, adhesion, and gumminess were found in the treatment with the addition of 8% scallop shell flour, respectively 0,486 J/m^2, 0,888 mJ, dan 424,526 N/m^2. All treatments were included in the food category for elderly people with dysphagia level 4-5 after being tested using the spoon test. The spoon test can be seen in Figure 8.



(a) (b) (c) (d) (e)

Figure 8. Engay food with the addition of shell flour concentration 0% (a); 2% (b); 4% (c); 6% (d); and 8% (e).

Wada et al. (2017) stated that food with a modified texture that is well accepted by the elderly age group is defined as having a gumminess level below 15,000 N / m2, a cohesiveness level below 1000 J / m2, and a level of Adhesion between 0.2-0.9 mJ. The values of cohesiveness, adhesion, and gumminess are mutually sustainable. In this study, the cohesiveness, adhesion, and gumminess values were directly proportional. The higher the cohesiveness and adhesion values, the higher the gumminess value. It can be concluded that engay food enriched with scallop shell flour has stickiness, cohesiveness, and chewiness in accordance with food standards for dysphagia but still gets denser.

The results of statistical tests using ANOVA, obtained p-value = 0.000 <0.05, so it can be concluded that there is an effect of increasing the concentration of scallop shell flour on gumminess, cohesiveness, and adhesion engay food. The results of the post-ANOVA test using Duncan with p-value = 0.05 showed that there was a very significant difference between each treatment on gumminess and cohesiveness. However, the control treatment adhesion and the addition of 2% shell flour did not show a significant difference. This is in line with the research of Shaliha et al., (2017) which states that, the higher the cohesiveness value, the higher the product adhesion value. The increase in cohesiveness and adhesion values in engay food can also be caused by the addition of starch as a thickening agent (Igoe and Yui, 1986). The amylopectin content in starch can increase the adhesion of a product (Iswara et al., 2019).

Sensory Characteristics

The highest mean of engay food color sensory value was found in the treatment with the addition of scallop shell flour as much as 4% (5.00) including in the very like scale. According to the panelists, the color of engay food with the addition of 4% scallop shells was brownish and bright yellow, while the lowest average value was in the control treatment because the color was too pale. The pale color that appears is thought to be due to the effect of the color of the milkfish, while the brownish color in the other samples is influenced by the Maillard reaction during the roasting process. The mean color sensory values are presented in Figure 9.

The Friedmann test results showed that there was an effect of adding scallop shell flour to the color of engay food with p-value = 0.021 <0.05. The results of the Wilcoxon further test showed that there was a significant effect between the control treatment and the addition of 2%, 4%, 6%, and 8% of scallop shell flour. However, there was no significant difference between the 2%, 6%, and 8% treatments.

The highest mean of engay food taste sensory value was found in the treatment with the addition of scallop shell flour as much as 4% (5.00) including in the very like scale According to the panelists, engay food with the addition of 4% scallop shell flour had the most savory taste compared to other treatments. Overall, engay food with the addition of scallop shell flour has a distinctive savory taste of milkfish.

The results of the Friedmann test show that there is an effect of adding scallop shell flour to the taste of engay food with p-value = 0.035 <0.05. The results of the Wilcoxon further test showed that there was a significant effect between the control treatment and the addition of 2% and 4% of the scallop shellfish flour. However, there was no significant difference between the control treatments, 6%, and 8%. This is inversely proportional to the study conducted by Abidin et al. (2016), where the addition of scallop shell flour had no effect on the taste of plain bread. Ratnawati et al. (2014) state, cookies with the addition of scallop shell flour do not affect the taste, the use of other ingredients such as butter, sugar, and carbohydrates contained in the constituent ingredients affect the taste. Firdaus et al. (2018) in their research states that the scallop shell flour does not have a special or neutral taste. It is suspected that the taste of milkfish contributes to the sensory value of the taste of engay food. The mean color sensory values are presented in Figure 10.

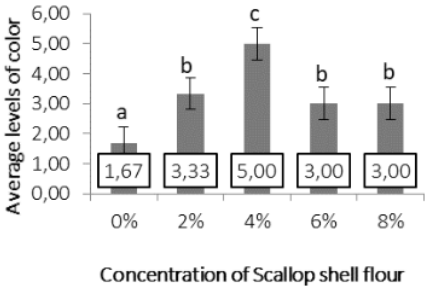


Figure 9. Average sensory value of color on engay food with the addition of scallop shells.

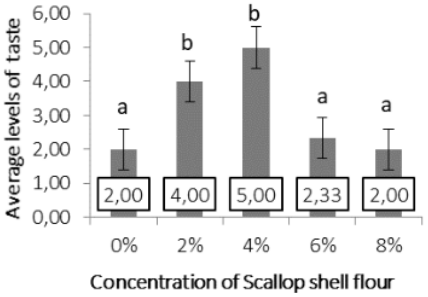


Figure 10. Average sensory value of taste on engay food with the addition of scallop shells.

The highest average sensory value for engay food aroma was found in the treatment with the addition of scallop shell flour as much as 4% (5.00) including in the very like scale. Overall, the aroma of engay food, enriched with scallop shell flour, has a distinctive aroma of milkfish. However, in the control treatment (0%) the fish aroma was more fishy.

The Friedmann test results showed that there was no effect of adding scallop shell flour to the aroma of engay food with p-value = 0.058> 0.05. This is in line with research conducted by Abidin et al. (2016) that there is no effect of aroma from the addition of scallop shell flour to plain bread. The addition of scallop shell flour to

cookies also did not significantly affect it, presumably, the aroma comes from margarine and butter (Ratnawati et al. 2014, Agustini et al. 2011) According to Firdaus et al. (2018) stated that the scallop shell flour will not affect the aroma of the extrudate product. The average aroma sensory value is presented in Figure 11.

The highest mean sensory value for engay food texture was found in the treatment with the addition of scallop shell flour as much as 2% and 4% (4.67). According to the panelists, engay food with the addition of 2% and 4% scallop shell flour has a soft texture but is not soft, easy to chew, not too dense, and does not leave fiber on the tongue. This is in accordance with the research of Wada et al., (2017) which states that the texture of engay food level 4-6 must have a soft texture, should not leave fiber on the tongue, and not be hard. Whereas in the addition of 6% and 8% concentrations, the texture of engay food tends to be hard and dense. This is influenced by the scallop shell flour which has very fine grains and glutenized starch. The mean texture sensory value is presented in Figure 12.

The Friedmann test results show that there is an effect of adding scallop shell flour to the texture of engay food with p-value = 0.029 <0.05. The results of Wilcoxon's further test showed that there was no significant effect between the control treatment, the addition of 2% and 4% scallop shell flour, while the 6% and 8% treatments were not significantly different. This is in line with research conducted by Firdaus and Aminah (2018), where corn cereal added with scallop shell flour has a better texture with an average of 3.40. Abidin et al. (2016) stated that the substitution of scallop shell flour in plain bread causes the texture of the bread to become drier because the addition of scallop shell flour can reduce water content.

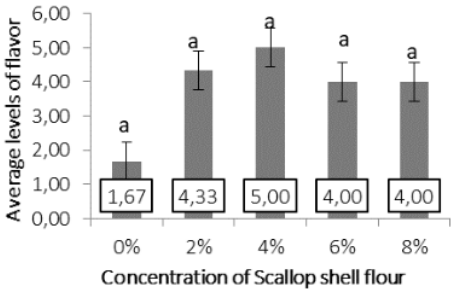


Figure 11. Average sensory value of flavor on engay food with the addition of scallop shells.

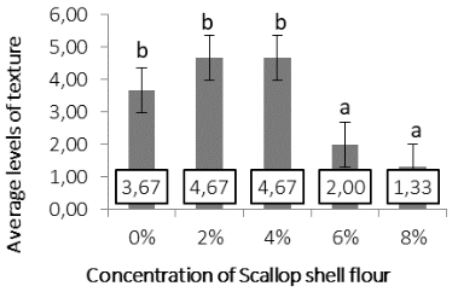


Figure 12. Average sensory value of texture on engay food with the addition of scallop shells.

According to Stading (2021), the temperature at the time of serving engay food will affect the sensory value of the texture. Engay food must be consumed at room temperature after baking because engay food consumed when it is hot or cold (above room temperature) can experience compaction or hardening of the texture, which makes it difficult for elderly people with dysphagia to consume it.

CONCLUSION

Engay food with the best formulation of chemical, physical, and sensory characteristics is the addition of 4% scallop shell flour concentration with the calcium

content of 0.099 mg / 100g, the water content of 68.97%, ash content of 0.98 %, 1.39% fat, 9.00% protein, 19.66% carbohydrates and contains 562 cal / 100g. The best formula has a L * (30.8), a * (2.4), b * (13.9), °Chroma (14.07°), and °Hue (80.27°) with the type of yellow-red color. The cohesiveness value was 0.334 J / m2, the adhesion value was 0.034 mJ, and the gumminess value was 206.176 N / m2. High calcium engay food with milkfish as the main ingredient can be used as an alternative food for elderly people with dysphagia because it meets the requirements for food categories level 4-5 based on IDDSI recommendation.

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