International Journal of Scientific Engineering and Research (IJSER)
ISSN (Online): 2347-3878
Impact Factor (2018): 5.426

Sensory Evaluation of Fish Cake (*Pempek*) with the Addition of Modified Tapioca

Ina Permata Sari[1], Filli Pratama[2], Tri Wardani Widowati[3]

[1]Magister Program of Agribusiness, Faculty of Agriculture, Universitas Sriwijaya

[2,3]Study Program of Agricultural Product Technology, Faculty of Agriculture, Universitas Sriwijaya

Abstract: ***Fish cake with the local name as pempek, is one of traditional foods from south Sumatra, Indonesia. The main ingredients in pempek include minced fish meat and tapioca. The large portion of tapioca in the pempek's dough resulted in the texture of pempek is firming during storage. Modification of tapioca was conducted to retard the firming texture of pempek. This research focused on the sensory evaluation of the pempek with the addition of modified tapioca. The selected modification methods included microwave, ultrasonic, and combination of microwave and ultrasonic methods. There were 50 panelists to judge the preferences on the texture, color, taste and appearance of pempek based on the hedonic scores of 1 (dislike), 2 (like moderately), 3 (like extremely). Results showed that the addition of modified tapioca significantly affected the texture, color, and taste of pempek. The most preferred treatment was found to be pempek with the addition of tapioca modified by combination of microwave and ultrasonic-assisted treatment. The hedonic score was in the range between 2 (like moderately) to 3 (like extremely).***

Keywords: fish cake (pempek), microwave, ultrasonic, sensory

1. Introduction

Fish cake or *pempek* is one of traditional foods from south Sumatra, Indonesia. The main ingredient in *pempek* are minced fish meat and tapioca. The ratio of minced fish meat and tapioca determines the eating quality *pempek*; and the common ratio between those two main ingredients are 1:1. *Pempek* is preferred not only by local Sumatrans but also by people from another region. *Pempek* has many shapes such as cylindrical, round, and noodle-like. *Pempek* used to stored in a refrigerator due to the short shelf life if stored at room temperature.

The tapioca in *pempek* dough is gelatinized during boiling *pempek*, and that is the reason the texture of *pempek* is firming during storing in a refrigerator. The gelatinized starch can be hardened (retrograded) during cold storage due to the re-arrangement of amylose so that the structure becomes more compact and hard [1]. The texture of *Pempek*'s become firmer as storage time in the refrigerator. Consumers usually reheat the *pempek* either by steaming or frying, but the *pempek*'s texture turns harder compared to the newly produced *pempek* because the reheated *pempek* has previously undergone retrogradation. Tapioca is the main ingredient that plays a role in changing the texture of *pempek* to be hard, therefore inhibition of the retrogradation process in *pempek* is done through tapioca modification.

The texture of *pempek* which is processed by modified tapioca with the autoclaving-cooling method produces a very soft *pempek* compared to the native tapioca [2] therefore most consumers do not like it. Consumers prefer *pempek* with a rather springy texture but not hard.

Another alternative is to use heat from microwaves and ultrasound for tapioca modification. Modification of starch by microwave involves electromagnetic waves which will be absorbed by water molecules in food and then converted into kinetic energy and heat. This situation causes water and starch molecules to collide and some water enters the starch granule so that the heating process by microwave can take place rapidly [3].

The formation of resistant starch due to the process of starch modification by heat of microwave waves was lower than that of native starch. This indicates that the starch modified by the microwave assisted method can slow down the starch retrogradation process so that the texture of starch which is gelatinized does not easily harden [4]. Modification by ultrasonication can provide a cavitation effect that is able to break the starch polymer chain so that it has the potential to accelerate the formation of resistant starch at a high frequency of ultrasonic waves that is 360kHz [5]. Low ultrasonic wave frequencies and low temperatures do not result in starch gelatinization so that retrogradation does not occur [6]. The vibrations of the ultrasonic wave frequency cause water to diffuse into the starch granules so that the starch conformation becomes more open, and at higher starch water content the resulting resistant starch content is higher than the lower starch water content [7]. Therefore, this study does not use high water content, since it is expected to slow down the retrogradation process. The maximum water content to be used in starch modification in this study is 50%.

The addition of modified tapioca into *pempek* is to slow down the process of hardening texture of *Pempek* during storage. The different properties of modified tapioca would have an impact on the preference of the product by consumers; therefore, the objective of the research is to evaluate the preference of consumers on the *pempek* with the addition of microwave and ultrasonic modified tapioca.

2. Materials and Methods

2.1 Materials

The minced fish meat of *Channa striata* and the native tapioca starch were purchased from local traditional market. The tapioca starch was modified by the method of microwave assisted treatment (denoted as A1), ultrasonic assisted treatment (A2) and combination of microwave and ultrasonic assisted treatment (A3).

2.2 Tapioca Modification

The native tapioca starch was conditioned to 30% (denoted as B1), 40% (B2) and 50% (B3) of moisture content (wet basis) in a closed jar and placed in a cool storage at a temperature of 4^{o}C for overnight prior to modification.

The microwave assisted treatment was performed by heating tapioca in a microwave oven at the power level of 450 Watt for 2 minutes. The tapioca was then dried in an oven at the temperature of 45^{o}C until achieving the moisture content of 12% (wet basis).

The ultrasonic assisted treatment was carried out by firstly conditioning tapioca to achieve desired moisture content with the similar procedures for the treatment of microwave heat method. The tapioca was then place in an ultrasonic processor at the frequency of 40 kHz with the temperature of 40^{o}C for 30 minutes. The tapioca was further dried in an oven at the temperature of 45^{o}C until achieving the moisture content of 12% (wet basis).

For the treatment of combination of microwave and ultrasonic heat was carried by first performing the microwave treatment followed by ultrasonic treatment. The tapioca was dried in an oven at the temperature of 45^{o}C until achieving the moisture content of 12% (wet basis).

2.3 Processing of *Pempek*

Minced fish meat (100 g) was added with 50 mL salt solution (2% w/v), and it was evenly mixed. Modified tapioca as amount of 75 g was gradually added into the mixture. The dough was kneaded until the mixture was smooth. The *pempek* dough was then shaped into a cylindrical shape with a diameter of 2 cm and length of 6 cm. The uncooked *pempek* was boiled for 15 minutes after water boiled. The cooked *pempek* was then strained and cooled at a room temperature.

2.4 Sensory Evaluation

The hedonic test was performed by evaluating the preference on texture, color, and taste. Tests were conducted on 50 panelists. Panelists were asked to give a hedonic scale of 1 to 3, namely 1 (dislike), 2 (like moderately), 3 (like extremely). The collected data were analyzed by the Friedman-Conover test.

3. Results and Discussion

3.1 Texture

The average value of panelists' preference level for *pempek* texture that has been added with different modified tapioca ranged from 1.64 to 2.2. The highest value was in the A1B2 (microwave treatment, 40% moisture content), while the lowest value was in A3B2 (microwave-ultrasonic treatment, 40% moisture content). The average value of panelists' preference for *pempek* texture for all treatments was presented in Figure 1.

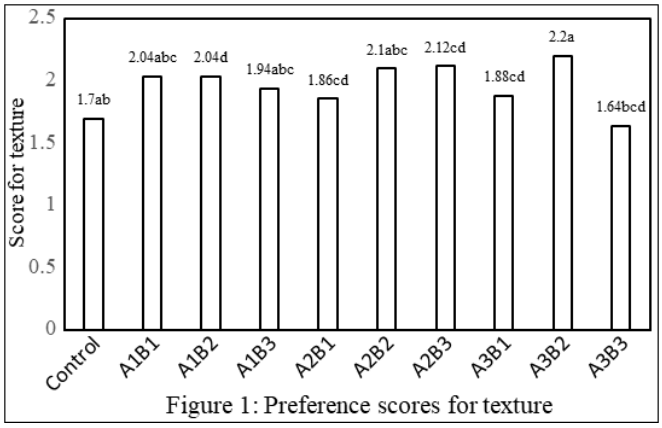

Figure 1: Preference scores for texture

The results of Friedman Connover's further test at a level of 5% for the texture of *pempek* with the addition of modified tapioca was indicated by letters at the end of the bars in Figure 1. The numbers followed by the same letters are not significantly different. The most preferred texture of *pempek* was found in the treatment of A3B2 (microwave-ultrasonic treatment at 40% moisture content). Heating of starch in microwave processing could reduce the viscosity of starch [8]. The heat of microwave could cause surface cracks on the starch granule, and it could facilitate water easily penetrates into the starch granule. According to the high temperature during microwave processing resulted long chain of amylose breaks into simple units. The amylose content of potato starch decreased after microwave and ultrasonic modification. The decreased of amylose content could slow down the re-arrangement of amylose-amylose during cooling [9], therefore the retrogradation of gelatinized tapioca in *pempek* could be retarded. As a result, the texture of *pempek* is still soft and moist, and this is reflected by a higher preference score for A3B2.

3.2 Color

The average value of the panelists' preference level for the color of the *pempek* with the addition of modified tapioca ranged from 1.94 to 2.44. The highest value was in the A3B1 treatment (microwave-ultrasonic, 30% moisture content), while the lowest value was in control (native tapioca). The average value of panelists' preference scores for the color of *pempek* can be seen in Figure 2.

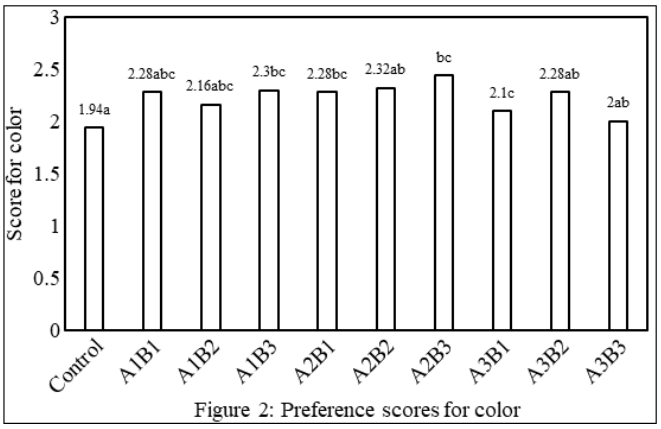

Figure 2: Preference scores for color

The highest preference score for color of *pempek* was found in the treatment of A2B3 followed by the treatments of A2B2, A1B3, A3B2 and A2B2. Although there seemed to be different in scores, statistical analysis showed that they were insignificantly different. The basic color of tapioca is white and the color changes is not significantly different among treatments. Some previous workers found that microwave and ultrasonic modifications significantly affected the color change on the modified starch as reported by [9].

3.3 Taste

The average value of the panelists' preference level for the taste of *pempek* that has been cooked using different tapioca modifications ranges from 1.84 to 2.12. The highest value was in the A3B1 treatment (microwave-ultrasonic, 30% water content), while the lowest value was in control (no treatment). The average value of panelists' preference for the color of *pempek* that has been added with modified tapioca for all treatments can be seen in Figure 3.

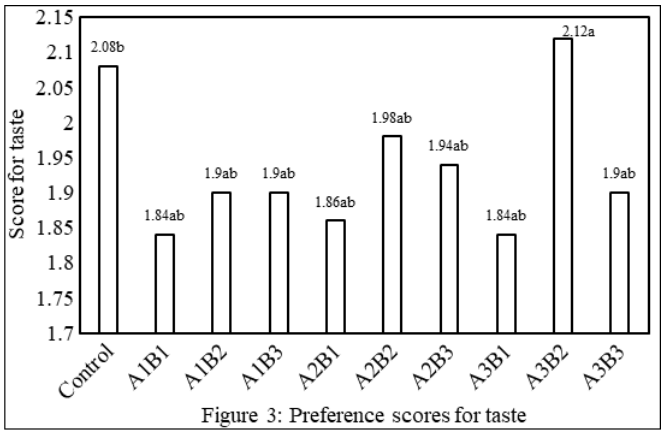

Figure 3: Preference scores for taste

The highest preference score for the taste of *pempek* was found in the treatment of A3B2, and statistical analysis showed that the treatment of A3B2 was not significantly different with other treatment except with control (no treatment). The taste of *pempek* was from the salt added during processing, therefore modification of tapioca did not affect the taste of *pempek*.

3.4 Appearance

The average value of the panelists' preference level for the appearance of *pempek* that has been cooked using different tapioca modifications ranges from 1.52 to 2.36. Friedman Connover test showed that there were no significant differences among all treatment for the appearance of *pempek*. This might be due to no color change on the modified tapioca starch. The average value of panelists' preference for the color of *pempek* that has been added with modified tapioca for all treatments can be seen in Figure 3.

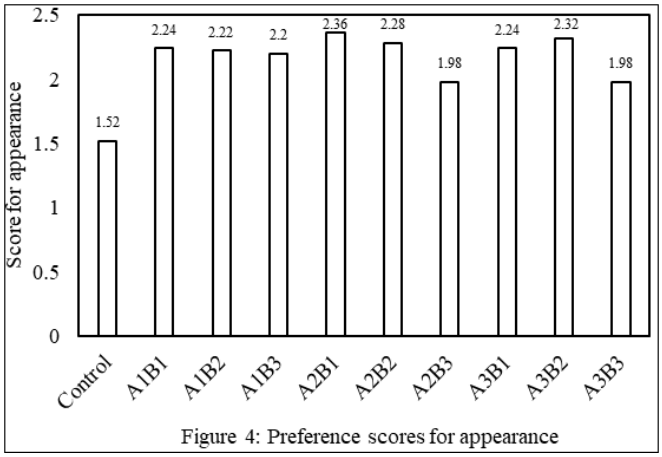

Figure 4: Preference scores for appearance

4. Conclusion

The addition of modified tapioca into *pempek* affected the texture, color and taste of *pempek*. The most preferred *pempek* was found in the treatment of *pempek* yang was added with modified tapioca by combination of microwave and ultrasonic modification at 40% of moisture content (wet basis) of tapioca.

5. Acknowledgement

Authors thank to Universitas Sriwijaya for the financial support and facilities for conducting this research.

References

[1] Tan H-Z, Li Z-G, Tan B. Starch noodles: History, classification, materials, processing, structure, nutrition, quality evaluating and improving. Food Res Int. 2009;42(5–6):551–76.
[2] Oksilia O, Pratama F. Karakteristik Fisik, Kimia Dan Sensoris Pempek Berbahan Dasar Pati Resisten Tipe III Tapioka. In: Prosiding Seminar Nasional Hasil Litbangyasa Industri. 2018. p. 163–75.
[3] Fan D, Shen H, Huang L, Gao Y, Lian H, Zhao J, et al. Microwave-absorbing properties of rice starch. Polymers (Basel). 2015;7(9):1895–904.
[4] Jiang Q, Xu X, Jin Z, Tian Y, Hu X, Bai Y. Physico-chemical properties of rice starch gels: Effect of different heat treatments. J Food Eng. 2011;107(3–4):353–7.
[5] Czechowska-Biskup R, Rokita B, Lotfy S, Ulanski P, Rosiak JM. Degradation of chitosan and starch by 360-kHz ultrasound. Carbohydr Polym. 2005;60(2):175–84.
[6] Haralampu SG. Resistant starch—a review of the physical properties and biological impact of RS3. Carbohydr Polym. 2000;41(3):285–92.

[7] Jambrak AR, Herceg Z, Šubarić D, Babić J, Brnčić M, Brnčić SR, et al. Ultrasound effect on physical properties of corn starch. Carbohydr Polym. 2010;79(1):91–100.
[8] Lewicka K, Siemion P, Kurcok P. Chemical modifications of starch: microwave effect. Int J Polym Sci. 2015;2015.
[9] Nadir AS, Helmy IMF, Nahed MA, Wafaa MMA, Ramadan MT. Modification of potato starch by some different physical methods and utilization in cookies production. Int J Curr Microbiol Appl Sci. 2015;4(10):556–69.