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Effect of Batter Mix Variations on Sensory Quality of Breaded Shrimp

Pengaruh Variasi Batter Mix terhadap Mutu Sensori Udang Breaded

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Abstract. Vaname shrimp is one of the fishery products cultivated at Jembrana Marine and Fisheries Polytechnic with the potential to be developed as breaded shrimp (BS). The objective of this study was to determine the effect of batter mix (BM) on sensory quality of BS. There were three types variation of BM, i.e. mix of all-purpose instant flour:cold water (1:2; B1); mix of all-purpose instant flour:eggs (1:2; B2); mix of all-purpose instant flour:cold water:eggs (2:1:2; B3) with frozen (b) and fried (g) treatment. ANOVA were used to analyze the data, followed by Duncan's additional tested for significant results. Sensory-hedonic tested showed that effect of BM variation did not significantly differ (p>0.05) on color, compactness, flavor, and overall attribute of frozen BS, as well as flavor, taste, texture, and overall sensory quality of fried BS. Different types of BM also did not show significantly difference on sensory-rating tested (p>0.05) for appearance, flavor, taste, and texture of fried BS. In this test, Bb1 attained first rank for appearance dan Bb3 attained first rank for color, compactness, flavor, and overall of frozen BS. Bg2 attained the first rank for appearance, flavor, texture, and overall attributes and Bg1 was the first rank for the taste attribute of fried BS.

Keywords: ANOVA, hedonic, ranking, rating

Abstrak. *Udang Vaname merupakan salah satu produk perikanan yang dihasilkan Politeknik Kelautan dan Perikanan Jembrana yang memiliki potensi untuk dikembangkan menjadi produk udang breaded (BS). Tujuan penelitian ini ialah untuk mengetahui pengaruh batter mix (BM) terhadap kualitas sensori BS. Terdapat tiga jenis variasi BM yakni campuran tepung serbaguna instan:air dingin (1:2; B1); campuran tepung serbaguna instan:telur (1:2; B2); campuran tepung serbaguna:air dingin:telur (2:1:2; B3) dengan perlakuan beku (b) dan goreng (g). Analisis data menggunakan ANOVA diikuti uji lanjut Duncan untuk hasil yang signifikan. Hasil uji sensori-hedonik menunjukkan bahwa variasi BM tidak berpengaruh signifikan (p>0.05) terhadap warna, kekompakan, flavor, dan atribut overall BS beku, begitupun dengan flavor, rasa, tekstur, dan atribut overall BS goreng. Perbedaan jenis BM juga tidak berpengaruh signifikan pada uji sensori-rating (p>0,05) untuk atribut kenampakan, flavor, rasa, dan tekstur BS goreng. Pada pengujian ini, Bb1 memperoleh ranking pertama untuk atribut kenampakan dan Bb3 memperoleh ranking pertama untuk warna, kekompakan, flavor, dan overall untuk sampel BS beku. Sampel Bg2 memperoleh ranking pertama untuk kenampakan, flavor, tekstur, dan overall, dan Bg1 memperoleh ranking pertama untuk rasa dari sampel BS goreng.*

Kata kunci: *ANOVA, hedonik, ranking, rating*

Practical Application: This research is expected to know the effect of variation of batter mix to sensory quality of frozen and fried breaded shrimp. The results can be used as a considerate recipe for develops an innovation and diversification products of Vaname shrimp by micro, small, and medium enterprises.

INTRODUCTION

One of Indonesia's central fisheries commodities was shrimp. According to export-import statistics for 2019 by the Ministry of Maritime Affairs and Fisheries, 207.702.651 kg of shrimp were exported (Statistik Kementerian Kelautan dan Perikanan 2019). The products exported are generally in the form of fresh or frozen shrimp. Further processing is needed to diversify, increase shelf life, optimize the utilization of shrimp catch production, and increase the selling value of Shrimp. One of the advanced shrimp processing processes that are relatively simple without adding much to production costs but are still in demand by many people is the processing of shrimp with breaded shrimp (Çankırılıgil and Berik 2018). Andrieieva *et al.* (2022) state that breaded shrimp also called appetizing seafood as a snack in the restaurant industry (ERI). This means that breaded shrimp is one of the value-added products that has high market value in the food industry (Jiamjariyatam 2017).

According to SNI 6163:2017, breaded shrimp (shrimp coated with flour) is a form of frozen preparation made from fresh or frozen shrimp from the genus *Penaeus* and others, without skin and heads and coated with batter coatings and breadcrumbs. These batter coatings and breadcrumbs used to prevent the disintegra-

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tion of products during storage and cooking (da Silva *et al.* 2021). Batter coatings can improve shrimp's appearance (color) and texture, nutritional quality, and barrier against moisture during frozen storage so that shelf life can increase (Gustina *et al.* 2015). Other research states that coating techniques (breaded/battered/coating) can increase palatability by forming a layered texture that is crispy on the outside but soft on the inside (da Silva *et al.* 2021). Others states that composition of breading batter effects the texture and color products (Brannan and Pettit 2015; Cui *et al.* 2022).

This research develops processed breaded shrimp products using Vaname Shrimp (*Litopenaeus vannamei*) as one of the fishery products cultivated at the Jembrana Marine and Fisheries Polytechnic. Several variations of the batter mix formulation in manufacturing breaded shrimp, especially frozen, are prepared to produce a quality product. Through this research, it is expected to compare the variation of batter mix formulation on the sensory characteristics of breaded shrimp in freezed and fried forms. It can also identify the percentage of shrimp yield and percentage of batter pickup for producing breaded shrimp.

MATERIALS AND METHODS

Materials

The main ingredient for making breaded shrimp is Vaname shrimp (*Litopenaeus vannamei*) with a size of 50 (50 pieces of shrimp per kilogram). The raw material producted by Koperasi Cahaya Mina PKPJ, owned by the Jembrana Marine and Fisheries Polytechnic. The coating materials as batter mix used are instant all-purpose flour and eggs, while the supporting materials were water and ice. Instant all-purpose flour used consist of tapioca flour, wheat flour, salt, monosodium glutamate, inosinate acid, garlic, pepper, shallot, and curry powder.

Making shrimp breaded

Vaname Shrimp, as the main ingredient, washed to remove dirt and other foreign objects and then sorted so that the size of the shrimp is relatively the same, namely at size 50. The sortation results are peeled into a peeled deveined tail on stretched (PDTO Stretched) form, by removing the head, all parts of the skin, and the intestine through the division of the back so that only the meat and tail are left and then straightened.

To produce breaded, PDTO-shaped shrimp were given a layer of dust, batter mix, and coating (modified from Voong *et al.* 2019). The product material used was all-purpose instant flour and the coating material was bread crumb. There were three types of batter mix variations in the manufacture of breaded shrimp consisting of: (B1) mix of all-purpose instant flour and ice water (1:2); (B2) mix of all-purpose instant flour and eggs (1:2); (B3) mix of all-purpose instant flour, ice water, and eggs (2:1:2) (modified from Gustina *et al.* 2015). The shrimp coating process starts with product coating, followed by a layer of batter mix, then given bread crumbs flour as a coating (Bandre *et al.* 2018). The breaded shrimp were then stored frozen in a Chest Freezer at -15°C for 12 hours so that three (3) types of samples were obtained, namely Bb1, Bb2, and Bb3. To obtain samples in fried form, the frozen breaded shrimp were fried in hot oil at 17°C for 3 minutes until yellowish and obtained samples Bg1, Bg2, and Bg3.

Yield of PDTO stretched shrimp

Shrimp yield was calculated by calculating the percentage of the final weight ratio of the shrimp peeled by PDTO stretched to the initial shrimp weight. This study calculated the yield by weighing each of five sample of early shrimp and PDTO stretched shrimp (modified from Aripudin *et al.* 2021). The formula for calculating the yield of shrimp can be seen in Equation 1.

$$\text{Yield of PDTO stretched shrimp (\%)} = \frac{\text{PDTO shrimp weight stretched (g)}}{\text{Initial shrimp weight (g)}} \times 100\% \quad \ldots\ldots\ldots\ldots (1)$$

Percentage of breaded shrimp batter pickup

The test method for the percentage of batter pickup (%) for breaded shrimp with different batter mix treatments was carried out by dipping stretched PDTO shrimp (substrate) into each variation of batter mix solution using a toothpick. The weight of the batter mix layer attached to the shrimp was measured from the reduction in the weight of the sample batter layer after coating (modified from Román *et al.* 2018). The formula for calculating the batter pickup percentage (%) of breaded shrimp can be seen in Equation 2.

$$\text{Breaded shrimp batter pickup (\%)} = \frac{\text{Weight of batter layer (g)}}{\text{Weight of shrimp without coating (g)}} \times 100\% \ldots\ldots (2)$$

Sensory tests of breaded shrimp

Sensory testing was used to test the frozen (Bb1, Bb2, and Bb3) and fried breaded shrimp (Bg1, Bg2, and Bg3) samples. The test method applied were the hedonic, rating, and ranking tests. Tests were conducted by untrained panel consist of 30 naive panelists (Setyaningsih *et al.* 2018) from volunteers in the Jembrana Marine and Fisheries Polytechnic (Students and employees). The panelists consisted of 13 males and 17 females with an age range of 20-25 years. Each panelist scored the samples for each test (Quality scoring/rating, hedonic rating, and ranking) and treatment.

Hedonic rating test for breaded shrimp

The hedonic test aims to see the level of preference of panelists for the attributes of the sample being tested. Each variation of the breaded shrimp sample is served whole and cut in the middle. Panelists must finish assessing the hedonic quality of one type of sample variation before continuing to other samples (Setyaningsih *et*

al. 2018). The hedonic quality assessment was carried out according to the preference level of each panelist. The panelists preference level applies seven (7) scales from very dislike (1) to like very much (7). For frozen breaded shrimp samples (Bb1, Bb2, and Bb3), the attributes observed were color, compactness, aroma, and overall attributes of frozen breaded shrimp. In contrast, the attributes observed for fried breaded shrimp samples (Bg1, Bg2, and Bg3) were the appearance, aroma, taste, texture, and overall attributes of the fried breaded shrimp (modified from Zhou *et al.* 2022). In this test, panelists were encouraged to give spontaneous assessments without comparing the attributes of one sample to another (Setyaningsih *et al*. 2018).

Quality Rating/scoring test for breaded shrimp

Rating/scoring test was carried out by scoring a sample quality attribute using the hedonic quality scale. Each panelist faced two sample conditions from the same batter mix variation in this test. Breaded shrimp samples are served whole and cut in the middle. Panelists must complete the assessment sheet from one sample presented before moving on to the following sample. This test also emphasizes that the assessment is carried out spontaneously without comparing one sample with another (Setyaningsih *et al*. 2018).

Sensory assessment sheets, quality attributes, specifications, and scale levels for testing frozen and fried breaded Shrimp refer to the Indonesian National Standard (BSN 2017) concerning Frozen Breaded Shrimp. For frozen breaded shrimp samples (Bb1, Bb2, and Bb3), there were two (2) attributes tested, namely appearance and degree of drying (dehydration). The fried breaded shrimp samples (Bg1, Bg2, and Bg3) had four (4) quality attributes: appearance, smell, taste, and texture. Each attribute has three (3) different specification levels. Each specification level has a different value scale. The value scale used is 5, 7, and 9. Test attributes and specifications can be seen in Table 1.

Hedonic ranking test for breaded shrimp

Ranking test is used to determine the level of the panelist's most preferred sample on each attribute. In this test, each panelist was exposed to three (3) variations of breaded shrimp samples in whole and in pieces. Panelists were asked to compare the attributes of the three sample variations from the most preferred to the least preferred. The most preferred sample was ranked 1, and so on, until each panelist could provide test results in the form of breaded shrimp samples ranked 1, 2, and 3. For frozen breaded shrimp samples (Bb1, Bb2, and Bb3), the attributes tested are color, compactness, smell, and overall, while the attributes tested for the fried breaded shrimp samples (Bg1, Bg2, and Bg3) were appearance, smell, taste, texture, and overall (modified from Çankırılıgil and Berik 2018).

Table 1. Attributes and spesification rating/scoring test for breaded shrimp

Attribute	Scale	Specification
1. Frozen Breaded Shrimp (Bb1, Bb2, and Bb3)		
Appearance	9	Whole, very neat, the flour layer is even and of sufficient thickness, clean, the color of the flour is brilliant and the prawns are in the middle of the flour when cut crosswise, the prawns are brilliant
	7	Whole, neat, even layer of flour but less thickness, clean, bright flour color, and shrimp is in the middle of the flour when cut crosswise, shrimp are not bright
	5	Not whole, not neat, flour coating is not even, not clean, prawns are exposed about 10%, the color of the flour is dull and the prawns are not in the middle of the flour when cut crosswise, the prawns are dull
Drying (dehydration)	9	No drying occurs
	7	Very little drying (<10%)
	5	Parts subject to drying 10-30%
2. Fried Breaded Prawns (Bg1, Bg2, and Bg3)		
Appearance	9	Whole, very neat, clean, golden color, prawns are in the middle of the flour when cut crosswise, no voids between the flour and prawns, no exposed parts
	7	Whole, neat, clean, golden color, shrimp is in the middle of the flour when cut crosswise, a little cavity between the flour and the shrimp, no exposed parts of the shrimp
	5	Not whole, not neat, not clean, not golden in color, there is a little cavity between the flour and the shrimp, lots of open parts of the shrimp
Smell	9	Fresh, specific smell of white bread, very fresh shrimp smell
	7	Fresh, the specific smell of white bread is somewhat reduced, the smell of shrimp is neutral
	5	The smell of sour bread starts to smell, the smell of ammonia arises
Flavor	9	Savory, the taste of bread and prawns blend together, the taste of sweet prawns
	7	Savory, the taste of the bread and prawns is not unified, the taste of prawns is less sweet
	5	Bland, not sweet
Texture	9	Compact, crisp and elastic
	7	Less compact, less crunchy, less elastic
	5	The texture of the shrimp is soft/mushy, not crunchy

Note: Source: SNI 6163:2017 for frozen breaded shrimp

Research methods

This study used a completely randomized design (CRD) with observational parameters in the form of differences in physical and sensory qualities of three (3) types of batter mix variations in the production of breaded shrimp (B1, B2, and B3). Parameters of physical observation of breaded shrimp include analysis of yield and batter pickup percentage. Each observation was repeated five times. Observing the sensory quality of breaded shrimp applies Rating, Ranking, and Hedonic test methods. The test used 30 untrained panelists. The sensory data obtained were analyzed using the analysis of variation method (ANOVA) using SPSS version 26 (SPSS 26; IBM, USA). If there is a difference between the treatments, proceed with the Significant Difference Test using the Duncan Multiple Range Test (DMRT) analysis at a significance level of 5%.

RESULTS AND DISCUSSION

Yield of PDTO stretched shrimp

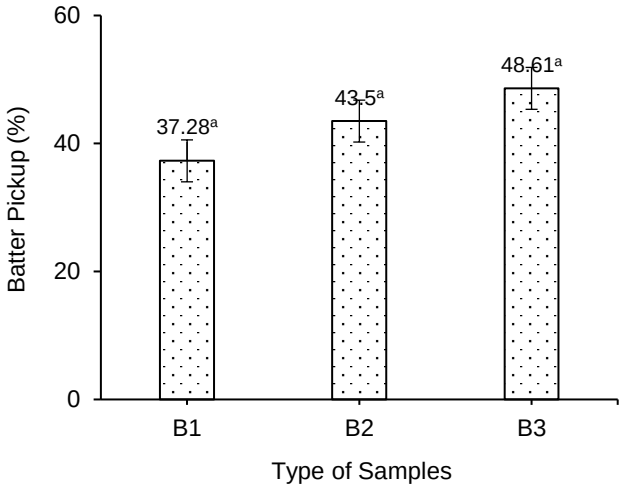
In general, the test results showed that the weight of the PDTO stretched shrimp was lower than the initial weight of the shrimp, this was because the PDTO stretched shrimp experienced removal of the skin, head, and intestines, resulting in a reduction in the weight of the shrimp. The sampling of five shrimp samples resulted in an average initial shrimp weight of 16.8±0.48 g and an average weight of PDTO stretched shrimp of 10.4±0.55 g. These can be used to calculate the percentage yield of each sample repetition obtained the average yield. The average yield of PDTO stretched shrimp from the five samples was 61.99±4.56%, indicating that around 61.99% of the shrimp parts could be used as breaded shrimp, and 38.02% was wasted as heads, skins, and intestines.

Shrimp waste consisting of heads, shells, legs, and tails ranges from 35-50% of their body weight (Yulianto *et al.* 2021). The results of the yield values can be influenced by the raw materials freshness, the shrimp's size, and the technique or method of cutting the heads (Rohadatul 'Aisy and Handoko 2022). The higher the level of freshness of the shrimp, the higher the yield produced because in fresh shrimp, the head will be firmly attached to the body of the shrimp compared to shrimp that have experienced a decline in quality (Trianjari *et al*. 2022).

Batter pickup of breaded shrimp

Batter pickup refers to the thickness or number of batter layers attached to a substrate and expressed as a percentage. The higher the batter pickup percentage of a breaded product, the thicker the batter layer, and the net weight of the product increases (Ching *et al.* 2021). It causes the battered pickup to be a critical factor in the cost reduction problem in producing breaded products (Mallikarjunan *et al*. 2009).

The percentage of batter pickup for breaded shrimp can be seen in Figure 1. The calculations show that the different types of ingredients used to manufacture batter mix can affect the percentage of batter pickup for breaded shrimp. However, this effect is not significantly different (p>0.05). In general, the percentage of batter pickups for breaded shrimp with three variations of batter mix ranged from 37.286 to 48.614%, with the lowest percentage of batter pickup in the B1 sample and the highest percentage of batter pickup in the B3 sample. The more types of ingredients used for the batter mix, the thicker the thickness, and the percentage of breaded shrimp batter pickup increase (Mallikarjunan *et al*. 2009). Other research found that highest batter viscosity would decrease the coating pickup due to low thickening capability (Xu *et al.* 2020).



Note: B1= all-purpose flour + ice water; B2= all-purpose flour + eggs; B3= all-purpose flour + icewater + eggs; Superscript notation with different letters in the same attribute indicates difference significant at 5% significance level

Figure 1. Batter pickup percentage (%) of breaded shrimp with batter mix addition variations

There are three (3) main ingredients that affect the percentage of batter pickup in the production of breaded shrimp in this study, *i.e*. flour, eggs, and water. These three types of materials can affect the batter mix viscosity. The higher the batter mix viscosity, the higher the batter pickup percentage of the breaded shrimp (Xu *et al.* 2020).

The acceptance of breaded shrimp

The hedonic test results for breaded shrimp samples with variations of frozen batter mix (Bb1, Bb2, and Bb3) and fried (Bg1, Bg2, and Bg3) can be seen in Figure 2. For frozen breaded shrimp products, the test results showed a decrease in the level of acceptance panelists sequentially starting from Bb1, Bb2, and Bb3 samples. In general, the Bb1 sample has the highest acceptance value compared to other samples, and conversely, the Bb3 sample has the lowest acceptance value for the attributes of color, compactness, aroma, and overall.

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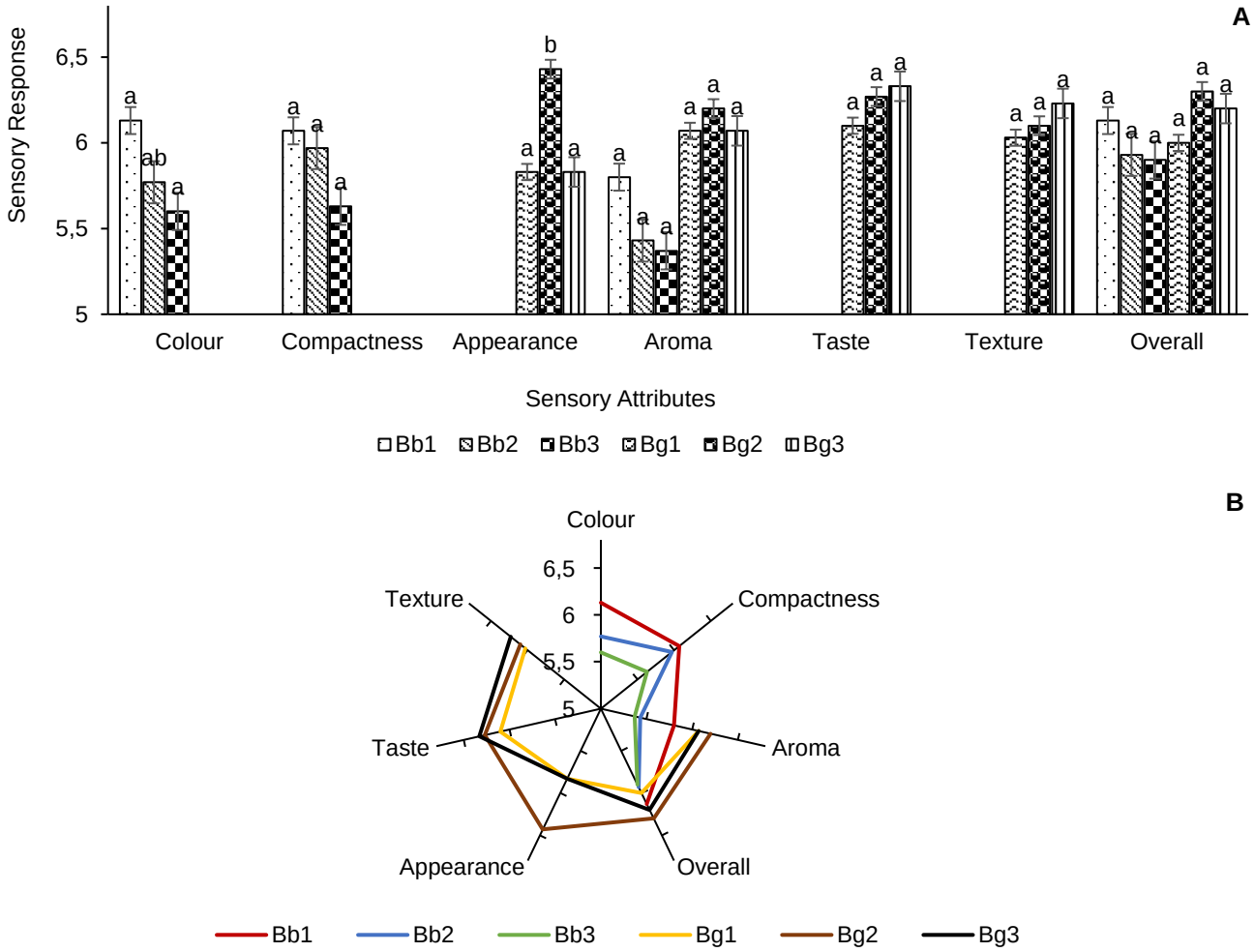


Note: A= Superscript notation with different letters in the same attribute shows a significant difference at the 5% significance level; Figure B: Bb1= frozen B1; Bb2= frozen B2; Bb3= frozen B3; Bg1= fried B1; Bg2= fried B2; Bg3= fried B3

Figure 2. Hedonic response of frozen (b) and fried (g) treatment of breaded shrimp with batter mix variation

The highest acceptance response of the frozen breaded shrimp sample was found in the color and overall attributes of the Bb1 sample with a value of 6.13 or a liking value, while the lowest response was in the aroma attribute of the Bb3 sample with a value of 5.37 or a slightly liking value. However, the influence of batter mix variations did not show a significant difference ($p>0.05$) on all four sensory attributes of frozen breaded shrimp samples.

The sensory-hedonic test results for the aroma, taste, texture, and overall attributes of the three types of fried breaded shrimp products showed similar results ($p>0.05$). Only the appearance attributes of the Bg2 samples showed significant differences ($p<0.05$) compared to the appearance of the Bg1 and Bg3 samples. The appearance value of the Bg2 sample has the highest acceptance value compared to other sensory attributes, namely 6.43 or a liking value. Even so, the texture attribute of the Bg2 sample has the lowest hedonic response compared to the Bg1 and Bg3 samples, which is 6.10. The texture results of the Bg2 samples did not show a significant difference ($p>0.05$) compared to the textures of the Bg1 and Bg3 samples.

There are two (2) same attributes for the frozen and fried breaded shrimp samples, i.e aroma and overall attributes. The frying process increased the panelists preference for breaded shrimp's aroma. The aroma of fried breaded shrimp showed a significantly different hedonic value ($p<0.05$) than that of frozen breaded shrimp. The frying process also increased the panelists preference for breaded shrimp as a whole although the increase in preference was not significantly different ($p>0.05$). This result in agreement with the study by Attar *et al.* (2018) which explained that addition variation treatment in batter formulation showed no significant differences to the color, taste, and overall attributes of breaded shrimp. Overall, the Bg2 sample which breaded shrimp with a mixture of all-purpose flour and eggs as the batter mix, is the breaded shrimp sample with the most preferred aroma and overall panelists compared to other samples. Garces-Rimon *et al.* (2016) state that presence of yolk in a whole egg contributes to made the samples creamier, so this could be responsible to increase aroma and overall breaded shrimp.

Quality rating/scoring value of breaded shrimp

Quality rating/scoring test results for frozen (Bb1, Bb2, and Bb3) and fried (Bg1, Bg2, and Bg3) breaded shrimp samples can be seen in Figure 3. There are two (2) sensory attributes observed for breaded shrimp samples frozen, namely appearance and drying. In contrast, the sensory attributes observed for the fried breaded shrimp samples were appearance, aroma, taste, and texture. The same attribute for both types of frozen and fried breaded shrimp is appearance.

The results of the analysis showed that different types of batter mix did not show significantly different sensory-rating results ($p>0.05$) for the drying attribute but had a significant effect ($p<0.05$) for the appearance attribute of frozen breaded shrimp samples. Different types of batter mix also did not show significantly different sensory-rating results ($p>0.05$) for the appearance, aroma, taste, and texture of the fried breaded shrimp samples. The sensory response in the appearance of the Bb1 sample (8.80) had the highest value ($p<0.05$) compared to the other five samples which indicated that the appearance of the breaded shrimp was intact, elegant, the flour layer was even, the thickness was sufficient, and the shrimp was in the middle of the flour when cut crosswise. The sample with the lowest sensory response for the appearance attribute is in the Bg1 sample with a value of 7.73 which shows that the appearance of the sample is generally intact, with the shrimp in the middle of the flour when cut across, although there is still a tiny cavity between the flour and shrimp.

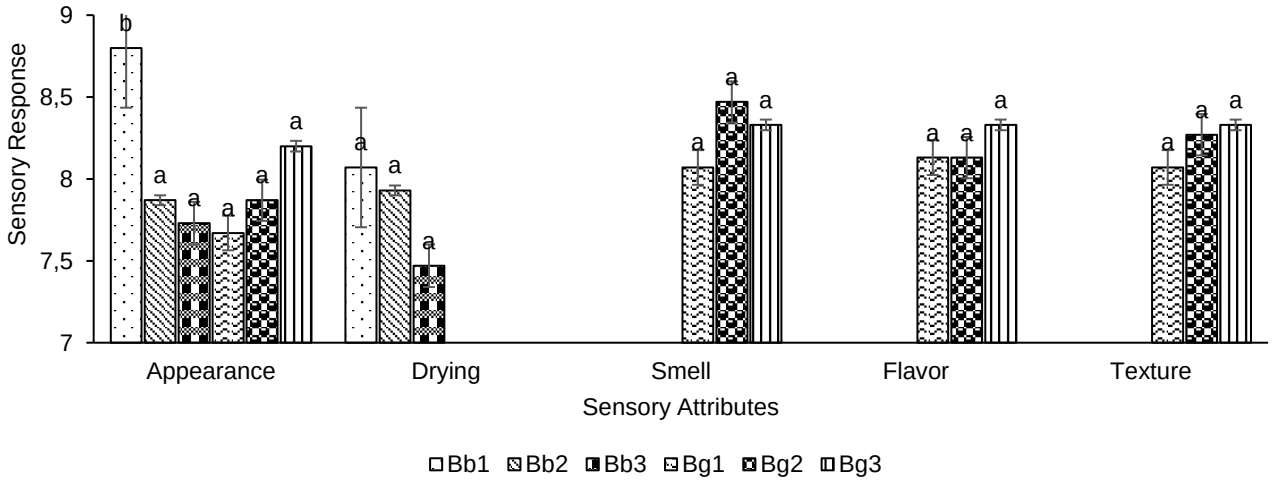
Hedonic ranking value of breaded shrimp

The results of the hedonic-rank test analysis for both frozen and fried breaded shrimp with batter mix variations can be seen in Figure 4. The hedonic-ranking test for frozen breaded shrimp samples is aimed at color, compactness, aroma, and overall attributes. In contrast, the sensory-rank test for fried breaded shrimp samples is intended for appearance, aroma, taste, texture, and overall attributes. Based on this, there are two (2) same attributes for frozen and fried breaded shrimp, i.e appearance and overall attributes.

The results of the hedonic-ranking response analysis generally show that the third rank (3) for the attributes of color, compactness, aroma, and overall of the frozen breaded shrimp sample is Bb1, and the first rank (1) for the four attributes is Bb3. For the fried breaded shrimp sample, the ranking results were more varied. The Bg2 sample got first place for the appearance, aroma, texture, and overall attributes, while the Bg1 sample got first place for the taste attribute. Generally, the Bg3 sample was ranked third (3) for the five attributes of the hedonic-ranking test for fried breaded shrimp.

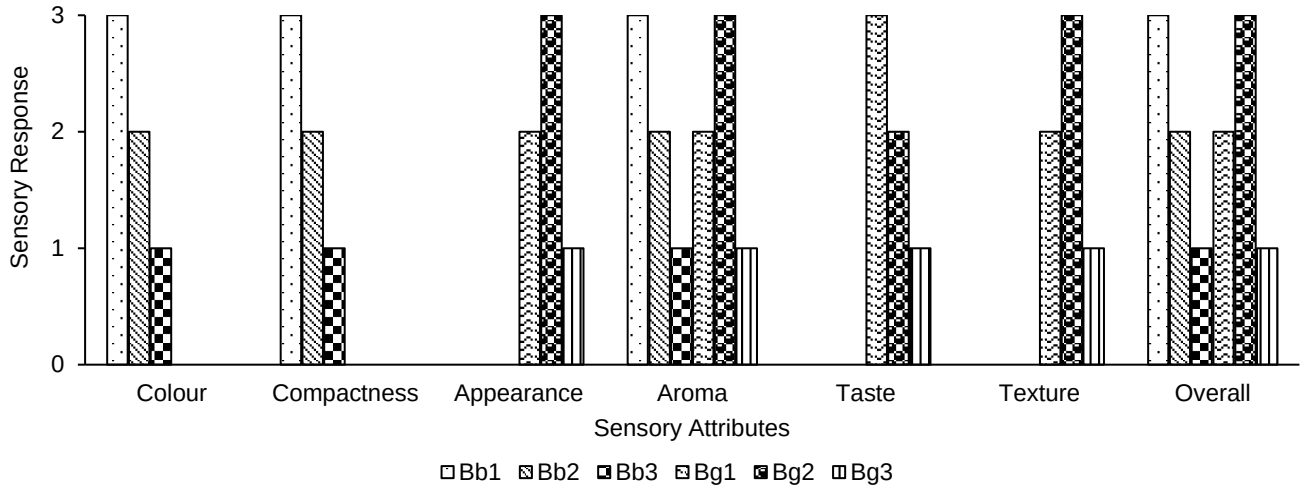
CONCLUSION

Yield of stretched PDTO shrimp as a raw material for breaded shrimp was 61.99±4.56%. The different batter mix ingredients can affect the percentage pickup batter breaded shrimp, although statistically, the effect was not significantly different ($p>0.05$). For sensory-hedonic testing, effect of batter mix variations did not show significant differences ($p>0.05$) on the attributes of color, compactness, aroma, and overall of the frozen breaded shrimp samples, as well as on the attributes of aroma, taste, texture, and overall of the fried breaded shrimp samples. Even so, the frying process had a significant effect ($p<0.05$) on the aroma and overall attributes of the fried breaded shrimp sample with the Bg2 sample as the panelist's most preferred sample compared to other samples. Sensory rating/scoring tests showed that different types of batter mix did not show significantly different sensory-rating results ($p>0.05$) for the drying attribute but had a significant effect ($p<0.05$) for the appearance attribute of frozen breaded shrimp samples.



Note: Bb1= frozen B1; Bb2= frozen B2; Bb3= frozen B3; Bg1= fried B1; Bg2= fried B2; Bg3= fried B3; Superscript notation with different letters in the same attribute shows a significant difference at the 5% significance level

Figure 3. Rating/scoring response of frozen (b) and fried (g) treatment of breaded shrimp with batter mix variation



Note: Bb1= frozen B1; Bb2= frozen B2; Bb3= frozen B3; Bg1= fried B1; Bg2= fried B2; Bg3= fried B3; Superscript notation with different letters in the same attribute shows a significant difference at the 5% significance level

Figure 4. Ranking response of frozen (b) and fried (g) treatment of breaded shrimp with batter mix variation

Different types of batter mix also did not show significantly different sensory-rating results (p>0.05) for the appearance, aroma, taste, and texture of the fried breaded shrimp samples. The Bb1 sample has the highest value in this test, especially on the appearance attribute. The sensory-ranking test results showed that the Bb3 sample obtained the first rank (1) for the attributes of color, compactness, aroma, and overall frozen breaded shrimp. For the fried breaded shrimp sample, the Bg2 sample obtained first rank (1) for the appearance, aroma, texture, and overall attributes, and the Bg1 sample obtained first rank for the taste attribute.

Further research suggestions given after conducting this research are (1) oil absorption reduce used in breaded shrimp products, for example, soy protein isolate or whey protein isolate; (2) type of frying methods effect the physical quality of breaded shrimp.

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