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CONSUMER ACCEPTANCE OF SENSORY CHARACTERISTICS OF VANNAMEI SHRIMP HEAD (LITOPENAEUS VANNAMEI) POWDERED BROTH EXTRACTION PRODUCTS WITH DIFFERENT FILLING INGREDIENTS

Penerimaan Konsumen Terhadap Karakteristik Sensori pada Produk Ekstraksi Kaldu Bubuk Kepala Udang Vannamei (*Litopenaeus vannamei*) dengan Bahan Pengisi yang Berbeda

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ABSTRACT

This study was conducted to investigate the production process of powdered broth, evaluate consumer acceptance of various formulations using wheat flour, cornstarch, tapioca starch, and rice flour, analyze the quality characteristics, identify the optimal formulation, and assess the quality of the selected product. The manufacturing process starts from washing, boiling, refining, filtering, adding fillers, drying, second refining, sieving, and packaging. The hedonic test involved 30 panelists with the best results in formula F3 (wheat flour: tapioca). Descriptive tests (spider web) and chemical tests (proximate) and microbiology (ALT) were also conducted. There are four types of formulations in making powdered broth, namely with the addition of wheat flour, cornstarch, tapioca, and rice flour. Based on the data obtained from the hedonic results, consumers prefer powdered broth with tapioca flour filler, because it has superior color, aroma, taste, texture, and solubility characteristics compared to other formulas. Several previous studies have proven the effectiveness of using natural fillers for making powdered broth based on shrimp head waste. Besides being a natural flavoring that is tasty and nutritious, powdered stock from shrimp head waste is also an effort to diversify fishery-based products that supports the principle of sustainable and environmentally friendly waste processing.

Keywords: Powdered stock; waste; vannamei shrimp; flour; formulation

ABSTRAK

Sebagian besar kepala udang belum termanfaatkan maksimal, bahkan hanya dianggap sebagai limbah. Oleh karena itu, pada penelitian ini bertujuan menentukan formula terbaik pada pembuatan kaldu bubuk kepala udang dari formulasi tepung berbeda (terigu, meizena, taioka, dan beras) dengan parameter menilai tingkat kesukaan konsumen. Proses pembuatan dimulai dari ektraksi kepala udang ekstraksi kepala yang ditambahkan dengan formulasi bahan tepung berbeda. Uji hedonik melibatkan 30 panelis dengan hasil terbaik pada formula F3 (terigu:tapioka). Uji deskriptif (spider web) dan uji kimia (proksimat) serta mikrobiologi (ALT) juga dilakukan. Terdapat empat jenis formulasi dalam pembuatan kaldu bubuk yaitu dengan penambahan tepung terigu 10 gr, terigu 5gr dan meizena 5 gr, terigu 5gr dan tapioka 5 gr, serta terigu 5gr dan tepung beras 5 gr.. Berdasarkan data yang diperoleh dari hasil hedonik, konsumen lebih menyukai kaldu bubuk dengan bahan pengisi tepung tapioka, karena memiliki karakteristik warna, aroma, rasa, tekstur dan kelarutan yang unggul dibanding dengan formula yang lainnya yaitu 20,56. Beberapa studi sebelumnya telah membuktikan efektivitas penggunaan bahan pengisi alam pembuatan bubuk kaldu berbasis limbah kepala udang. Selain sebagai penyedap alami yang gurih dan bergizi, kaldu bubuk dari limbah kepala udang juga merupakan upaya diversifikasi produk berbasis hasil perikanan yang mendukung prinsip pengolahan limbah secara berkelanjutan dan ramah lingkungan.

Kata kunci: Kaldu bubuk; limbah kepala udang ; formulasi tepung; karakteristik sensori

INTRODUCTION

The increasing demand for shrimp also results in a greater amount of shrimp waste. This product has undergone a peeling and deveining process, which involves removing the head and skin. Waste shrimp shells and heads disposed of in the environment can cause new problems, such as foul odors and become a source of disease. According to Amini (2023), most shrimp waste in Indonesia comes from the shrimp freezing industry. Shrimp used for food consists of various species and varying sizes. However, only the meat is consumed or used; the shells, heads, and skin are often discarded, creating an unpleasant odor in the surrounding environment, commonly referred to as shrimp waste (Dipuja et al., 2023).

According to Rathore, (2018), shrimp heads contain approximately 43.12% protein. The relatively high nutritional content of shrimp heads makes them potentially suitable for further utilization. Saleh et al. (2017) reported that shrimp heads have a proximate composition of 80.15% water, 14.67% protein, 0.93% fat, and 2.64% ash. With these contents, shrimp head waste can be processed into economically valuable powdered flavor products. Furthermore, using shrimp heads and shells as ingredients for broth can produce an umami or savory flavor that can improve the organoleptic quality of food products. In addition to being used as a flavor enhancer, shrimp shells have benefits against free radicals ten times better than fruits and vegetables due to their content of the antioxidant astaxanthin (Putri Hermanto & Nengseh, 2019).

Broth is a flavoring ingredient often added to food products to enhance aroma and flavor. Natural flavors derived from shrimp heads can be obtained by boiling them with water to produce a liquid broth. However, the liquid form has limitations in storage and handling, requiring a drying process to convert it into a powdered broth, which is more practical and has a longer shelf life (Suparmi et al., 2020). In the production of powdered broth, fillers generally come from various types of flour that function as thickeners and stabilizers. The starch content in flour plays a crucial role in binding water during processing (Muchtar et al., 2022). Arsyad et al., (2021) stated that wheat flour is the most frequently used filler in the production of powdered broth because its starch content is able to bind water and increase the amount of solids in the broth. However, the use of wheat flour can result in a product texture that tends

to be coarse and easily clumps (Arsyad et al., 2021). Therefore, alternative fillers are needed that can produce better quality powdered broth. This powdered broth is made using fillers such as wheat flour, cornstarch, tapioca, and rice flour, which function as binders or thickeners that can stabilize, concentrate, or thicken food when mixed with water to form a certain consistency. Several previous studies have evaluated the use of various types of fillers in the production of shrimp head flavor powder. Handayani et al., (2019) reported the use of wheat flour and tapioca flour in the production of flavor powder from vaname shrimp heads. Meanwhile, Suparmi et al., (2020) studied the quality of shrimp head powder broth formulated with various levels of wheat flour addition.

RESEARCH METHODS

Tools And Materials

The equipment used to make powdered stock from vannamei shrimp heads with different fillers includes a thermometer, plastic cups, labels, and a set of cooking utensils. The ingredients used to make powdered stock from vannamei shrimp heads with different fillers include vannamei shrimp heads as the main ingredient, mineral water, pepper, salt, sugar, garlic, wheat flour, tapioca flour, rice flour, and cornstarch.

The filler used as a binder in the shrimp head broth product is pure wheat flour mixed with tapioca, cornstarch, and rice flour. The filler addition refers to research by Ridwan (2021).

Research Design

The composition of the additional ingredients, garlic, pepper, and salt, refers to research by Diah (2024) and is modified accordingly. The stock is then poured into a stainless steel baking pan and the filler ingredients are added according to the treatment. The composition of the powdered stock can be seen in Table 1.

Table 1. Composition of Powdered Stock

Treatment	Shrimp waste (g)	Water (ml)	Additional seasonings (g)				Filling material (10gr)
			Garlic	Pepper	Salt	Sugar	
F0	50	100	10	0,20	10	5	10 gr of wheat flour
F1	50	100	10	0,20	10	5	5 gr of wheat flour + 5 g Tapioca flour.
F2	50	100	10	0,20	10	5	5 gr of wheat flour + 5 gr cornstarch
F3	50	100	10	0,20	10	5	5 gr of wheat flour + 5 gr rice flourr

This research began with the process of making shrimp heads into powdered broth using various types of fillers, namely wheat flour, wheat flour with tapioca flour, wheat flour with cornstarch, wheat flour with rice flour. After that, a hedonic test was conducted on the panelists, then a descriptive test was conducted to determine the quality characteristics of the product, then a de garmo test was conducted to determine the selected formulation, after finding one selected formulation, quality testing was carried out including proximate tests and microbiological tests.

Research Procedure

The shrimp heads were first washed under running water until clean, then weighed using a digital scale according to the formulation, namely 50 grams each. After that, the shrimp heads were boiled at 70°C for 2 minutes. Next, the boiled ingredients were pureed using a blender with the addition of 10 grams of garlic. Next, the pureed ingredients were pureed using a blender while adding 10 grams of garlic. After the boiling process was complete, filtered

using a coconut milk strainer to separate the filtrate in the form of broth from the residue or dregs. The resulting broth was then added with filler ingredients according to the treatment, namely wheat flour, cornstarch, tapioca flour, or rice flour, as well as seasonings such as salt, sugar, and pepper. All ingredients were mixed and stirred until homogeneous. The addition of various types of flour was intended to act as a binding agent in the preparation of shrimp head powder broth. Next, the mixture of broth and filler ingredients was homogenized to form a thick dough, then poured into a stainless steel pan. The drying process was carried out in an oven at 70°C for 6 hours, referring to the method used by Ridwan et al. (2021). After drying, the product was cooled and air-dried at room temperature (20–25°C), then ground using a blender and sieved to obtain a uniform particle size. The use of fillers refers to the research of Ridwan et al. (2021), while the formulation of garlic, pepper, and salt refers to the modified research of Diah (2024).

The formulated broth was then placed in a stainless steel pan and treated with fillers according to the specified formulation. Consumer acceptance of the resulting powdered broth was evaluated using a hedonic test. The test was conducted three times for four treatments, involving 30 panelists, consisting of lecturers and cadets from the Jakarta Fisheries Business Expert Polytechnic. Parameters assessed included color, aroma, taste, texture, and solubility. The assessment used a hedonic scale of 1–5, with the criteria being 1 = dislike very much, 2 = dislike, 3 = neutral, 4 = like, and 5 = like very much. The assessment scale used refers to the method proposed by Putri (2023).

Quantitative descriptive sensory analysis (QDA) refers to SNI 2718 1:2013 concerning shrimp paste. The test was conducted three times with the same panelists. The resulting data was then processed using the spider web method. This method involved three repetitions of sensory testing of powdered broth with six trained panelists. Each panelist was given four sample formulas and a descriptive test sheet with parameters such as color, aroma, taste, and texture. Each parameter was marked with a linear scale structure, and the panelists drew a line and stopped at the length of the line, assessed based on the available information. The data from the three repetitions were then averaged and processed using the spider web method. This method aimed to determine the physical characteristics of the powdered broth based on the assessments of the six trained panelists.

The de Garmo test is a method for determining the best hedonic test formula from four formulas (1, 2, 3, and 4) of vannamei shrimp head powdered broth based on attributes/parameters deemed important by the panelists for taste, odor, texture, color, and solubility. The first stage in using the de garmo test method is to determine the parameter weights to trained panelists, each criterion is given a weight according to its level of importance, the weight value given uses a scale of 1-5, namely 1 (very unimportant), 2 (not important), 3 (normal), 4 (important), and 5 (very important, then the data results from the weight panelists are added up, the score is divided by the number of scores. The next stage then determines the highest value and the lowest value from the average per formula respectively, then determines the effectiveness value to find the highest value of the four formulas, the result with the highest value is the best formula.

RESULT AND DISCUSSION

Consumer Acceptance Level of Powdered Broth Based on Hedonic Test

The parameters used on powder samples are color, aroma, texture tests. The parameters used in the solution samples were color, aroma, taste, and solubility. The hedonic scale used was (1) dislike very much, (2) dislike, (3) somewhat like/neutral, (4) like, and (5) like very much. The results of the hedonic test can be seen in Table 2.

Table 2. Results of the hedonic test for powdered broth

Parameter	Treatment			
	F1	F2	F3	F4
Color	3,72	3,92	4,26	3,81
Aroma	3,71	3,86	4,03	3,71
Taste	3,64	3,61	3,94	3,83
Texture	3,97	3,96	4,30	3,81
Solubility	3,71	3,74	4,02	3,74
Total	18,75	19,09	20,56	18,91

Based on the average values in Table 2 above, the highest value for color was found in treatment F3, with a score of 4.26. The highest value for aroma was found in treatment F3, with a score of 4.03. The highest value for taste was found in treatment F3, with a score of 3.94. The highest value for texture was found in treatment F3, with a score of 4.30. The highest value for solubility was found in treatment F3, with a score of 4.02. The hedonic analysis graph for powdered broth can be seen in Figure 15.

Based on the average results in Table 2, the overall hedonic test results showed that the highest value was found in treatment/formula F3, with a score of 20.56, namely powdered broth with tapioca flour as the filler. The lowest value was found in treatment/formula F1, with a score of 18.75, namely powdered broth with wheat flour as the filler. Therefore, the differences can be explained based on each parameter: color, aroma, taste, texture, and solubility.

Color is the most immediate response and easily creates a positive impression. The good quality of a food product does not always guarantee consumer acceptance if the product has an unattractive color or does not meet the desired color characteristics (Sari et al., 2021). The resulting product color is greatly influenced by the type and composition of the raw materials used during processing (Subamia et al., 2020). The increase in brown color intensity in a product is generally caused by the Maillard reaction during heating or oven baking. This reaction occurs due to the interaction between reducing sugars and amino groups present in the food (Kaahoa et al., 2017). Pramudya et al. (2022) explain that the Maillard reaction is a non-enzymatic browning process that occurs due to heating, involving a reaction between free amino acids or amino groups from proteins with reducing sugars, primarily D-glucose. The rate of the Maillard reaction is influenced by heating temperature, so increasing the drying temperature can accelerate the formation of brown color, potentially decreasing panelists' preference for the product. Furthermore, the browning reaction that occurs during the drying process can cause a decrease in product brightness and color degradation.

Based on the graphic results in Figure 3, it can be concluded that the F3 powdered broth with wheat flour filler: tapioca obtained the highest hedonic value compared to other treatments, this is thought to be because tapioca flour is able to produce attractive characteristics in the broth, namely producing bright colors when combined with wheat flour. Meanwhile, the color found in the F1 powdered broth treatment with wheat flour filler obtained the lowest hedonic value, this is thought to be because the broth has a brownish yellow color and its color is slightly dark. Color is also an important element in assessing the quality or level of acceptance of a food product, attractive colors can increase the level of consumer acceptance (Aprillia et al., 2025).

The powdered stock produced from shrimp heads has a distinctive savory shrimp aroma combined with the aroma characteristics of each filler used. Treatment F3 showed the highest aroma preference score, namely the formulation with a combination of wheat flour and tapioca flour. This formulation produced a stronger and more distinctive shrimp aroma than the other

treatments. The aroma of a product can be detected by the sense of smell and is influenced by the composition of the raw materials and additives used in the processing (Arsyad et al., 2021). In the food industry, aroma testing is an important parameter because it can provide a quick overview of consumer acceptance of a product (Kusumaningrum & Setiawan, 2018). Furthermore, aroma can also be used as an indicator to detect spoilage in food products (Pradipta, 2011). According to Widyadnyani (2022), the smell sensation perceived by the nose is a combination of several aroma characteristics, namely fragrant, sour, rancid, and burnt.

The test results showed that the use of wheat flour and tapioca flour as fillers did not significantly reduce the distinctive savory flavor of the shrimp stock. In contrast, the combination of wheat flour and cornstarch, as well as the use of rice flour and glutinous rice flour, tends to slightly mask the resulting savory flavor. Flavor is a sensory attribute that significantly influences consumer acceptance of a food product. Taste perception is formed through the interaction of gustatory and olfactory sensations. Taste assessment is carried out through the sense of taste, namely the tongue, which functions to recognize and evaluate the flavor of a food or drink (Nafsiyah et al., 2022). These findings indicate that the type of filler used influences the flavor characteristics of powdered broth. These results align with research by Kereh et al. (2022), which states that the flavor of powdered broth can be influenced by ingredients added during processing.

Texture is a characteristic of a material that can be perceived by the senses of touch, taste, and sight (Midayanto & Yuwono, 2014). Based on the hedonic test, the most preferred parameter was found in treatment F3, namely powdered broth with wheat flour and tapioca as the filler, because it has a fine-grained texture and is less likely to clump compared to the other formulas. Meanwhile, treatment F4, namely powdered broth with wheat flour and rice as the filler, had a coarser texture and clumped texture. The texture of food products is determined by various factors, including water content, ingredient composition, mold thickness, and oven temperature during processing. Increasing water content generally results in a softer texture, while differences in raw materials, product thickness, and heating temperature can significantly influence the final texture characteristics of the product (Nanda et al., 2020).

The solubility tested in the hedonic test is visual solubility, namely the ability of powdered broth to dissolve in water to form a homogeneous solution without visible coarse particles, clumps, or sediment. According to Meiyani et al. (2014), dextrin has a high water-binding capacity after being mixed with boiled shrimp head water and dried. Next, the hedonic test data for color, aroma, taste, texture, and solubility attributes were analyzed using the Kruskal–Wallis test, a nonparametric statistical test used to examine differences in preference levels across three or more treatment groups. The results of the Kruskal–Wallis test can be seen in Table 3.

Table 3. Kruskal–Wallis Test Results

	Color	Aroma	Taste	Texture	Solubility
Chi-Square	26,672	7,160	12,702	16,893	8,096
df	3	3	3	3	3
Asymp. Sig.	0,000	0,067	0,005	0,001	0,044

The Kruskal-Wallis test results on the aroma parameter showed P≥0.05 so there was no significant difference in the level of preference for the aroma of vannamei shrimp head powder broth with different fillers. Meanwhile, the color, taste, texture and solubility parameters showed P≤0.05 so there was a significant difference in the color, taste, texture and solubility

of vannamei shrimp head powder broth with different fillers.

Determining the Characteristics of Powdered Stock Based on Qualitative Descriptive Analysis (spider web)

Descriptive sensory analysis methods are used to identify, describe, and quantify the sensory characteristics of a product or food ingredient through assessments conducted by trained panelists (Setyaningsih, 2010). Sensory attribute assessments are conducted using a 15 cm unstructured line scale, with zero as the lowest intensity value (Kusumaningrum et al., 2014). The obtained data are then averaged and visualized in the form of a radar or spider web diagram using Microsoft Excel to more clearly illustrate the sensory profile of each sample (Purba et al., 2013).

Results are defined in the form of data per formula: F1: powdered broth with wheat flour filler, F2: wheat flour: cornstarch filler, F3: wheat flour: tapioca flour filler, F4: wheat flour: rice flour filler, and also in combined form. The results in the graph will resemble a spider web, with lines that jut out or extend to the corners indicating higher or superior points for that point. Samples and descriptive test sheets were given to 6 panelists, the four powdered broth formulas can be seen in Figure 1.

Figure 1. Powdered stock

A spiderweb diagram showing all the characteristic/sensory attributes of each powdered broth product according to the treatments/formulations F1, F2, F3, and F4, as assessed by trained panelists. The more outward the spiderweb, the higher the quality characteristic value of the powdered broth. The quality characteristics are graded on a scale of 1-5, with captions. With lines ranging from 0-15 cm, the panelists assign lines according to their assessment. The descriptive test results from six panelists are shown in Table 5.

Table 5. Descriptive Test Results

Code	Color	Aroma	Taste	Texture
F1	1.4	1.5	1.6	1.3
F2	2	1.8	2.2	1.5
F3	2.1	2.8	2.2	2.4
F4	2.1	1.4	1.5	1.4

With a line size of 0-15 cm, the panelists assigned lines according to their assessment. The results of the spiderweb graph can be seen in Figure 2.

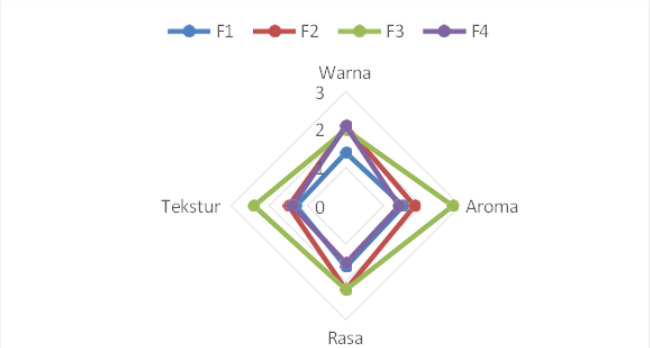

Figure 2. Overall spiderweb test

Based on the graph in Figure 2, it can be concluded that the more indented the lines extending from the center point on the spider web graph indicate a higher intensity of the attribute, according to the panelists' assessments. Formula F3 was superior due to its superior aroma, flavor, and texture, although its color was slightly lower than F4. F4 excelled in its very bright color but lacked in flavor and aroma. F1 had a golden brown color, a less dominant texture and flavor. F2 excelled in its strong shrimp flavor but had the roughest texture and weakest aroma.

For formula F1, or powdered broth with wheat flour filler, the descriptive test results from three repetitions on six trained panelists are shown in Figure 3.

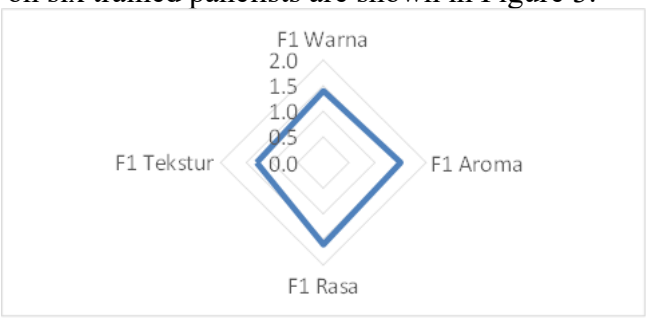

Figure 3. F1 spiderweb test

Based on research (Arsyad et al., 2021), wheat flour is not suitable for use as a sole filler because it produces a coarse powder texture and easily clumps, resulting in an unfavorable color appearance. Formula F1 showed a golden brown color compared to the other formulas. Compared to the other formulas, F1 had a slightly darker color, but reflected characteristics that were still acceptable to the panelists. In terms of aroma, F1 was considered to have a very weak or almost invisible shrimp aroma. Similarly, the taste attribute tended to be bland and lacked savory characteristics. The texture still felt rough and clumpy. Therefore, overall, F1 was unable to provide optimal sensory values compared to the other formulas. The color change is suspected to be due to the presence of

For formula F2, or powdered broth with wheat flour and cornstarch fillers, the descriptive test results from 3 repetitions on 6 trained panelists are shown in Figure 4.

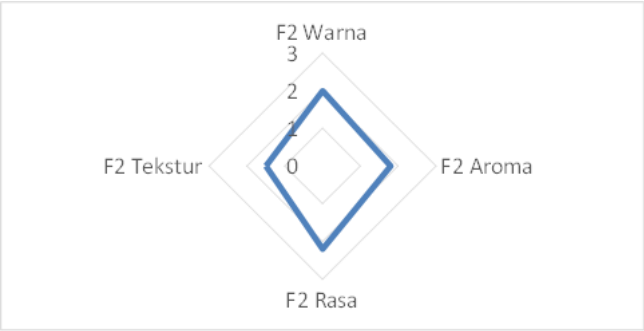

Figure 4. F2 spiderweb test

Based on Figure 5 above, it can be concluded that the F2 formula exhibits characteristics in the form of cream and attractive color parameters, thus giving the impression of a fresher and cleaner product. While in terms of the distinctive aroma of shrimp is slightly smelled and the taste has a fairly strong characteristic aroma typical of shrimp, but this is not balanced by the quality of the texture which is slightly lumpy and feels a bit rough.

In the F3 formula or powdered broth with wheat flour and tapioca flour fillers, the descriptive test results data from 3x repetitions on 6 trained panelists can be seen in Figure 5.

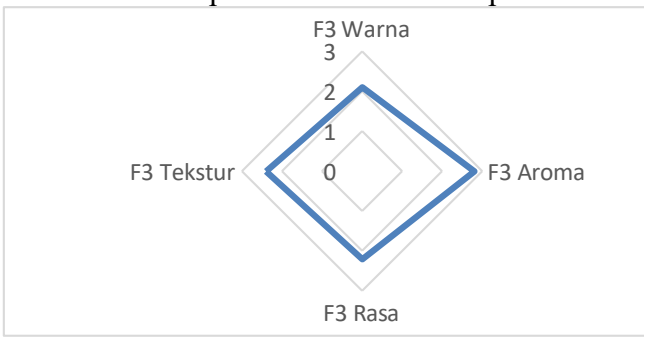

Figure 5. F3 spiderweb test

Based on Figure 6 above, it can be concluded that the F3 powdered broth formula with wheat flour and tapioca flour fillers is the most prominent formula overall because it is able to provide the best value in terms of aroma, taste, and texture. Where the resulting aroma is stronger and more distinctive shrimp, the dominant taste and provides a delicious savory shrimp taste, and the smooth broth texture without lumps, making F3 the most preferred formula by the panelists even though the product color is slightly lower than F2 and F4, but the balance between other sensory parameters makes F3 superior in terms of overall consumer acceptance. Good powdered broth has the characteristics of evenly grained, not striking color, and a distinctive aroma (Ramadhani, 2015).

For the F4 formula or powdered broth with wheat flour and rice flour fillers, the descriptive test results of 3x repetitions on 6 trained panelists can be seen in Figure 6.

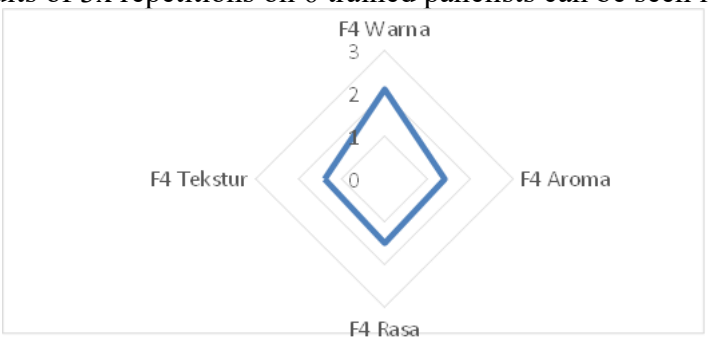

Figure 6. F4 spiderweb test

Based on Figure 21, formula F4 (wheat flour: rice flour) produced the brightest and most attractive color, but had low flavor and aroma values, and a moderate texture. Thus, F4 was visually superior but not sensorially optimal, requiring improvements in flavor and aroma. Color variation is thought to be influenced by the increased filler concentration, which paled the color, as well as the Maillard reaction between reducing sugars and amine groups during the drying process (Kereh et al., 2022).

Determination of the Best Product Based on the de garmo test

The first step was to determine the weights for the parameters: color, aroma, taste, texture, and solubility. The weighting was performed on six trained panelists, including lecturers and broth consumers (meatball vendors). The results of the weighting test are shown in Table 6.

Table 6. Weighting

Weight	Parameter				
	Color	Aroma	Taste	Texture	Solubility
	0,16	0,30	0,28	0,09	0,18

Panelists rated each parameter on a scale of 1–5 based on its importance, then weighted it using the average value. The highest value was given a score of 5 and the lowest a score of 1. Interview results indicated that aroma was the most important parameter, especially for meatball broth. Data from the six panelists was then summed, averaged per parameter, and used to calculate an effectiveness score to determine the best formula. The results of the highest and lowest scores are presented in Table 7.

Table 7. Highest and Lowest Scores

Parameter	N. highest			Average	N. lowest			Average
	U1	U2	U3		U1	U2	U3	
Color	4.15	4.17	4.47	4.26	3.75	3.80	3.58	3.71
Aroma	4.08	3.87	4.13	4.03	3.78	3.57	3.60	3.65
Taste	4.03	3.83	3.97	3.94	3.60	3.67	3.30	3.52
Texture	4.1	4.37	4.43	4.30	3.83	3.73	3.70	3.75
Solubility	4	4	4.07	4.02	3.67	3.77	3.47	3.64

The highest and lowest values were obtained from the average results of three repetitions of each formula, F1, F2, F3, and F4. The highest and lowest values were then averaged based on their parameters. The next step was to determine the final result to obtain the highest value based on the effectiveness value. The effectiveness value results can be seen in Table 8.

Table 8. Effectiveness Value

Parameter	NT	NR	S	Nilai Efektifitas				Nilai Hasil			
				F1	F2	F3	F4	F1	F2	F3	F4
Color	4.26	3.71	0.55	0.02	0.39	1.01	0.18	0.00	0.06	0.16	0.03
Aroma	4.03	3.65	0.38	0.14	0.57	0.99	0.15	0.04	0.17	0.30	0.04
Taste	3.94	3.52	0.42	0.29	0.13	1.01	0.75	0.08	0.04	0.28	0.21
Texture	4.30	3.75	0.55	0.39	0.37	1.00	0.11	0.04	0.03	0.09	0.01

Solubility	4.02	3.64	0.38	0.19	0.28	1.01	0.28	0.03	0.05	0.18	0.05
Average								0.20	0.35	1.00	0.34

Description: NT = Highest Value; NR = Lowest Value; S = difference

Based on Table 8, the effectiveness value is obtained from the treatment value for each parameter minus the lowest value of all treatments and then divided by the difference. The difference value is obtained from the lowest value minus the highest value. Then, after obtaining the effectiveness value results for each formula, the result value is searched by multiplying the effectiveness value by the weight, after which each formula is added up, the highest value will be considered the selected formula. In the table above, the highest value is obtained in treatment F3 with a value reaching 1.00. So it can be concluded that the best formula for powdered broth with treatments F1, F2, F3, F4 is obtained by treatment F3, namely powdered broth with wheat flour filler: tapioca.

CONCLUSION

Based on the results of hedonic testing and Kruskal Wallis testing with further Man Whitney testing of 4 formulas, with parameters of color, aroma, taste, texture, solubility, and the De Garmo test, it was stated that the powdered broth that consumers liked most was wheat flour: tapioca flour (F3).

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