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Karakteristik Fisikokimia, Organoleptik, dan Daya Terima Bubuk Penyedap Rasa Alami dari Ceker Ayam dan Tomat

Physicochemical, Organoleptic, and Acceptability Characteristics of Natural Flavoring Powder from Chicken Feet and Tomatoes

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A B S T R A K

Tomat memiliki komponen volatil yang dapat mengurangi amis pada ceker ayam. Penelitian bertujuan untuk mengetahui karakter fisikokimia, organoleptik, dan daya terima bubuk penyedap rasa alami dari ceker ayam dengan penambahan konsentrasi tomat yang berbeda. Parameter yang diamati meliputi pengujian warna, daya larut, kadar air, hedonik dan mutu hedonik. Data diolah dengan analisis ANOVA dan perbedaan nyata dianalisis menggunakan DMRT dengan taraf kesalahan 5%. Hasil perlakuan terbaik T3 (40%) dengan warna irish coffee, memiliki kemampuan daya larut sebesar 67,67 detik, kadar air sebesar 3,84%, memiliki rasa gurih, aroma tidak bau amis, tekstur cukup halus, dan disukai panelis. Penyedap rasa alami ceker dengan penambahan tomat sebanyak 40% dapat dijadikan alternatif dalam mengolah makanan lebih lezat dan sehat.

Kata Kunci:
asam glutamat, bubuk penyedap rasa alami, ceker ayam, tomat

A B S T R A C T

Tomatoes have volatile components that can reduce the fishiness of chicken feet. This Study aimed to determine the physicochemical, organoleptic, and acceptability characteristics of natural flavoring powder from chicken feet with the addition of different concentrations of tomatoes. Data processed with ANOVA and significant differences analyzed using DMRT with a 5% error rate. Results of the best treatment T3 (40%) with irish coffee color, has a dissolving ability of 67.67 seconds, moisture content of 3.84%, has a savory taste, no fishy aroma, smooth texture, and liked by panelists. Natural chicken feet flavoring with the addition of tomato as much as 40% can be used as an alternative in processing food more delicious and healthier.

A R T I C L E I N F O

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chicken feet, glutamic acid, natural seasoning powder, tomato

1. INTRODUCTION

According to BPOM No. 11, 2019, seasoning or flavoring ingredients is flavor enhancer or food additive which function to strengthen or modify the taste and/or aroma of food. The common seasoning is made from salt, sugar, vegetable fat, monosodium glutamate, pepper, garlic, celery, onion, turmeric, etc. (Hidayati & Widyaningsih, 2018). Most commercial seasonings are guanylate acid, inosinate acid (Pratiwi & Ananingsih, 2017) and salt of the amino acid L-glutamate such as monosodium glutamate (Fitri, 2018). Glutamate as monosodium glutamate (MSG) is enjoyed by hundreds of millions of people because it imparts a savory taste to food (Brosnan & Brosnan, 2013).

Currently, many food products cannot be separated from the use of MSG. MSG has been widely used in the cooking process, it has even become a part of today's demanding lifestyle practicality in cooking. MSG can make the taste and aroma stronger in cooking, and the taste of the food produced becomes more delicious or is often called "umami" by the Japanese. Nevertheless, excessive use of MSG can cause an increase in salt concentration in the blood because it contains high sodium (Widyastuti et al., 2012). The safety of consuming MSG is still being debated, meanwhile, it is necessary to have an alternative natural seasoning that is safer. One of which is obtained naturally from various kinds of food ingredients, such as mushroom (Praptiningsih et al., 2017) spirulina (Pratiwi & Ananingsih, 2017) fish broth (Tamaya et al., 2020) chicken feet broth (Hidayati & Widyaningsih, 2018) and vegetables (Tahmaz et al., 2022).

Chicken feet are a by-product of Rumah Pemotongan Unggas (Poultry Slaughterhouse). Broiler or domestic chicken feet are cheaper and easier to find in the market. Utilization of chicken feet is still relatively low due to the public understanding that chicken feet are part of a chicken's body that is dirty and non-hygienic (Rasbawati, 2018). The use of chicken feet as food is also limited than carcass due to the presence of small bones and cartilage with no muscle (Nazri et al., 2012). Based on the research by Swasono (2008), chicken feet contain 20% of protein and 4% fat. Chicken feet also contain 44 mg/100 g of glutamic acid (Onyema et al., 2006). This presence of glutamic acid in chicken feet has the potential to be processed into a flavor enhancer (Hidayati & Widyaningsih, 2018). The seasoning produced from chicken feet has a slightly fishy aroma (Hidayati & Widyaningsih, 2018). One of the natural ingredients that can be used to neutralize the fishy smell is tomatoes.

Tomatoes are perishable commodities because they still carry out metabolic processes after being harvested, so further processing is needed (Hok et al., 2007). The type of tomato used is the opal variety because this type of tomato is suitable for use as a cooking spice, besides that the opal tomato has a cheap price and is easy to obtain. After all, this variety has been commercialized (Supriati & Siregar, 2015). Tomatoes contained volatile compounds such as carbonyl, ester, lactone, acetal, ketal, and alcohol which can contribute to aroma (Rahim et al., 2019). Tomatoes have high nutritional value including vitamin A, vitamin C, and lycopene as an antioxidant and free radical scavenger (Febriansah et al., 2016). Tomatoes also contain 238 mg/100 g of glutamic acid (Fitri, 2018). Srivastava & Kulshreshtha (2013) revealed that tomato powder contained vitamin C 125 mg, lycopene 1.41 mg, and macro and micro mineral elements. The utilization of tomatoes and chicken feet as flavor enhancers can be an alternative to reduce MSG consumption in Indonesia, which is still quite

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high, reaching 77.8% with an average consumption of 600 mg/kg a day. The sensory color, aroma, and flavor of seasoning made from striped snakehead and tomato had been evaluated (Fitri, 2018) but there's no report about the physicochemical properties so far. This research aims to investigate the physicochemical, and organoleptic properties, and acceptability of natural chicken feet seasoning powder with the addition of tomatoes.

2. METHODS

Material used in this study were broiler chicken feet and tomatoes obtained from Subang's Local Market. Other ingredient used for seasoning were garlic, shallots, dextrin, white pepper and aquadest. Equipment used in this stud were digital scales, dehydrator, blender, stove, knife, cutting board, pan, spatula, basin, sieve mesh no.60, camera, baker glass, magnetic stirrer, stir bar, porcelain cup, tongs, analytical balance, oven, desiccator, funnel, and 100 ml measuring cup.

2.1 Formulation of Seasoning Powder of Chicken Feet and Tomato

A food dehydrator was used in this study for maintaining constant airflow and constant temperature during the drying stage. Chicken feet were sorted and cleaned. Chicken feet powder was made by boiling for 1 hour and then cut into small pieces before drying for 20 hours in a food dehydrator at 60°C. Then chicken feet were crushed and 10%/kg of dextrin was added to avoid powder clumps then sieving was carried out using a mesh sieve no. 60. Tomatoes were sliced and dried at 70° for 8 hours, then ground and sieved. Garlic and shallots were also sliced and dried for 6 hours at 70°C, then ground. The ingredients were mixed according to the formulation and then dried for 11 minutes in a food dehydrator at 65°C. The formulation of powdered seasoning is presented in **Table 1**.

Tabel 1. Formulation of seasoning powder (gram)

Material	T0	T1	T2	T3
Chicken feed powder	100	100	100	100
Tomato powder	0	20	30	40
Shallot powder	10	10	10	10
Garlic powder	10	10	10	10
Pepper powder	5	5	5	5

Notes: T0 (0% tomato addition), T1(20% tomato addition), T2(30% tomato addition), dan T3(40% tomato addition)

2.2 Determination of Physicochemical Properties

Physicochemical properties measurements include color, solubility, and moisture content. Color testing was carried out using a descriptive method by the On Color Measure 7.0 application to get a specific color. On Color Measure 7.0 is an application for android phones to detect and recognized colors easily by using the camera of the phone. The product is stored in a transparent container then point the camera phone above the product and the application detected the color of the product automatically.

Solubility was determined by the method proposed by Praptiningsih et al., (2017). Three grams of flavoring sample was dissolved in 100 ml of distilled water at 100°C, the sample was stored in a glass beaker and then stirred using a magnetic stirrer at medium speed at 100 ℃. The faster the dissolving time indicates the higher the solubility.

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Moisture content was determined using the thermogravimetric method (Daud et al., 2019) The porcelain was dried to constant weight and cooled inside a desiccator for 15 minutes. The sample is weighed as much as 2-5 g and then put into a porcelain cup and made in two repetitions. The porcelain cup and sample were weighed using an analytical balance and then dried in an oven at 105℃ for 3 hours. The porcelain cup and sample were cooled in a desiccator for 15 minutes. The porcelain cup and sample are weighed and dried again for 60 minutes then cooled for 15 minutes in a desiccator until the weight was constant. Moisture content was reported in % using the formula below:

Moisture content Formula

$$\% \text{ Moisture content (w/w)} = \frac{(b-c)}{(b-a)} x\ 100\%$$

Where *"a"* is the weight of the empty porcelain cup, *"b"* is the weight of the cup porcelain and sample, and *"c"* is the dry weight of the cup porcelain and sample.

2.3 Determination of Organoleptic Properties

Organoleptic properties were determined by quality hedonic test (Setyaningsih et al., 2014). The panelists used in the hedonic quality test were semi-trained panelists of 15-25 people. The parameters assessed were taste, aroma, and texture parameters. The number of treatment samples used in the hedonic test is four samples, where all samples will be presented simultaneously and have been given a sample code. Panelists were asked to provide an assessment of each sample using the hedonic quality scale from 1-5 provided on the test form.

2.4 Determination of Acceptability

The degree of acceptability was determined using a hedonic scale (Setyaningsih et al., 2014). The panelists used in the hedonic test were semi-trained panelists of 15-25 people. The number of treatment samples used in the hedonic test is four samples, where all samples will be presented simultaneously and have been given a sample code. Panelists were asked to provide an assessment of each sample using the hedonic scale from 1-7 (very dislike to really like) provided on the test form.

2.5 Statistical Approach and Data Management

The collected data were analyzed using one-way ANOVA and if there was a difference then it was continued with the DMRT test and statistical significance was accepted at $p < 0,05$. All data were analyzed and explained descriptively.

3. RESULTS AND DISCUSSION

3.1 Physicochemical Properties

Color

One of the factors that determine the preference for a product is color. Color can be a determinant of attractiveness and consideration for consumers to buy the product. Color is a physical parameter that plays an important role, often used as an indicator of changes that occur in food products, such as browning and caramelization reactions (Oksilia, 2018). Flavoring generally has a brown color but can change based on other determining factors such as the additional ingredients used or the processing carried out. The results of the assay were presented in **Table 2**.

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Table 2. Color of Seasoning Powder Made from Chicken Feet and Tomato

Formula of Tomato Additon	Color	Result
T0 (0%)	Light wood	
T1 (20%)	Potters clay	
T2 (30%)	Brown	
T3 (40%)	Irish coffee	

Table 2. showed that the seasoning powder in the T0 (0% tomato addition) treatment had a light wood color. This color is due to the brown color of the chicken feet. Chicken feet contain bones that have a dark brown color so when dried the color gets darker because an oxidation process has occurred during drying (Malichati & Adi, 2018). However, when dextrin was added, the brown color fades slightly because it mixed with the white color of the dextrin, resulting in light wood color. With the addition of tomato powder, the color of the flavoring became darker and there was a reddish color due to the color pigment lycopene in tomatoes. This reddish color produced a more attractive color. The lycopene contained in tomatoes is oxidized due to the heating process so that the resulting red color fades (Dewandari et al., 2009). Oxidation occurs in the drying stage due to the use of temperatures above 60 ℃, causing a change in the color of the tomatoes and chicken feet to a brown color. Heat processing and storage of tomato products causes lycopene degradation to certain extent. Retention of total lycopene content in tomato powder was 52% or about 1,41 mg/100 g compared with fresh tomato (Srivastava & Kulshreshtha, 2013). The reddish tint in tomatoes faded when heated so that the reddish hue is not so conspicuous.

Solubility

Solubility is one of the determining factors for the quality of the seasoning powder. The seasoning powder product has good quality if it quickly dissolves in water after the stirring process is carried out, then instant products must have the ability to dissolve in water without any lumps. The data obtained based on the results of the analysis of variance showed that the addition of tomato had no significant effect (P>0.05) on the solubility of the natural chicken feet seasoning. The average solubility of chicken feet and tomato seasonings was in the range of 66.67 – 67.67 seconds. The most soluble flavoring is in treatment T2 (30% tomato addition) with an average solubility of 66.67 seconds and the longest dissolving power is in treatment T0 and T3 for 67.67 seconds. Data on the results of the solubility test for chicken feet seasoning with the addition of tomato can be seen in **Figure 1**.

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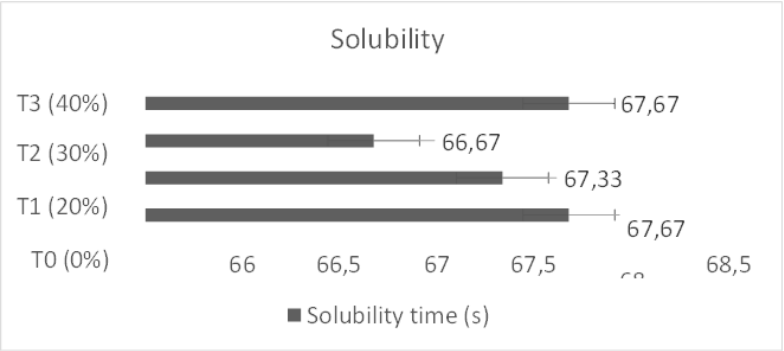

Figure 1. Solubility of 4 Different Seasoning Powder Formula
(T labels refer to tomato addition concentration)

Solubility is affected by the nature of the origin of the material such as chicken feet which consist of collagen and bone, so the solubility is low. Solubility is increased by adding dextrin which has high solubility properties (Hidayati & Widyaningsih, 2018). Dextrin is a type of soluble fiber that is made from starchy foods, such as wheat, potatoes, corn or tapioca. The use of dextrin in the manufacture of seasoning functions as a fat binder in chicken feet powder so that clumping does not occur and is more easily dissolved. Tomato powder has an average dissolving time that is faster than chicken feet powder because tomatoes do not contain many materials that are difficult to dissolve such as fat or collagen. The T2 treatment had the fastest average dissolution time, presumably because the temperature when boiling water to dissolve the flavoring was too high so the seasoning powder dissolved more quickly. Solubility is measured based on the length of time the seasoning dissolves in water, the higher the solubility value indicates the lower the solubility or the more difficult the seasoning is to dissolve (Praptiningsih et al., 2017).

The solubility value can also be related to the moisture content of the material, where the higher the moisture content, the lower the solubility value. With the higher moisture content, clumps will form so that it takes a long time to break the bonds between the particles which results in a decrease in the ability of the product to dissolve (Wahyuni et al., 2021). Yuliawaty & Susanto, (2014) stated that the higher the solubility value, the better the quality of the product produced because it will be easier to use.

Moisture Content

The moisture content of food is a representation of the amount of moisture content contained in a food ingredient which is expressed as a percentage. The moisture content in food ingredients can affect the resistance of food ingredients to microbes (Daud et al., 2019). High moisture content can affect the product's shelf life. So, the higher the water content, the lower the shelf life. The data obtained based on the results of the analysis of variance showed that the chicken feet flavoring with the addition of tomato powder had a significant effect ($P<0.05$) on the water content of the natural chicken feet flavoring. The average value of water content is in the range of 3.05 – 3.84%. The highest water content was found in the T3 treatment at 3.84% while the lowest water content was found in the T0 treatment at 3.05%. The water content in all treatments has fulfilled the water content quality requirements based on SNI 01-4273-1996, which is a maximum of 4%. Data on the results of testing the water content of chicken feet and tomato flavorings can be seen in **Figure 2**.

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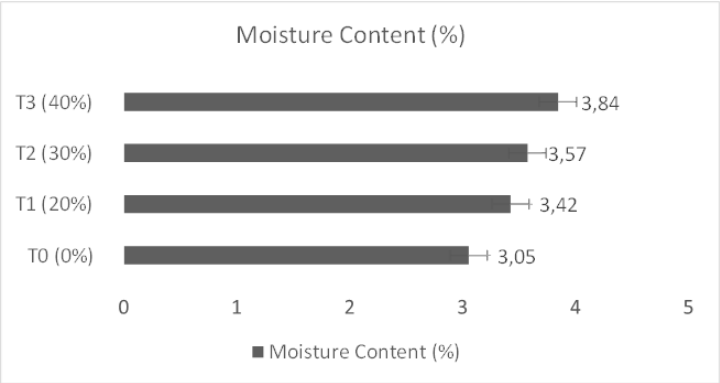

Figure 2. Moisture content of 4 different seasoning powder formula (t labels refer to tomato addition concentration)

Tomato powder has a water content of around 5.6% (Srivastava & Kulshreshtha, 2013). The higher the addition of tomato powder, the higher the moisture content in the product. Moisture content can affect product shelf life, high moisture content above the standards will cause the product to clump and other unwanted damage (Hidayati & Widyaningsih, 2018). All product results meet the water content limit according to SNI 01-4273-1996, which is below 4%.

3.2 Organoleptic Properties

The hedonic quality test is a test in sensory analysis that is used to express an impression about whether a product is good or bad. Like rough or smooth, soft or hard, and so on. This hedonic quality test is more specific than just showing likes or dislikes. The results of the analysis of variance **Table 3**. showed that the addition of tomato powder had a significant (P<0.05) effect on the taste parameters. The results of the hedonic taste test conducted based on the panelist's assessment ranged from 3.10 to 4.05, which means that the seasoning powder in the T0 and T1 treatments had a quite savory flavor and the T2 and T3 treatments had a savory flavor. The highest average value of the taste parameter is found in the T3 treatment which is 4.05 and the lowest average value in the T0 treatment which is 3.10.

The addition of tomato powder with more concentration resulted in a higher savory flavor. This savory is produced because tomatoes contain glutamic acid of 238 mg/100 g of material (Onyema et al., 2006). The glutamic acid contained in tomatoes is higher than the glutamic acid content in chicken feet which is only 44 mg/100 g (Hidayati & Widyaningsih, 2018). This is in line with research conducted by Fitri (2018) which concluded that the higher the concentration of tomato powder added to the production of snakehead fish flavoring, the more favored by the panelists because it was much savorier.

Table 3. Organoleptic properties of 4 different seasoning powder formulas

Formula of Tomato Addition	Flavor	Aroma	Texture
T0 (0%)	3.10 ± 0.55[a] (Quite savory)	3.70 ± 0.73[a] (Not fishy smell)	3.10 ± 0.79[a] (Quite smooth)
T1 (20%)	3.40 ± 0.68[a] (Quite savory)	3.75 ± 0.64[a] (Not fishy smell)	3.20 ± 0.70[a] (Quite smooth)
T2 (30%)	3.80 ± 0.52[b] (Savory)	3.80 ± 0.70[a] (Not fishy smell)	3.25 ± 0.85[a] (Quite smooth)
T3 (40%)	4.05 ± 0.69[b] (Savory)	3.80 ± 0.70[a] (Not fishy smell)	3.30 ± 0.92[a] (Quite smooth)

Note: Different letters in the same column mean significantly different at the p < 0,05

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The results of the hedonic aroma quality test carried out based on the panelist's assessment ranged from 3.70 to 3.80. Chicken feet seasoning powder with the addition of tomato powder did not smell fishy. The highest average value of the aroma parameter found in treatments T2 and T3 was 3.80 and the lowest average value in treatment T0 was 3.70.

The fishy smell produced in the feets was caused by the high-fat content in the chicken feets, resulting in unsaturated volatile aldehyde compounds which were trapped in collagen during the refining process, giving rise to a fishy odor. The fishy smell produced in the feets was caused by the high-fat content in the chicken feets, resulting in unsaturated volatile aldehyde compounds trapped in collagen during the refining process, giving rise to a fishy odor (Purba, 2014). The addition of tomato powder to the chicken feet seasoning powder reduced the fishy smell of the chicken feet, this was because tomatoes contained volatile compounds in the form of carbonyls, esters, lactones, acetals, ketals, and alcohols which had distinctive effects of tomato scent (Rahim et al., 2019).

Meanwhile, other spices such as garlic, red onion, and pepper are also responsible for giving the seasoning powder a special aroma and flavor. Garlic contains allicin and Y-glutamylcysteine compounds (Lisiswanti, 2017) while shallots contain sulfur compounds (Aryanta, 2019) and pepper contains essential oils (Risfaheri, 2016). Garlic contains allicin and Y-glutamylcysteine compounds, while shallots contain sulfur compounds, and pepper contains essential oils. The aroma of these volatile compounds was produced when the heating process occurred due to the Maillard reaction (Purba, 2014).

Chicken feet flavoring with the addition of tomato powder had no significant effect ($P>0.05$) on the texture parameter of seasoning powder. The results of the texture hedonic quality test conducted based on the panelist's assessment ranged from 3.10 to 3.30, which means that the chicken feet and tomato flavoring has a fairly smooth texture. The highest average value for the texture parameter found in the T3 treatment was 3.30 and the lowest average value in the T0 treatment was 3.10. The addition of tomato powder did not have a significant effect on the texture of the chicken feet flavoring because the shape was already powdered and dry.

3.3 Acceptability

The hedonic test aims to determine the magnitude of the quality difference between a product by providing an assessment based on parameters that have been determined according to the preferences of the panelists. The results of the analysis of variance (Figure 4) showed that the addition of tomatoes had a significant effect ($P<0.05$) on the panelist's preference level. The results of the hedonic test conducted based on the panelist's assessment ranged from 4.30 to 5.65, which means that the seasoning made from chicken feet and tomato as a whole was neutral in the T0 (0%) treatment, quite liked the T1 (20%) treatment, and the panelists liked the T2 (30%) and T3 (40%) treatments. The highest average value is in the T3 (40%) treatment and the lowest average value is in the T0 (0%) treatment.

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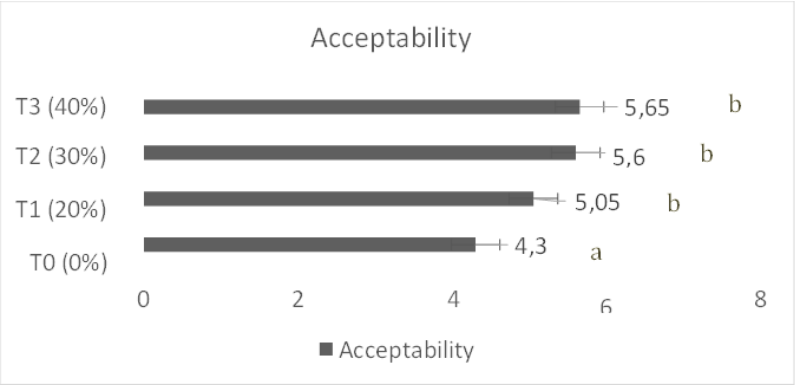

Figure 4. Acceptability of 4 Different Seasoning Powder Formulas (t labels refer to tomato addition concentration)

It was suspected that the savory taste has increased the panelist's preference. This is consistent with the statement that flavoring with the addition of more tomato powder treatments has a higher savory taste (Fitri, 2018). Aroma has also affected the level of preference of panelists because flavoring with the addition of tomatoes has a distinctive aroma of tomatoes which is more fragrant. The aroma comes from volatile compounds in the form of carbonyls, esters, lactones, acetals, ketals, and alcohols found in tomatoes (Rahim et al., 2019).

4. CONCLUSION

Seasoning powder can be made from chicken feet and tomatoes. The difference in tomato concentration affects the moisture content, flavor, and acceptability of chicken feet seasoning powder. All seasoning powder results had moisture content below 4%, which met the moisture content limit according to the standard. The best treatment results were T3 (40% tomato addition) which had an Iris coffee color, a solubility of 67.67 seconds, a moisture content of 3.84%, a savory taste, no fishy smell, and smooth texture, and was preferred by panelists. Further research, such as a higher concentration of tomato addition is possible to get better characteristics and panelist preferences.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

6. REFERENCES

Aryanta, I. W. R. (2019). Bawang merah dan manfaatnya bagi kesehatan. *Widya Kesehatan*, *1*(1), 29–35.

Brosnan, J. T., & Brosnan, M. E. (2013). Glutamate: a truly functional amino acid. *Amino Acids*, *45*(3), 413–418.

Daud, A., Suriati, & Nuzulyanti. (2019). *Kajian penerapan faktor yang mempengaruhi akurasi penentuan kadar air metode thermogravimetri*. https://ppnp.e-journal.id/lutjanus_PPNP.

Dewandari, K., Kailaku, S., & Sunarmani, N. (2009). Perubahan kandungan likopen dan kualitas pasta tomat selama proses pengolahan. *Indonesian Journal of Agricultural Postharvest Research 6*(2), 102–107.

DOI: https://doi.org/10.17509/edufortech.v8i1
p- ISSN 2541-4593 e- ISSN 2776-4761

Febriansah, R., Indriyani, L., & Muthi, K. D. P. dan. (2016). *Tomat (solanum lycopersicum l.) Sebagai agen kemopreventif potenial*. *May*, 1–8.

Fitri, R. R. (2018). Pemanfaatan ikan gabus (channa striata) dan tomat (lypersion esculentum mill) sebagai penyedap rasa alami. *Jurnal Proteksi Kesehatan*, *7*(2), 94– 100.

Hidayati, N., & Widyaningsih, T. D. (2018). Optimization of instant powdered chicken feet broth's drying temperature and time on pilot plant scale production. *IOP Conference Series: Earth and Environmental Science*, *131*(1).

Hok, K. T., Setyo, W., Irawaty, W., & Soetaredjo, F. E. (2007). Pengaruh suhu dan waktu pemanasan terhadap kandungan vitamin a dan c pada proses pembuatan pasta tomat. *Widya Teknik*, *6*(2), 111–120.

Lisiswanti Rika, F. P. H. (2017). Allicin pada bawang putih (allium sativum) sebagai terapi alternatif diabetes melitus tipe 2. *Jurnal Majority*, *6*(2), 33–38.

Malichati, A. R., & Adi, A. C. (2018). Kaldu ayam instan dengan substitusi tepung hati ayam sebagai alternatif bumbu untuk mencegah anemia. *Amerta Nutrition*, *2*(1), 74.

Nazri, M., Rahman, A., Azzainurfina, S., Khair, S., & Jamalulail, A. (2012). Extractions, physicochemical chracterizations and sensory quality of chicken feet gelatin. *BORNEO SCIENCE*, *30*, 1–13.

Oksilia. (2018). Hubungan karakteristik fisik dan kimia beberapa jenis buah mangga (mangifera indica l) terhadap penerimaan konsumen. *Unimal*, *2*(1), 51–58.

Onyema, O.O.; Farombi, E.O.; Emerole, G.O.; Ukoha, A.I.; Onyeze, G. O. (2006). 195822-ID-monosodium-glutamat-dan-kesehatan.pdf. In *Indian Journal of Biochemistry and Biophysics* (pp. 20–24).

Praptiningsih, Y., Widya Palupi, N., Lindriati, T., Manikam Wahyudi, I., teknologi hasil pertanian, j., teknologi pertanian universitas jember jalan kalimantan, f., & tegal boto, k. (2017). Seasoning alami jamur merang (volvariella volvaceae). In *Jurnal Agroteknologi 11*(1)

Pratiwi, A. R., & Ananingsih, V. K. (2017). *Produksi penyedap non-msg berbasis spirulina menggunakan teknologi granulasi*. 1–43.

Purba, M. (2014). Pembentukan flavor daging unggas oleh proses pemanasan dan oksidasi lipida. *Wartazoa*, *24*(3), 109–118.

Rahim, E. M., Fadhilla, R., Ronitawati, P., & Swamilaksita, P. D. (2019). *Penambahan ekstrak serai (cymbopogon citratus) dan ekstrak tomat (solanum lycopersicum) terhadap kadar proksimat, fe, dan vitamin c pada permen jelly*. *21*(2), 75–82.

Rasbawati. (2018). Kadar protein tepung ceker ayam dan tingkat kesukaan biskuit dengan subtitusi tepung ceker. *Jurnal Galung Tropika*, *7*(2), 115–122.

Risfaheri. (2016). Diversifikasi produk lada (piper nigrum) untuk peningkatan nilai tambah.

Setyaningsih, D., Apriyantono, A., & Sari, M. P. (2014). *Analisis sensori untuk industri pangan dan agroindustri*. Penerbit IPB Press.

DOI: https://doi.org/10.17509/edufortech.v8i1
p- ISSN 2541-4593 e- ISSN 2776-4761

Srivastava, S., & Kulshreshtha, K. (2013). Nutritional content and significance of tomato powder. *Annals of Arid Zone*, *52*(2), 121–124.

Supriati, Y., & Siregar, F. D. (2015). *Bertanam tomat di pot*. Penebar Swadaya.

Tahmaz, J., Begić, M., Oručević Žuljević, S., Mehmedović, V., Alkić-Subašić, M., Jurković, J., & Djulančić, N. (2022). Physical properties of vegetable food seasoning powders. in *10th central european congress on food* (pp. 14–32). Springer International Publishing.

Tamaya, A. C., Darmanto, Y. S., & Anggo, A. D. (2020). Characteristics of flavor enhancers made from different types of fish broth with addition of cornstarch. In *Jurnal Ilmu dan Teknologi Perikanan 2* (2).

Wahyuni, S., Dewi, Y. S. K., & Rahayuni, T. (2021). Karakteristik fisikokimia dan sensori bumbu instan bubuk gulai tempoyak dengan penambahan maltodekstrin. *FoodTech: Jurnal Teknologi Pangan*, *4*(2), 40.

Widyastuti, N., Tjokrokusumo, D., & Giarni, R. (2012). Potensi beberapa jamur basidiomycota sebagai bumbu penyedap alternatif masa depan. *Jurnal Agroindustri Dan Lokakarya Nasional FKPT-TPI*, *15*(2), 56.

Yuliawaty, S. T., & Susanto, W. H. (2014). Pengaruh lama pengeringan dan konsentrasi maltodekstrin terhadap karakteristik fisik kimia dan organoleptik minuman instan daun mengkudu (morinda citrifolia l). *Jurnal Pangan dan Agroindustri, 3*(1), 41–52.

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p- ISSN 2541-4593 e- ISSN 2776-4761