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CHEMICAL AND ORGANOLEPTIC QUALITY OF SMOKED SALTED EGGS WITH THE ADDITION OF HERBAL INGREDIENTS GINGER AND TURMERIC

Salma Sania, Andri Kusmayadi*, Putri Dian Wulansari
Department of Animal Science, Faculty of Agriculture, Universitas Perjuangan Tasikmalaya,
Pembela Tanah Air Street No. 177, Tawang, Tasikmalaya, 46115
*Correspondent author, email: andrikusmayadi@unper.ac.id

ABSTRACT

The addition of herbal ingredients such as turmeric and ginger can increase the durability and shelf life of smoked salted eggs. The active compounds curcumin and gingerol are thought to play a role in increasing the quality of salted eggs. This study aims to analyze the effect of adding turmeric and ginger on the chemical and organoleptic properties of smoked salted eggs. The method used was a Completely Randomized Design (CRD) with four treatments: P_0 (control), P_1 (turmeric 7.5%), P_2 (ginger 7.5%), and P_3 (combination of turmeric and ginger 7.5%), each with five replications. The parameters observed included ash content, salt content, crude fiber, and organoleptic tests (color, aroma, texture, and preference). The results showed that the addition of turmeric and/or ginger had a significant effect on ash content, color, aroma and had a very significant effect on crude fiber content, but had no significant effect on salt content, texture and preference level. The mineral and crude fiber content in turmeric and ginger contributed to the increase in ash and crude fiber content. Meanwhile, the addition of turmeric and ginger in the salted egg mixture does not affect the salt content, so the salty taste remains balanced, neither excessive nor lacking. The best results were obtained in the combination treatment of 7.5% turmeric and 7.5% ginger (P_3) with an ash content of 12.27%, a salt content of 4.00%, crude fiber of 4.41%, and an organoleptic score for color of 4.07, aroma of 3.60, and a preference level of 3.47. Thus, the use of a combination of turmeric and ginger can be an alternative in improving the quality and durability of smoked salted eggs without changing the balance of taste.

Keywords: Chemical quality, ginger, organoleptic, smoked salted eggs, turmeric

INTRODUCTION

Duck eggs are a livestock product that is affordable and easily accessible to the public. Duck eggs have several advantages, including large size, thick shells, and comprehensive nutritional content, namely 12% protein, 11% ash, 10% fat, 1% carbohydrates, and various vitamins, minerals, and cholesterol (Fajarwati *et al*., 2020). However, in addition to these advantages, duck eggs also face a high risk of damage, both chemically, by microorganism attacks and physically (Purdiyanto and Riyadi, 2018). In addition, the level of preference for duck eggs is not as high as the preference for chicken eggs. One factor that influences the low level of preference for duck eggs is the stronger fishy taste compared to chicken eggs. One effort that can help overcome these two problems is to diversify duck egg products into herbal smoked salted eggs. The salting and smoking process can help minimize the risk of egg damage, thereby extending the shelf life (Prasetyo, 2023). The addition of herbs can improve the taste and aroma, which can help reduce the fishy taste and smell of duck eggs. In addition, the addition of herbs also contributes to increasing the nutritional value of smoked salted eggs (Wibowo *et al*., 2017). The addition of garlic, bay leaves, and sappanwood has been reported to have good ability to improve water, fat, and pH levels (Fauzi *et al*., 2022).

The salting process using salt (NaCl) functions to improve the taste, shelf life, and quality of eggs. Duck eggs are often chosen as the main ingredient in making salted eggs because their shells have larger pores than other poultry eggs, allowing salt to be absorbed more effectively. (Suharno, 2019). As an innovation, the smoking process is often added after salting to provide a distinctive smoky taste sensation, extend shelf life, and increase the aesthetic value of the product. The smoking process also functions as a natural preservative, where the phenol compounds and organic acids produced can inhibit microbial activity and stabilize the color and texture of eggs (Hidayati and Putra, 2021).

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Turmeric contains curcuminoid compounds, which include bisdemethoxycurcumin, curcumin and demethoxycurcumin. The curcuminoid compound has antimicrobial, antioxidant, and anti-inflammatory properties. Ginger, on the other hand, is rich in essential oils, such as zingiberol, which has been shown to be effective as an antibacterial agent. Previous studies have shown that curcuminoid compounds from turmeric and essential oils from ginger can inhibit the growth of pathogenic microorganisms, including *Escherichia coli, Bacillus subtilis*, and *Staphylococcus aureus*, and contribute to increasing the body's resistance. (Al-Snafi, 2016; Jain *et al*., 2022). Research on smoked salted eggs with the addition of herbs has a significant relationship in improving product quality through its effect on various parameters, such as ash content, salt content, crude fiber content, and organoleptic properties. The addition of turmeric and ginger as herbal ingredients not only provides functional benefits in preventing bacterial growth but also contributes to extending the shelf life of smoked salted eggs. The content of active compounds, such as curcumin in turmeric and gingerol in ginger, has antimicrobial properties that are effective in inhibiting the growth of bacteria that cause damage. In addition, turmeric and ginger can affect the ash content, salt content, and crude fiber content, which play an important role in the physical and chemical stability of the product. In terms of organoleptic, the addition of these herbs can improve the taste, aroma, and visual appeal, thereby increasing public interest in smoked salted eggs that are healthier and last longer.

Through the use of local herbal ingredients that are rich in benefits, this research is expected to be able to increase the appeal and interest of consumers in processed duck egg products, produce innovations in food products that are of added value and support the empowerment of local potential, especially Cihateup duck eggs from Tasikmalaya Regency, so that they have competitiveness in the local and national markets. This study aims to analyze the effect of adding

turmeric and ginger on the chemical quality and organoleptic properties of smoked salted eggs.

RESEARCH METHODS

Materials

The ingredients used are 100 duck eggs obtained from farmers in Sukanagalih Village, salt, ash, bricks, turmeric, ginger, coconut fiber, coconut shells, water. The tools used are sandpaper, basins, stoves, pans, spatulas, measuring cups, digital scales, jars, smoke machines, knives, plates, spoons, trays, measuring cups, cups, beaker glasses, Erlenmeyer flasks, ovens, pens, notebooks.

Making Herbal Smoked Salted Eggs

In making salted eggs, the first step begins with cleaning the eggs by rubbing them with sandpaper which also aims to open the pores of the eggs. After cleaning the eggs, they are coated with salted egg dough, the dough consists of 500 grams of salt, ash, brick, and added with herbs according to the concentration of each treatment, namely P_0 (0%), P_1 (Turmeric 7.5%), P_2 (Ginger 7.5%), and P_3 (Turmeric 7.5% + Ginger 7.5%). After the dough is ready and mixed homogeneously, the next stage of coating the dough on the eggs must ensure that the eggs are tightly covered with the dough without any parts being missed. Eggs that have been coated with the dough are stored in jars according to the name of the treatment sample and its repetition. After that, the eggs are incubated for 21 days. After a 21-day incubation period, the eggs are harvested and boiled in boiling water at a temperature of 90^0C for 30 minutes. The eggs are removed and left until the egg temperature is low and put back into the sample jar.

The salted eggs that have been cooked then enter the smoking process. The materials used in the smoking process are coconut fiber and shells. Eggs are arranged into the smoke machine rack, after all the eggs are arranged the smoke machine is tightly closed and the smoking material space at the bottom of the machine is lit with fire until charcoal is formed which will produce smoke and enter the top section containing the salted egg rack. The smoking process is carried out for 6 hours until it is brown. After 6 hours the eggs are removed and allowed to cool then put back into the jar. The herbal smoked salted eggs are then tested with parameters of ash content, salt content and organoleptic properties.

Data Analysis

The data obtained were analyzed using the IBM SPSS Statistics version 23 application. Analysis of Variance (ANOVA) was used for ash content, salt content, and crude fiber content data. If the results showed a significant effect, the analysis was continued with the DMRT (Duncan Multiple Range Test) at a 5% confidence level for ash content and salt content, and 1% confidence level for crude fiber content. The organoleptic test data were analyzed using the Shapiro-Wilk normality test. If the data were not normally distributed, an analysis was carried out using the Kruskal-Wallis nonparametric test to identify differences between samples, which was then continued with the Mann-Whitney test. All statistical analyses were performed using IBM SPSS Statistics version 23. The mathematical model used in this study refers to Steel and Torrie (1996).

RESULTS AND DISCUSSION

Ash Content

Analysis of ash content in food products plays an important role in determining quality of the product, especially related to its nutritional content. Ash content can also provide an indication of microbiological stability, because some minerals in it have the ability to inhibit the growth of microorganisms (Fitriarni *et al*., 2024). The results of the test on the effect of adding herbs

on the ash content of smoked salted eggs in this study are presented in Table 1.

Table 1. Results of ash content analysis in herbal smoked salted eggs.

Treatment	Ash Content (%)	Salt Content (%)	Crude Fiber Content (%)
P_0 (Without Added Herbs)	11.86 ± 0.06^a	4.45 ± 1.12	0.57 ± 0.02^a
P_1 (7.5% Turmeric)	13.97 ± 0.08^c	4.28 ± 0.90	2.35 ± 0.05^b
P_2 (7.5% Ginger)	11.99 ± 0.10^a	3.77 ± 0.68	7.36 ± 0.30^c
P_3 (7.5% Ginger and 7.5% Turmeric)	12.27 ± 0.03^b	4.00 ± 0.64	4.41 ± 0.01^d

Description: Different superscripts in the same column (a,b,c,d) mean significant (P<0.05).

The results showed that the control treatment (P_0) and the addition of ginger (P_2) did not experience a significant increase in ash content, with average values of 11.86% and 11.99%, respectively. Significant results were shown by smoked salted eggs with additional turmeric (P_1) and a combination of turmeric-ginger (P_3), with average values of 13.97% and 12.27%, respectively. These results are consistent with the findings obtained in the study conducted by Fitriarni *et al*. (2024), which states that the addition of herbs to food products can increase ash content by 0.85% to 3.66%.

The best treatment of ash content parameters is shown by P_3 with a value of 12.27%. This result is considered the best because it shows a significant but not excessive increase, and is still close to the ash content in the control treatment. Other studies have shown that the ash content in animal food products is in the range of 11.02% to a maximum limit of 15.53% (Adriani *et al*., 2024). Ash content that is too high does not always indicate better salted egg quality, because it can indicate contamination or the addition of unwanted non-food ingredients. Excessive ash content can also affect the sensory characteristics of the product, such as the texture becoming too hard (Fikriyah and Nasution, 2021). The ash content in salted eggs refers to the remaining minerals left after burning the sample in laboratory analysis. The increase in ash content in herbal smoked salted eggs is influenced by the mineral content in turmeric and ginger which are used as additional ingredients in the salted egg mixture. While ginger has several nutritional and mineral contents that are slightly lower than turmeric (Wibowo *et al*., 2017).

Salt Content

The results of the ANOVA analysis on the effect of adding herbs on the salt content of smoked salted eggs in this study are presented in Table 1. Based on the analysis results, the addition of turmeric and/or ginger did not have a significant effect (P>0.05) on salt content, with an average salt content ranging from 3.77% to 4.45%. The salt content in this study met the SNI 01-4277-1996 standard which stipulates that the minimum limit for salt content in salted eggs is 2.00%. The findings in this study are consistent with the results of previous studies which revealed that the salt content in salted eggs is in the range of 3.05% to 4.56% (Rukmiasih *et al*., 2015). Other studies have also shown similar results with a salt content range of 1.48% to 3.79% (Prasetyo, 2023). The best treatment of the salt content parameter is shown by P_3 with a value of 4.00%, this is because the salt content considered optimal at the consumer preference level is in the range of 2.00-4.00% (Latipah *et al*., 2017).

The addition of turmeric and ginger to the salted egg mixture does not affect the resulting salt content, so that the smoked salted eggs still have a balanced salty taste, neither too little nor too much. The ash particles function to bind iodized salt particles and diffuse into the eggs, so that the salt content does not change significantly (Fadhlurrohman *et al*., 2021). The salt content in salted eggs will draw water from the eggs so that there is a decrease in water activity which will inhibit the growth of destructive microorganisms because most bacteria and fungi require high water content to thrive (Putri *et al*., 2022).

Chloride ions produced from salt dissociation have antimicrobial properties that inhibit enzymatic activity and bacterial growth (Fajriana *et al*., 2020). The addition of turmeric containing curcuminoids can act as an antimicrobial and antioxidant, curcuminoids inhibit the growth of microorganisms and increase the oxidative stability of smoked salted eggs (Rohmah, 2024). The antimicrobial activity of ginger is influenced by gingerol and shogaol compounds which can help inhibit the growth of pathogenic bacteria such as *Salmonella sp.* and *Escherichia coli* (Hernani and Dewandari, 2018).

Crude Fiber Content

The results of the ANOVA analysis and DMRT further test at a significance level of 1%, regarding the effect of adding herbs on the crude fiber content of smoked salted eggs in this study are presented in Table 1. Based on the analysis results in Table 1, it is known that the addition of turmeric and/or ginger has a very significant effect ($P<0.01$) on the crude fiber content of smoked salted eggs with values ranging from 0.57% to 7.36%. Treatment with the addition of 7.5% ginger (P_2) produced the highest crude fiber content of 7.36%, while the lowest content was found in the control treatment (P_0) of 0.57%. These results are in line with research by Hapsari *et al.* (2022) which showed that the addition of herbs significantly increased the crude fiber content of mackerel nuggets, with values ranging from 2.34%-11.53%. Other studies also state that the addition of herbs affects the crude fiber content of food products, with an average value of between 1.56%-1.88% (Rohana *et al*., 2022).

The best treatment of crude fiber content parameters was shown by P_3 with a value of 4.41%, based on considerations of nutritional balance and consumer acceptance levels. The addition of fiber to animal food products can increase nutritional value and provide health benefits, such as supporting digestive function. However, the addition of fiber needs to be done in the right proportion so as not to interfere with the sensory quality of the product. Too high a fiber content can have a negative impact on sensory characteristics, such as texture and taste, which can reduce consumer acceptance (Idrus *et al.*, 2016). The increase in crude fiber in smoked salted eggs is thought to occur because the coarse fibers from turmeric and ginger stick to the shell surface or are absorbed into the outer layer of the egg during the incubation process. Other studies have shown that the active component gingerol in ginger can penetrate the pores of the egg shell and affect the color of the albumen, these results indicate that certain compounds such as crude fiber from ginger and turmeric additives can enter the eggs during the salting process (Pundiswara *et al*., 2021). The crude fiber content can also increase due to the influence of the drying process, high temperatures can reduce water content thereby increasing the carbohydrate content of the powder (Kusuma *et al*., 2019).

Organoleptic Characteristics

Table 1. Results of organoleptic test analysis on herbal smoked salted eggs.

Treatment	Organoleptic Characteristics			
	Color	Flavour	Texture	Favorites
P_0 (Turmeric 0% + Ginger 0%)	2.70 ± 0.65^{a}	1.97 ± 0.32^{a}	3.00 ± 0.64	3.20 ± 0.80
P_1 (Turmeric 7.5%)	3.20 ± 0.55^{b}	2.80 ± 0.85^{b}	2.87 ± 0.62	3.33 ± 0.76
P_2 (Ginger 7.5%)	3.70 ± 0.60^{c}	3.27 ± 1.05^{bc}	2.73 ± 0.58	3.27 ± 0.87
P_3 (Turmeric 7.5% + Ginger 7.5%)	4.07 ± 0.45^{d}	3.60 ± 0.85^{c}	2.80 ± 0.85	3.47 ± 0.73

Note: Different superscripts in the same column (a,b,c,d) mean significant ($P<0.05$).

Color

The results showed that there was a significant difference ($P<0.05$) in smoked salted eggs with added turmeric and ginger. The treatment with the highest average value was the treatment with the addition of a combination of turmeric and ginger (P_3), which was 4.07, while the lowest value was in the control treatment (P_0) with a value of 2.70. The results of this study are in line with Pundiswara *et al.* (2021), which stated that the addition of ginger flour had a significant effect on the color of salted eggs. Based on color testing using a colorimeter, the increase in color was in the range of 55.93 to 66.71.

Previous studies have shown that the addition of turmeric has a significant impact on increasing the intensity of the yellow color in salted eggs. The results of Aprilia's (2015) study stated that the higher the concentration of turmeric extract used, the higher the intensity of the yellow color in the egg yolk. This is thought to be related to the curcumin content in turmeric, which acts as a natural dye, thus providing a color-enhancing effect on salted eggs (Widodo, 2020). The combination of turmeric and ginger has the potential to increase the yellow color of salted egg yolks. Turmeric contains curcumin compounds which act as natural color pigments, while ginger contains carotenoid compounds which can also contribute to the coloring of egg yolks (Maleta *et al*., 2018; Widodo, 2020). The significant color increase in smoked salted eggs with added herbs can also be influenced by the

smoking process. During the smoking process, the temperature and compounds in the smoke can trigger the mMaillard reaction on the surface of the albumen and salted egg yolks, causing a color change. This reaction causes the egg yolk to darken, which becomes more apparent as the smoking duration increases (Atmaja, 2021).

Flavour

Based on the results of the analysis, it is known that there is a significant difference ($P<0.05$) in the aroma parameters of smoked salted eggs with the addition of turmeric and ginger. The highest average value was obtained in the treatment with the addition of a combination of turmeric and ginger (P_3), which was 3.60, while the lowest value was in the control treatment (P_0), which was 1.97. These results are in line with the research of Nurmila *et al.*, (2023) which showed that the addition of ginger to salted eggs had a significant effect on aroma, with a value range of 2.80–3.90. The essential oils in turmeric can increase the herbal aroma of salted eggs, previous studies have shown that the addition of turmeric increases the aroma value in the range of 3.5 to 4.1 (Aini, 2019). Other studies also state that the combination of ginger and turmeric, which contain the aromatic compounds zingiberene and turmerone, can provide a distinctive and unique aroma to food products, but are still acceptable to panelists (Maolani and Sukriadi, 2023).

Ginger and Turmeric are known as herbal plants that are rich in distinctive aromatic compounds, especially in food products. In addition to providing aromatic benefits, the content of essential oils and active chemical compounds such as zingiberin, camphor, shogaol and gingerol in ginger are also rich in properties, one of which can overcome nausea, motion sickness and digestive disorders. Aromatic compounds in turmeric include turmerone, atlanto, zingiberin and curcuminoids which also function to prevent infections from various diseases (Kusbiantoro, 2018). Curcuminoids are known as color-producing compounds in turmeric, but curcuminoids also have a role in the aromatic profile (Suprihatin *et al*., 2020).

Texture

Based on the test results in Table 1, shows that there is no significant difference ($P> 0.05$) in the texture parameters of smoked salted eggs with added turmeric and ginger. The average value is in the range of 2.73 - 3.00. The results of this test are in line with Nadeak's (2016) study in which the addition of ginger was not significant to the texture parameters of salted eggs, the values obtained in this assessment were higher, namely in the range of 3.86 - 4.36, this is because the manufacture of salted eggs uses the wet salting method. Other studies show similar results, where the addition of turmeric extract does not have a significant effect on changes in the texture of smoked salted eggs with an average value ranging from 2.84 - 4.84 (Wibowo *et al*., 2017).

Turmeric contains starch which contributes to the formation of texture, while the drying process is also thought to affect the water content, which correlates with the final texture of the product (Leviana and Paramita, 2017). Similar to turmeric, the starch content in ginger is quite high, which is around 52.9% which plays a role in providing texture to ginger and its processed products (Gelgel *et al*., 2016). The results of the study showed that the addition of the two ingredients with starch content did not cause changes in the characteristics of the chewy and crumbly texture of smoked salted eggs, so that it was still acceptable to consumers.

Preference

Based on the data presented in Table 1, it is known that there is no significant difference ($P>0.05$) in the preference parameters for smoked salted eggs with added turmeric and ginger. The results table shows that the average value of the preference parameters is in the range of 3.20 - 3.47. These results are in accordance with research conducted by Nadeak (2016) which showed that the level of preference for salted eggs with additional herbal ingredients did not experience a significant difference, with an average result ranging from 3.90 to 4.91. This is thought to be because the flavor or taste of smoked salted eggs is not significantly affected by the addition of turmeric and ginger. Based on the results of this study, it can be seen that the addition of ginger and turmeric does not change the level of preference from the control, so the addition of ginger and turmeric can be done without reducing the level of preference for smoked salted eggs.

Consumer preference or level of preference is one of the key factors influencing decisions in choosing a product. This assessment is generally correlated with taste, but other aspects such as color, texture, and aroma also play a role in determining the level of acceptance by panelists. Turmeric and ginger contain various compounds that are beneficial for health, but can also affect

taste characteristics, especially by providing a bitter sensation. Turmeric contains essential oils, which are also found in ginger. These compounds play a role in providing a distinctive aroma and slightly spicy taste. In addition, turmeric is rich in curcuminoids, which are not only responsible for its distinctive orange color but also contribute to the bitter taste. Despite its bitter taste, curcuminoids are known to have benefits as antioxidants and anti-inflammatories (Kusbiantoro, 2018). In ginger, the main compound that contributes to the bitter and spicy taste is gingerol which has a chemical structure similar to capsaicin in chili. In addition, shogaol, which is formed in dried ginger, provides a stronger spicy sensation than gingerol (Al-Snafi, 2016).

CONCLUSION

The addition of herbal (turmeric and/or ginger) to smoked salted eggs has a significant effect on the parameters of ash content and crude fiber, but has no significant effect on the salt content parameter. In the organoleptic test, the results showed a significant effect on the color and aroma indicators, but no significant effect on the texture and preference indicators.

SUGGESTION

Research on the effect of adding herbs consist of combination of turmeric and ginger on the quality of smoked salted eggs needs to be further developed. Further studies can include in-depth analysis of the effectiveness of various types of herbs in inhibiting the activity of pathogenic microbes and their impact on the sensory quality and shelf life of smoked salted eggs. Evaluation of economic aspects can also be carried out to assess the feasibility of using herbs on a production scale.

REFERENCES

Adriani A, Andalia R, Hardiana, Safrida, YD, dan Mustafa I. 2024. Analysis of water content, ash content, pH, and storage time of trunk fish (*Euthynnus religion*) household industrial production smoke. *Serambi Journal of Agricultural Technology (SJAT), 6*(2): 111-118. https://doi.org/10.32672/sjat.v6i2.8290

Aini SNQ. 2019. The effect of adding turmeric powder (*Curcuma longa*) in salted egg processing on moisture content, Aw, organoleptic properties, and free fatty acids (FFA). Thesis Faculty of Animal Science, Brawijaya University.

Alang H, Yunus M dan Hasyim A. 2022. Quality analysis of salted eggs in Pa'baeng-Baeng market based on nutrition and contaminant bacteria. *Bioma: Jurnal Ilmiah Biologi, 11*(1): 89-102. https://doi.org/10.26877/bioma.v11i1.9819

Al-Dosary M, Mohammed M dan Al-Rashdi M. 2023. Antimicrobial potential of curcumin and its applications in food preservation. *Journal of Food Science and Technology, 60*(2): 558–565. https://doi.org/10.1007/s13197-013-1195-4

Al-Snafi AE. 2016. The pharmacological importance of *Zingiber officinale* (ginger) in the treatment of various diseases. *International Journal of Pharmaceutical Science and Research, 7*(4): 1748-1755.

Aprilia M. 2015. Effect of adding white turmeric extract (*Curcuma zedoaria*) on the quality of salted eggs. *Dissertation* Faculty of Animal Science, Brawijaya University.

Astawan M, dan Wahyuni S. 2020. *Traditional Food Processing Technology*. Jakarta: Universitas Indonesia Press.

Fadhlurrohman I, Sumarmono J, dan Setyawardani T. 2021. Levels of Firmness, Salt Content, and Water Content of Salted Eggs Made by Adding Ginger and Garlic Flour to the Dough. *Proceedings of the National Seminar on Agribusiness Livestock Technology,* 8: 574-582.

Fajarwati R, Ansori ANM dan Madyawati SP. 2020. First report of protein and fat level of Alabio Duck (*Anas platyrhynchos* Borneo) eggs in Hulu Sungai Utara, Indonesia for improving human health. *Indian Journal of Forensic Medicine and Toxicology, 14*(4),

3408-3411. https://doi.org/10.37506/ijfmt.v14i4.12152

Fajriana E, Djaelani A dan Gunawan A. 2020. The Effect of Smoking Media on the Exterior Quality and Organoleptic Properties of Smoked Salted Eggs. *Rawa Sains: Jurnal Sains STIPER Amuntai, 10*(1): 26-37. https://doi.org/10.36589/rs.v10i1.115

Feringo M. 2019. Ash Analysis as a Quality Indicator in Food Materials. *Indonesian Journal of Agricultural Science, 12*(3): 67-75.

Fikriyah YU, dan Nasution RS. 2021. Analysis of Moisture and Ash Content in Market-Sold Black Tea Using Gravimetric Method. *Amina, 3*(2): 50-54.

Fitriarni D, Zulfahmi AN, Assrorudin A, dan Ramadani D. 2024. The Effect of Moringa Leaf Powder (*Moringa oleifera*) Addition on Proximate Composition, Phenol Content, and Sensory Evaluation of Moringa Leaf Jam. *Jurnal Teknologi Pangan dan Industri Perkebunan, 4*(1): 50-63.

Gelgel KD, Yusa NM, dan Permana DGM. 2016. Study on the Effect of Ginger (*Zingiber officinale Rosc*.) Type and Leaf Drying Time on Antioxidant Capacity and Sensory Quality of Wedang Uwuh. *Jurnal Ilmu Teknologi Pangan, 5*(2): 11-19.

Gill SK, Rossi M, Bajka B, dan Whelan K. 2021. Dietary fibre in gastrointestinal health and disease. *Nature Reviews Gastroenterology & Hepatology, 18*: 101-116. https://doi.org/10.1038/s41575-020-00375-4

Gustafson CR, dan Rose DJ. 2022. US consumer identification of the health benefits of dietary fiber and consideration of fiber when making food choices. *Nutrients, 14*(11): 1-11. https://doi.org/10.3390/nu14112341

Hapsari KAP, Sugitha IM, dan Suparthana IP. 2022. Effect of Moringa Leaf Puree (*Moringa oleifera* Lamk) Addition on the Characteristics of Mackerel Nuggets (*Rastrelliger kanagurta*). *ITEPA: Jurnal Ilmu Teknologi Pangan, 11*(1): 123-133. https://doi.org/10.24843/itepa.2022.v11.i01.p13

Hernani, dan Dewandari TK. 2018. Antimicrobial Properties of Nanoemulsion Formulations of Garlic, Ginger, and Cinnamon Extracts Against Escherichia coli and Salmonella. *Indonesian Journal of Agricultural Science, 19*(2): 75-82. https://doi.org/10.21082/ijas.v19n2.2018.p75-82

Hidayati L, dan Putra M. 2021. Effectiveness of Smoking on Salted Eggs to Extend Shelf Life. *Jurnal Teknologi Hasil Pertanian, 14*(2): 87-95.

Huda N, Putra A, dan Ahmad R. 2017. Mineral Content and Nutritional Evaluation of Salted Duck Eggs. *Asian Journal of Poultry Science, 11*(2): 35-42.

Idrus H, Rossi E, dan Rahmayuni. 2016. Study of Chemical Composition and Sensory Evaluation of Chicken Sausages with Straw Mushroom (*Volvariella volvacea*) Addition. *JOM FAPERTA, 3*(2): 1-15.

Jain M, Niamsa N, dan Sittiwet P. 2022. Antimicrobial Activity of Turmeric (*Curcuma longa*) and Its Potential Use in Food Preservation. *Nepalese Medical Journal, 5*(10): 613-616. https://doi.org/10.3126/nmj.v5i2.48014

Kusbiantoro D, dan Purwaningrum Y. 2018. Utilization of Secondary Metabolites in Turmeric Plants to Support Community Income Enhancement. *Kultivasi, 17*(1): 544-549.

Kusuma IGNS, Putra INK, dan Darmayanti LPT. 2019. Effect of Drying Temperature on Antioxidant Activity of Cocoa Peel Herbal Tea (*Theobroma cacao* L.). *Jurnal Ilmu dan Teknologi Pangan, 8*(1): 85-93. https://doi.org/10.24843/itepa.2019.v08.i01.p10

Laelasari I, dan Syadza NZ. 2022. Assistance in the Use of Ginger (*Zingiber officinale*) as a Spice Ingredient in the Development of Herbal Food Innovations to Boost Immunity. *Jurnal Bakti Saintek, 6*(2): 31-37. https://doi.org/10.14421/jbs.3483

Latipah IR, Utami MMD, dan Sanyoto JI. 2017. Effect of salt concentration and egg age on consumer preference level for salted eggs. *Jurnal Ilmu Peternakan Terapan, 1*(1): 1-7. https://doi.org/10.25047/jipt.v1i1.530

Lestary AE. 2020. The effect of addition red galangal (*Alpinia purpurata* K. Schum) concentrate on water content, salt content, pH, and yolk color of salted egg. *Thesis*. Faculty of Animal Science, Brawijaya University.

Leviana W, dan Paramita V. 2017. Effect of temperature on water content and water

activity in turmeric (*Curcuma longa*) using an electric oven dryer. *Metana,* 13(2): 37-44. https://doi.org/10.14710/jis.%v.%i.%Y.645-654

Liu Y. 2019. Nutritional composition and mineral analysis in processed foods. *Food Chemistry Research, 34*(1): 112-120.

Maleta HS, Indrawati R, Limantara L, dan Brotosudarmo THP. 2018. Various methods of carotenoid extraction from plant sources in the last decade (A literature review). *Jurnal Rekayasa Kimia dan Lingkungan,* 13(1): 40-50. https://doi.org/10.23955/rkl.v13i1.10008

Maolani A, dan Sukriadi EH. (2023). Herbal pudding with ginger and turmeric to enhance benefits and taste. *Jurnal Manajemen Kuliner, 2*(2): 83-89. https://doi.org/10.59193/jmn.v2i2.192

Mufarrijah M. 2015. The benefits of ginger as an aromatic and therapeutic spice in food processing. *Jurnal Ilmiah Farmasi Indonesia, 14*(1): 12-18.

Muller M, Canfora EE, dan Blaak EE. 2018. Gastrointestinal transit time, glucose homeostasis, and metabolic health: Modulation by dietary fibers. *Nutrients, 10*(3): 275. https://doi.org/10.3390/nu10030275

Nadeak H S. 2016. Effect of red ginger usage in wet method salted egg production on organoleptic quality of Samak salted eggs. *Journal of Animal Product Technology, 1*(1):1-12.

Nugraha, A. (2022). Curcumin in ginger: Anti-inflammatory and antibacterial properties as natural preservatives in food. *Journal of Herbal Medicine, 28*(4), 55–63.

Nurmila J, Kusmayadi A, dan Wulansari PD. 2023. Effect of ginger juice (*Zingiber officinale*) addition on organoleptic quality and acidity of salted quail eggs. *Jurnal Sains Peternakan Nusantara, 3*(1): 29-37. https://doi.org/10.53863/jspn.v3i01.932

Nuruzzakiah, Rahmatan H, dan Syafrianti D. 2016. Effect of salt concentration on protein content and organoleptic quality of duck eggs. *Jurnal Ilmiah Mahasiswa Pendidikan Biologi, 1*(1): 1-9.

Pertiwi R. 2020a. Effect of coconut shell smoking on organoleptic and microbiological aspects of salted duck eggs. *Rawa Sains: Jurnal Sains Stiper Amuntai, 4*(2): 45-53.

Pertiwi R. 2020b. Effect of salt concentration in the process of making salted eggs. *Jurnal Teknologi Pangan, 12*(1): 45-50.

Putri R. 2017. Effect of ginger addition on the antioxidant properties of salted duck eggs. *Indonesian Journal of Food Science, 23*(3): 58-65.

Prasetyo L. 2023. Effect of salting duration in raw salted egg production using wet method on salt content, water content, and total bacteria *Thesis* Jambi University.

Pundiswara DA, Sumarmono J, dan Sentosa SS. 2021. The effect of adding ginger flour (*Zingiber officinale*) to the pH and color of salted chicken eggs. *ANGON: Journal of Animal Science and Technology,* 3(3): 233-241. https://doi.org/10.20884/1.angon.2021.3.3.p233-241

Purdiyanto J, dan Riyadi S. 2018. Effect of duck egg storage time on weight loss, yolk index (YI), and Haugh Unit (HU). *Maduranch: Jurnal Ilmu Peternakan, 3*(1): 23-28. https://doi.org/10.53712/maduranch.v3i1.343

Putri AR, Afriani A, dan Sumadja WA. 2024. Saturation level of salt solution in wet method salted egg production on salt content, water content, and total bacteria. *Proceedings of the National Seminar on Agriculture,* 1, 215-222.

Qomaruddin M, dan Afandi H. 2017. Consumer preference level for chicken and duck salted eggs in Kembangbahu Subdistrict, Lamongan Regency. *Jurnal Ternak, 8*(2). https://doi.org/10.30736/jy.v8i2.17

Rohana R, Yulinda R dan Putri RF. 2022. Effect of adding various concentrations of beluntas (*Pluchea indica* L.) and rose (*Rosa damascena* Mill) leaf flour on chemical characteristics and organoleptic test of the solution. *Jurnal Sains dan Terapan, 1*(3): 197-207. https://doi.org/10.57218/juster.v1i3.341

Rohmah MN. 2024. Utilization and content of turmeric (Curcuma domestica) as medicine in the Islamic perspective. *Es-Syajar: Journal of Islam, Science and Technology Integration, 2*(1): 178-186. https://doi.org/10.18860/es.v2i1.18151

Rukmiasih R, Ulupi N, dan Indriani W. 2015. Physical, chemical, and organoleptic characteristics of salted eggs with different pressure and salt concentrations during salting. *Jurnal Ilmu Produksi dan*

Teknologi Hasil Peternakan, 3(3): 142-145.

Septinova D. 2023. Color characteristics, pH, and yolk index of coriander-coated chicken eggs during different storage durations. *Jurnal Ilmiah Peternakan Terpadu, 11*(2): 121-130. https://doi.org/10.23960/jipt.v11i2.p121-130

Sihombing I, dan Nursita IIW. 2021. Effectiveness of ginger (*Zingiber officinale*) and turmeric (*Curcuma domestica*) in drinking water on feed consumption, body weight gain, and feed conversion of broiler chickens (Literature study). Doctoral Dissertation. Faculty of Animal Science, Brawijaya University.

Singh R, Sharma S, dan Tiwari R. 2022. Antimicrobial activity of turmeric (*Curcuma longa*) and its potential use as a food preservative. *International Journal of Food Science and Nutrition, 74*(3): 389-398.

Suharjo R. 2019. Fatty acid composition in duck and chicken eggs: A comparative study. *Jurnal Gizi dan Pangan, 14*(3): 123-130.

Suharno A. 2019. Physical and chemical characteristics of duck and chicken eggs in the salting process. *Jurnal Peternakan Indonesia, 21*(3): 103-110.

Suprihatin T, Rahayu S, Rifa'i M, dan Widyarti, S. (2020). Compounds in turmeric (Curcuma longa L.) powder with potential antioxidant activity. *Buletin Anatomi dan Fisiologi, 5*(1): 35-42. https://doi.org/10.14710/baf.5.1.2020.35-42

Surya E, Apriana E, dan Fanisah. 2017. Effect of adding different types of acid on the processing of salted eggs to reduce fishy odor. *Jurnal Edubio Tropika, 5*(2): 54-106.

Titdoy NR, Watuguly TW, dan Tuapattinaya PMJ. 2021. Fiber content analysis of young galangal stem nugget (*Alpinia galanga* L.) as a learning resource in ethnobotany course. *Jurnal Biologi, Pendidikan, dan Terapan, 7*(2): 89-94.

Tri AB. 2021. Organoleptic quality of salted eggs smoked with cinnamon wood (*Cinnamomum verum*) at different smoking durations *Doctoral Dissertation*. Universitas Jambi.

Utami RS, Yulianto T, dan Purnamasari R. 2018. Influence of salting time on nutritional and sensory properties of salted eggs. *International Journal of Food Science, 54*(3): 89-96.

Wibowo DG, Widanti YA, dan Mustofa A. 2017. Addition of ginger extract (*Zingiber officinale* var. amarum) and white turmeric extract (*Curcuma zedoaria*) in the production of salted eggs with various curing durations. *Jurnal Teknologi Pertanian, 8*(2): 16-25. https://doi.org/10.35791/jteta.v8i2.18701

Widodo T. 2020. Pharmacological potential of turmeric as traditional medicine. *Jurnal Farmasi dan Fitokimia, 8*(2): 123-131.

Xu L, Zhao Y, Xu M, Yao Y, Nie X, Du H, dan Tu YG. 2017. Effects of salting treatment on the physicochemical properties, textural properties, and microstructures of duck eggs. *PLOS ONE, 12*(8): e0182032. https://doi.org/10.1371/journal.pone.0182912