# Quality of Bebek Ungkep as Affected by Natural Feed Additives

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**ABSTRAK**

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Penelitian ini bertujuan untuk mengetahui pengaruh pemberian natural feed additive terhadap kualitas bebek ungkep berdasarkan parameter kimia, mikrobiologi dan organoleptik. Rancangan percobaan yang digunakan dalam penelitian adalah rancangan RAL (Rancangan Acak Lengkap) terdiri dari 2 perlakuan yaitu P0 (bebek yang diberi pakan komersial selama proses budidaya) dan P1 (bebek yang diberi pakan natural feed additives selama proses budidaya) dengan masing-masing perlakuan diulang sebanyak 5 ulangan. Variabel yang diamati karakteristik kimia (kadar air, kadar protein, kadar abu, kadar lemak, kadar kolesterol, dan kadar asam lemak jenuh), karakteristik mikrobiologi (TPC, number of *Enterobacteriaceae*, *Salmonella sp.*, *Staphylococcus aureus*, dan *Listeria monocytogenes* colonies) dan kualitas organoleptik (warna, aroma, tekstur, rasa dan keseluruhan). Data yang didapat di analisa dengan one-way ANOVA. Hasil penelitian menunjukkan bahwa terjadi penurunan kadar kolesterol pada bebek ungkep yang diberi feed additives. Selain itu, tidak ada perbedaan yang nyata pada parameter mikroorganisme. Untuk organoleptik tidak ada perbedaan nyata terhadap semua parameter (rasa, warna, tekstur, secara keseluruhan), kecuali aroma.

**Kata Kunci**: Bebek Ungkep, Kimia, Mikrobiologi, *Natural Feed Additives*, Organoleptic

**ABSTRACT**

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This study aimed to determine the effect of natural feed additives on the quality of ducks based on chemical, microbiological, and organoleptic parameters. The experimental design used in this study was the Completely Randomized Design, which consisted of 2 treatments, namely P0 (ducks were fed commercial feed during rearing) and P1 (ducks were given additional natural feed during rearing), with each treatment pentaplicates. The observed variables were chemical properties (moisture content, protein content, ash content, fat content, cholesterol content, and saturated fatty acid content), microbiological properties (TPC, number of *Enterobacteriaceae* colonies, *Salmonella sp.*, *Staphylococcus aureus*, and *Listeria monocytogenes*) and organoleptic quality (color, aroma, texture, taste and overall). The data collected in this study were analyzed by one-way ANOVA. The results showed an alteration of cholesterol content in Bebek Ungkep with natural additives during rearing. Besides that, there was no significant difference in the parameters of the microorganisms. For organoleptic, there is no significant difference for all parameters (taste, color, texture, overall) except aroma.

**Key Words**: Bebek Ungkep, Chemical, Microbiological, Natural Feed Additives, Organoleptic

## INTRODUCTION

Bebek ungkep is a famous Indonesian dish that involves cooking duck meat in a mixture of aromatic spices and herbs. The preparation consists of marinating the duck in a blend of garlic, shallots, turmeric, and other spices, then cooking slowly (92-96°C) over low heat until the duck is tender and delicious. Ducks are the second most produced poultry after chickens in Indonesia. Not only that, the number of duck populations has grown quite rapidly. Based on (Badan Pusat Statistik 2022) data, the population of ducks in Indonesia has increased by 2 million compared to 2020. The high population and production of ducks are influenced by efforts to prevent and control disease in animals carried out by breeders. Generally, breeders use Antibiotic Growth Promoters (AGP) to prevent or treat sick animals.

The antibiotic Growth Promoter (AGP) mechanism suppresses the population of microorganisms that cause infection, thus increasing the body weight of livestock, and the feed conversion ratio can be optimized (Maria Cardinal et al. 2019). However, the Antibiotic Growth Promoter (AGP) can also be absorbed with nutrients and accumulate in meat carcasses; thus, consumers also indirectly receive low-dimension antibiotics. This

antibiotic can interfere with human health because it can cause bacterial antibiotic resistance (Untari et al. 2021). Therefore, the government has issued regulations to regulate the use of AGP.

The prohibition and restriction on the use of AGP raises a new problem, namely a decrease in duck production; thus, natural supplements are needed to replace the role of AGP. One of the natural supplements that can be used is derived from herbs and spices. Herbs and spices contain numerous active ingredients that can exert various effects (bactericidal, immunomodulatory, and antioxidant) on animals. Thus, they can affect animal health status, productivity, and the quality of animal products (Krzysztof et al. 2018). However, only a few publications are related to post-harvest, especially the characteristics of duck carcasses processed into Bebek Ungkep products.

Based on this description, quality testing of Bebek Ungkep products was carried out. The parameters tested were chemical, microbiological, and organoleptic. This study aimed to test the chemical, microbiological, and organoleptic quality of Bebek Ungkep products.

## MATERIALS AND METHODS

### Sample

The sample used in this study was a hundred 42-day-old hybrid ducks given additional natural feed additives and commercial feed during rearing. Ducks reared for 42 days, then slaughtered at Dimoro Slaughterhouse, Blitar City. The research sample used was duck carcasses, which were processed into Bebek Ungkep.

### Preparation of bebek ungkep

The duck carcass is cut into four parts. The duck carcass is cooked with spices such as 21.3% galangal, 17.9% shallots, 9% garlic, 2.1% coriander, 5.9% candlenut; 1.3% turmeric; 5.3% ginger; 0.4% nutmeg; 0.8% pepper; 6.3% lemongrass; 1.3% lime leaves; 1.3% bay leaves; 5.2% salt; and 20.8% sugar for 1 hour. Next, drain the steamed duck and wait for it to cool. The roasted duck was vacuum packed in PE plastic packaging and stored in a freezer at -18$^{o}$C.

### Chemical evaluation

The chemical evaluation was carried out to determine the nutrition in food. In this study, we measured the ash content (AOAC 2016), carbohydrate content (by difference method), fat content (Monakhova et al. 2013), moisture content (AOAC 2016), protein content (AOAC 2016), cholesterol content (Dinh et al. 2012), and saturated fatty acid content (Dahimi et al. 2014).

### Microbiology analysis

The samples were tested for several microorganism groups: Total Plate Counts (ISO 4833-1), *Enterobacteriaceae* (ISO 21528-2), *Salmonella* (ISO 6579), *Staphylococcus aureus* (SNI ISO 6888-1), dan *Listeria monocytogenes* (SNI ISO 11290-1).

### Organoleptic analysis

Organoleptic analysis was carried out using the hedonic test. Organoleptic attributes are commonly used to describe the sensory properties of food, such as color, appearance, shape, taste, and texture. Product appearance is the most essential attribute of a product. When choosing a product, consumers consider product appearance first, ignoring other sensory attributes. Good product appearance tends to be seen as high quality and tasty (Tarwendah 2017). Therefore, in this study, we use the sensory parameters observed by the panelists: aroma, taste, color, texture, and overall parameters.

The hedonic test followed Mardiana's et al. (2021) method. The hedonic test measured panelists' preference for Bebek Ungkep products. The hedonic test was carried out with 39 trained panelists. Panelists were asked to give a score from 1-5; score 1 had the lowest preference level, while score 5 indicated the highest.

### Statistical analysis

The experiments were performed in 5 replications. The significant differences between the means of parameters were analyzed by the t-test (paired comparison) using the Minitab program (version 17.0).

## RESULTS AND DISCUSSION

### Chemical analysis

Ash, carbohydrate, moisture, protein, fat, cholesterol, and saturated fat content of Bebek Ungkep are depicted in Table 1. The ash and carbohydrate content of Bebek Ungkep with different treatments showed no significant difference ($P>0.05$). Bebek ungkep without natural feed additives was 2.30±0.14%, while Bebek Ungkep with natural feed additives was 2.00±0.24%. Our results are in agreement with (Farghly et al. 2019), who found that the moisture content in Muller duck meat, ranging from 1.78% to 2.26%. Different feed diets in broilers do not affect broiler meat's chemical composition, such as ash content. Meanwhile, the carbohydrate content of Bebek Ungkep without natural feed additives was 1.35±0.14%, while for Bebek Ungkep with natural feed additives was 1.17±0.16%. According to (Kementerian Kesehatan Republik Indonesia 2018) data, the carbohydrate content of raw

**Table 1**. Proximate composition of bebek ungkep

| Parameter | Samples | | T-test value |
|---|---|---|---|
| | Bebek Ungkep Without Natural Feed Additives | Bebek Ungkep With Natural Feed Additives | |
| Ash Content (%) | 2.30±0.14 | 2.00±0.24 | 0.123 |
| Carbohydrate content (%) | 1.35±0.14 | 1.17±0.16 | 0.483 |
| Moisture content (%) | 65.24±1.00 | 61.16±2.48 | 0.040* |
| Protein content (%) | 16.63±1.04 | 16.55±1.35 | 0.916 |
| Fat content (%) | 14.24±0.76 | 19.27±1.31 | 0.000* |
| Cholesterol (mg/100 g) | 202.55±2.96 | 124.18±3.19 | 0.000* |
| Saturated Fatty Acid Content (%) | 7.90±0.76 | 6.16±0.51 | 0.134 |

*****significantly difference

duck meat was zero. However, during the cooking process, with the addition of spices and herbs, the carbohydrate content of fried duck is 4.5%.

The study results showed that a difference in feed affects moisture content on Bebek Ungkep ($P<0.05$). The moisture of Bebek Ungkep without natural feed additives during rearing was 65.24±1.00%, while Bebek Ungkep with natural feed additives was 61.16±2.48%. The results are consistent with those obtained by Džinić (2011), confirming that feed alters carcasses' or processed meat's moisture content. However, cooking methods such as boiling affect the moisture content in products. Water as a heat transfer medium enters the duck meat tissue; thus, the moisture content will increase (Nurmala et al. 2014).

The study results showed that a difference in feed does not affect moisture content on Bebek Ungkep ($P>0.05$). The protein content of Bebek Ungkep without natural additives was 16.63±1.04%, while the protein content of Bebek Ungkep with natural feed additives was 16.55±1.35%. This study's result is lower than that of Nurmala et al. (2014), in which the protein content of duck meat was between 17.78% and 23.63%. Differences might happen due to different types of ducks, feed, and cooking methods. Different types of birds will have a metabolism system to utilize feed for poultry to grow and other vital processes. Meanwhile, in making Bebek Ungkep, we cooked duck meat with water and spices in low heat for a long time. It is suspected that there is a process of leaching nitrogenous compounds into the boiling water because the protein dissolves easily in water. (Olagunju & Nwachukwu 2020). Also, boiling and grilling may reduce protein content in meat due to protein denaturation. Thus, it lowers the protein content in duck.

Table 1 presents the fat and cholesterol content between the two samples. The study results showed that a difference in feed does not affect fat and cholesterol content on Bebek Ungkep ($P<0.05$). The fat content of Bebek Ungkep with natural feed additives is higher (19.27±1.31%) than Bebek Ungkep without natural feed additives (14.24±0.76%). This study disagreed with the observation of Elis (2020) that the addition of phytogenic feed additives in feed reduces the fat content in duck meat and improves the duck flavor. In contrast, the cholesterol content of Bebek Ungkep with natural feed additives is lower (124.18±3.19 mg/100 g) than without natural feed additives (202.55±2.96 mg/100 g). According to (Lestari et al. 2021), different types of feed will influence cholesterol metabolism. High consumption caused a high intake of ducks. Carbohydrates and fatty acids are converted into triglycerides deposited in the liver and muscle. Excess amounts of triglycerides cause more cholesterol deposits in muscle; thus, the cholesterol content in duck meat will increase, leading to health problems for humans who consume it. In humans, cholesterol has a function to produce hormones, as a building block for human tissues, and assists in bile production in the liver. However, daily high cholesterol and saturated fatty acid food intake will increase heart disease risk (Zampelas & Micha 2015). Thus, lower cholesterol in Bebek Ungkep will minimize the health risk.

The study results showed that a difference in feed does not saturated fatty acid content on Bebek Ungkep ($P>0.05$). The saturated fatty acid content in Bebek Ungkep without natural feed additives is higher (7.90±0.76) than natural feed additives (6.16±0.51%). Natural feed additives can lower saturated fatty acid in duck meat. It is supported by Jakubczyk's et al. (2020) research, which is similar to ours. Natural feed additives such as herbs and spices have antioxidant properties that may affect the fatty acid profile in tissue lipids and the oxidative stability of meat, as well as limit the deterioration of meat quality in storage. Besides that, herbs in feed rations reduced the percentage of SFA of

**Table 2.** Bacteria counts of bebek ungkep samples

| Parameter | Samples | | Acceptable microbial limit* |
|---|---|---|---|
| | Bebek Ungkep Without Natural Feed Additives | Bebek Ungkep With Natural Feed Additives | |
| Total Plate Count (colony/gram) | <10 | <10 | $10^4$ |
| *Enterobacteriaceae* (colony/ gram) | <10 | <10 | 10 |
| *Salmonella sp*. (/25 gram) | Negative | Negative | Negative |
| *Staphylococcus aureus* (colony/gram) | <10 | <10 | $10^2$ |
| *Listeria monocytogenes* (/25 gram) | Negative | Negative | Negative |

*based on Peraturan badan pengawas obat dan makanan nomor 13 tahun 2019

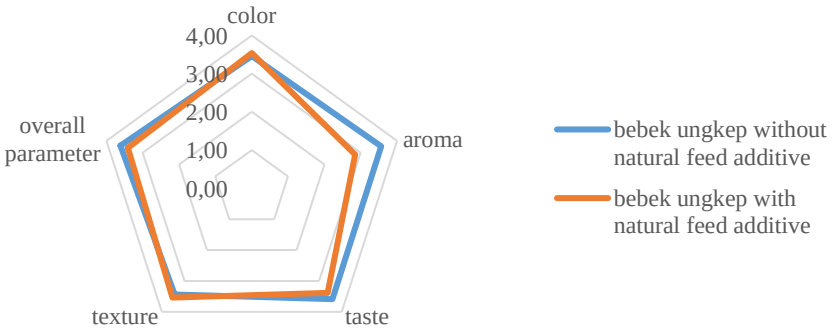


**Figure 1.** Organoleptic test of Bebek Ungkep

abdominal fat (Xing et al. 2020). Saturated fatty acids can harm consumer health, while monounsaturated fatty acids (MUFA) and PUFAs affect health positively. Thus, lowering the saturated fat content in Bebek Ungkep impacts human health.

## Microbiology analysis

Microbiology analysis was aimed at detecting the presence of microbial contaminants in Bebek Ungkep products. Total Plate Count is a method to determine whether pathogenic or non-pathogenic microbes exist in food and the hygienic status of food produced (Arifan et al. 2019). Besides that, we also count four pathogenic bacteria isolated from Bebek Ungkep samples: *Enterobacteriaceae, Salmonella sp., Staphylococcus aureus, and Listeria monocytogenes*. *Enterobacteriaceae* is coliform, and their presence in any food sample reflects fecal contamination; hence, they should not be isolated in food samples (Genome et al. 2018). These bacteria could be attributed to poor hygienic standards and could be suspected to be the poultry contamination source.

Meanwhile, *Salmonella sp*. is among the most foodborne outbreaks worldwide. Salmonella occurs naturally in the intestines of animals such as poultry. It can contaminate and survive for extended periods in food products (Eng et al. 2015). *Listeria monocytogenes* can grow in refrigerated temperatures and tolerate salty environments, unlike many other foodborne bacteria (Ariyanti 2010). Under the National Agency of Drug and Food Control Law, the absence of *Salmonella sp*. and *Listeria monocytogenes* is required in frozen meat products. *Staphylococcus aureus* is usually a contaminant in food and causes clinical infection. This disease is associated with cross-contamination of ready-to-eat food with either raw or cooked food and poor hygienic practices of food handlers (Provincial Health Services Authority 2022). Based on Table 2, the number of colonies *of Salmonella sp*. and *Listeria monocytogenes* were zero. Meanwhile, TPC and the number of colonies *of Enterobacteriaceae* and *Staphylococcus aureus* were less than ten colonies/grams. There was no significant difference between the two samples, which means the addition of natural feed additives will not influence microorganisms in Bebek Ungkep. However, microorganisms loaded in the sample depend on the cooking process. According to

Rai et al. (2016), enough heat in the cooking process can inactivate pathogenic microorganisms and ensure the safety of products.

Table 2 presents the bacterial load in all the samples, generally within the acceptable microbial limit decided by the National Food Drug Agency (2019). This value proved that food safety practices were correctly done during the cooking and post-cooking of Bebek Ungkep. Proper cooking time and temperature are essential to kill microorganisms (James et al. 2021). Proper food handling, food storage at the correct temperature, and proper hygiene practices also need to prevent contamination of microorganisms after cooking (Chekol et al. 2019)

### Organoleptic analysis

The organoleptic test was carried out using the hedonic test method. The hedonic test is a method that aims to identify and assess a product based on the preference level of each attribute in the product. The organoleptic test of samples can be seen in Figure 1. Based on Graph 1, all the samples were well-accepted by the respondents. There was no significant difference in color, taste, texture, and overall parameters between the two groups. This carcass quality agrees with the findings of Babalola (2016), who reported that dried lettuce in a fed diet did not affect the quality of carcass snails. In contrast, there was a significant difference in aroma between the two groups. Replenishment of natural feed additives during the rearing process may cause a change in the aroma of the carcass due to the components of the active compounds contained in natural feed additives entering the muscle tissue (Sugiharto 2022). In addition, there is a change in the fatty acid profile where fatty acids have a significant contribution to the aroma of a product (Song et al. 2022). Besides that, during the cooking process, volatile components such as pyrans, alcohols, ketones, and other components that contribute to aroma production were formed (Shahidi & Hossain 2022).

## CONCLUSION

Feed influenced the nutrient content of duck carcass. The use of natural feed additives affects fat and cholesterol content; thus, it predisposes the acceptability of panelists to the aroma of Bebek Ungkep. In contrast, other parameters, such as color, taste, and texture, have no alteration by applying natural feed additives during rearing.

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