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Effect of Storage time on quality of Bebek *Ungkep* in retort pouch

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Nur Agustin Mardiana*, Hindra Kurniawan, Aditya Wirawantoro, Panji Purnomo, and Bagus Prasetiyo

Poultry Production, Community College State of Putra Sang Fajar Blitar,
Jl. Dr. Sutomo, Blitar, 66133, Indonesia

*Email: Mardiana.2022@akb.ac.id

Abstract. Bebek *ungkep* is highly commercialized in Indonesia, but it has a short shelf life. To overcome the problem, we used a retort pouch to prolong the shelf-life of the product. This study aimed to evaluate the effect of storage time on the quality of Bebek *Ungkep* in retort pouch packaging based on physicochemical, microbiological, and sensory analysis. The parameters were free fatty acid value, pH value, total plate counts of aerobic and anaerobic bacteria, and sensory. This study used a Randomized Block Design (RBD) with one experimental factor: the length of storage time. The storage time was 0, 2, 4, and 6 weeks. The data were evaluated by using one-way ANOVA (α= 95%) and followed by Fisher's test. The results showed that storage time affected FFA and pH values of retorted Bebek *ungkep*. Meanwhile, total plate counts of aerobic and anaerobic bacteria were not significantly different. Based on sensory analysis, color, and aroma were not significantly different, while taste and texture were significantly different.

1. Introduction

Poultry meat is one of the most consumed animal products worldwide, including in Indonesia. Although there is more demand for poultry meat, especially chicken, duck production in Indonesia during 2021 increased by 1,289 tons compared to the previous year [1]. Duck meat is also the prima donna that consumers demand as a product that is high in nutrients such as amino acids and fatty acids. In addition, the distinctive taste of duck meat, which is delicious and easy to process, make processed meat products popular.

One of the processed duck products is Bebek *Ungkep*. Bebek *ungkep* literally means bebek and *ungkep*. Bebek means duck meanwhile *ungkep* is cooking method. Bebek *Ungkep* is processed duck meat that under a cooking process over low heat (92-96^{o}C) so that the seasoning is perfectly absorbed into the meat [2]. Bebek *Ungkep* can be a widely commercialized food. However, this product has a weakness in the form of low shelf life, while consumers want Bebek *Ungkep* to be packaged using practical packaging and has a long shelf life. Therefore, it is necessary to innovate the right packaging technology to extend the product's shelf life. Packaging technology innovation can be done using a retort pouch.

Packaging technology innovation can be done using retort pouch. Retort pouch is a flexible packaging that is resistant to sterilization temperatures. This packaging has several advantages compared to conventional packaging [3]. Its advantages include being more attractive, cheaper, shorter sterilization time, lighter weight, and easier to recycle than metal, paper, or glass [4]. The heating process in product

packaging with retort pouches is crucial to prevent product damage [5]. This research aimed to evaluate effect of storage time on quality of Bebek *Ungkep* in retort pouch packaging based on physicochemical, microbiological, and sensory analysis.

2. Materials and Methods

2.1. Materials

Duck, garlic, shallot, coriander, turmeric, ginger, galangal, bay leaf, cumin, candlenut were purchased from local market in Blitar.

2.2 Preparation of bebek ungkep

Whole duck was cleaned and cut into four parts. Duck was cooked with spices for 40 minutes. Bebek *ungkep* was vacuum packaged and retorted it at 121ºC for 20 minutes. Then cooled it with ice cube for 30 minutes. Store the samples at room temperature.

2.3 pH value

The analysis of pH value in this research was determined by using pH meter following the method Triyannanto et al [6]. Two grams of sample was chopped and diluted with 18 ml of distilled water, then repeated it three times.

2.4 Free fatty acid value (FFA)

The analysis of free fatty acid value in this research using the method of SNI [7]. Five grams of sample was chopped. Mixed it with 50 ml ethanol 95%, five drops of indicator PP and titrated with 0.1 N NaOH standard until the colour was pink.

2.5 Total plate counts of aerobic bacteria

Analysis of total plate counts using the method of Mannulang et al [8]. Five grams of sample was chopped and diluted with 5 ml aquadest. A total of 1 ml of the sample was transferred aseptically to 9 ml sterile distilled water (dilution 10^2) and this step was repeated until a dilution of 10^4 was obtained. A total of 1 ml of sample from each dilution was inoculated aseptically into petri dishes and made in duplicate, then incubated in an incubator at 37ºC for 48 hours and colony was counted.

2.6 Total plate counts of anaerobic

Total plate of anaerobic bacteria assay was described by FDA [9]. Twenty five grams of sample was chopped and put 225 ml peptone dilution fluid (1:10 dilution). Sample was homogenized for 1-2 minutes. Serial dilutions was made from 10^{-1} to 10^{-6}. Seven ml of TSC agar was poured into petri dishes and spread evenly. Transferred one ml of each dilution of homogenate to the center of duplicate agar plates. Then pour again of 15 ml TSC agar into dish and mix with inoculum. Then incubated in an incubator for 24 h at 35°C.

2.7 Sensory analysis

Sensory analysis was using hedonic test described by Mardiana et al [10]. Sensory evaluation parameters consist of colour, aroma, texture, and taste using scale 1-5 in which represents “extremely like, like, neutral, dislike, and extremely dislike, respectively”. The respondent was untrained panelist.

2.8 Statistical analysis

Data were evaluated statistically using one-way ANOVA with probability of 95%. If there is significant differences ($p<0.05$), then it was compared using Fisher’s test. All the data were analyzed by using Minitab 17.

3. Results and discussion

3.1 pH value

pH value is an important parameter to measure the quality of a product. The effect of storage time on pH value of Bebek *Ungkep* were shown in Table 1. The result showed that pH value had significantly different between the storage times. The mean pH value of each treatments ranged from 6,18 to 6,90. In this research, the pH tends to lower the more prolonged the storage times. Rohimadilwa et al. [11] stated that during the storage, the pH of a product would be lower until the final pH reached 5,4, which turned the product rancid. Irkin et al. [12] also stated that carbon dioxide dissolving in meat tissue could cause pH to decrease.

3.2 Free fatty acid value (FFA)

The free fatty acid value (FFA) is a parameter that measures hydrolytic rancidity [13]. Hydrolytic rancidity is a reaction causing FFA to be released from lipids and fat, which can develop into off flavours and aroma in the product. Changes in FFA values during the storage time were presented in Table 1. From the table, mean of FFA values ranged from 1,68 to 3,38%. According to statistic test, the treatments had significantly difference ($p<0,05$) on FFA values. The FFA significantly increase during six weeks of storage. Our result is in agreement with those Tenyang et al [14] who observed an increase in FFA during storage time. It might be cause by hydrolysis of lipids and phospholipids by lipase and phospholipase which produce FFA [15].

3.3 Total aerobic plate counts (APC)

The total aerobic plate counts for Bebek *Ungkep* during six weeks of storage are detailed in Table 1. During six weeks of storage, there was no significantly difference in the total aerobic plate. We observed that the total aerobic plate counts during six weeks of storage are less than ten colonies/ gram. It has not exceeded the maximum limit standard set by SNI [16]. Thus, this product is safe and suitable for consumption.

3.4 Total anaerobic plate counts

The total anaerobic plate counts for Bebek *Ungkep* during six weeks of storage can be seen in Table 1. There was no significantly difference in the total anaerobic plate counts during six weeks of storage. According to National Standardization Agency [16], the maximum limit standard for anaerobic bacteria especially, *Clostridium perfringens* was ten colonies/gram. The occurrence of anaerobic bacteria was measure because its spore could germinate after cooking and during storage, thus, it can cause food poisoning [17]. From our data, we found that the total anaerobic plate count was zero, so this product is safe for consumption.

Table 1. Analysis of physicochemical and microbiological of Bebek *Ungkep* in retort pouch

Storage time (weeks)	pH value	FFA value (%)	Total plate counts of aerobic bacteria (colony/g)	Total plate counts of anaerobic bacteria (colony/g)
0	6,90±0,01^{a}	1,68±0,01^{d}	<10^{a}	0^{a}
2	6,87±0,02^{a}	2,39±0,07^{c}	<10^{a}	0^{a}
4	6,60±0,01^{b}	3,18±0,01^{b}	<10^{a}	0^{a}
6	6,18±0,03^{c}	3,38±0,06^{a}	<10^{a}	0^{a}

*Different superscripts at the same column indicate significantly differences ($P<0,05$)

3.5 Sensory evaluation

The result of sensory evaluation are presented in Fig. 1. Based on statistic test, color and aroma parameters of Bebek *Ungkep* during six week storage had no significantly difference. In contrast, taste and texture parameters had significantly difference. Our study is line in with Jeremiah [18] found that

prolonged storage would reduce the taste and turn the texture into softer. Our results agree with Laporte et al. [19], who stated that during storage, there was progressive of meat tenderness. The tenderness of meat because of degradation of muscle tissue. This degradation is caused by proteolytic enzymes.

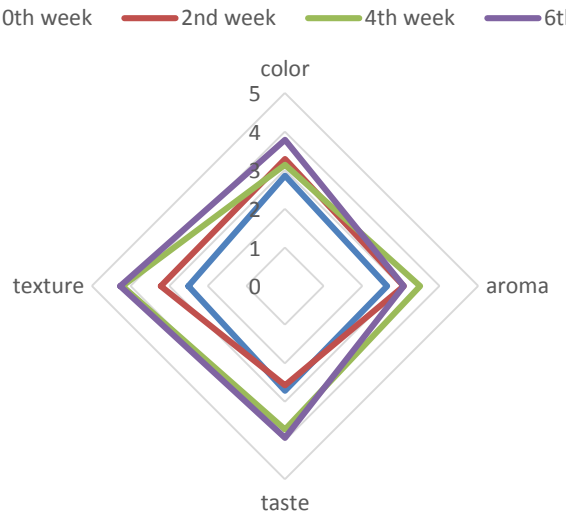

Figure 1. Sensory evaluation of Bebek *Ungkep* in retort pouch

4. Conclusion

The effect of storage time affects the pH value, FFA value, taste, and texture of Bebek *ungkep* in the retort pouch. Meanwhile, storage time had no significantly different on the microbiological parameter in retorted Bebek *ungkep*. In addition, retorted Bebek *ungkep* is still acceptable under six weeks storage considering all the parameters. Meanwhile, retorted Bebek *ungkep* starts to decay after six weeks of storage time.

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