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MARINATION WITH POMEGRANATE (PUNICA GRANTUM L.) PEEL EXTRACT ENHANCES THE STORAGE STABILITY OF BREAST MEAT PRODUCT FROM KOREAN NATIVE CHICKEN

Dowon Jeong[1], Dongwook Kim[1], Yousung Jung[1], Soomin Oh[1], Hyo-Jun Choo[2] Aera Jang[1*]

1 Department of Applied Animal Science, Kangwon National University, Chuncheon, Republic of Korea.

2 Poultry Research Institute, National Institute of Animal Science, Pyeongchang, Republic of Korea

*Corresponding author email: ajang@kangwon.ac.kr

I. INTRODUCTION

Woorimatdag No. 1 is a Korean native chicken breed developed by the National Institute of Animal Science in Korea through a crossbreeding Black Cornish and Brown Korean native chicken male with Rhode Island Red female, to overcome the slow growth rate of traditional native chickens, with a shortened rearing period from 24 to 12 weeks. It contains high content of taste-related amino acids and inosine monophosphate, enhancing its distinctive and favorable flavor [1]. Given these attributes, Woorimatdag is very suitable for production of native chicken meat products. However, in-depth studies on this subject are limited, needing a diverse and systematic approach [1]. In Korean cuisine, a well-known stir-fried chicken product is prepared by marinating the meat in spicy or savory sauces, typically gochujang or soy sauce, and cooking it with vegetables and rice cakes. But, It exhibits a short shelf life, limiting commercial production[2]. Over the past few years, the demand for natural extracts in the food industry has steadily increased as an alternative to synthetic additives associated with health concerns. Pomegranate peel extract(PPE) contains higher concentrations of biologically active compounds, such as phenolic acids, flavonoids and tannins compared to the edible portion. These compounds exhibit antioxidant and antimicrobial properties[3]. Therefore, this study was conducted to investigate effect of PPE on storage stability and quality in Korean stir-fried chicken product made from woorimatdag No. 1 breast meat.

II. MATERIALS AND METHODS

A 100 g of pomegranate peel was mixed with 5 L of distilled water and extracted at 20°C for 4 hours. The crude extract was filtered and freeze-dried. Antioxidant activity was determined by oxygen radical absorption capacity (ORAC) assay and total phenolic content (TPC) and the results were expressed as mmol of Trolox equivalent/g of dry matter and mg of gallic acid equivalent/g of dry matter [4]. Antimicrobial activity was measured using paper disc diffusion assay using *Escherichia coli* and *Staphylococcus aureus* [4]. Korean stir-fried chicken product was prepared by cutting breast meat into 1 cm wide pieces and mixing it with a marination solution. The solution (Control) consisted of soy sauce (40%), starch syrup (12%), sugar (12%), oyster sauce (5%), garlic (12%), ginger (2%), onion (8%), pepper (1%), cooking rice wine (6%), and sesame oil (2%), with 0.14% (0.14PPE) and 0.18% (0.18PPE) pomegranate peel extract. The meat and solution were mixed in a 4:1 ratio, vacuum-packed, and stored at 4°C for 16 days.Total aerobic bacteria counts was determined using 3M Petrifilm (3M Company, Saint Paul, MN) after incubation for 48 h at 37°C and the results were expressed as log CFU/g. Volatile basic nitrogen(VBN) was analyzed using a micro diffusion method [4]. All experiments were performed with at least three replicates, and statistic analysis was conducted using a SAS software(ver. 9.2; SAS Institute, Cary, NC, USA) with one-way ANOVA and Tukey's test ($P < 0.05$) [4].

III. RESULTS AND DISCUSSION

The antioxidant activity of pomegranate peel extract is presented in Table 1. Antioxidant activity was measured using ORAC assays, with results of 1063.82 ± 118.38 mmol TE/ g DM. The total phenolic content was found to be 179.16 ± 3.83 mg GAE/g DM.

Table 1 – Antioxidant activity of pomegranate peel extract.

ORAC (mmol TE/g DM)	TPC (mg GAE/g DM)
1063.82±118.38	179.16±3.83

TE, Trolox equivalent; DM, Dry matter; GAE, Gallic acid equivalent; ORAC, Oxygen radical absorption capacity; TPC, Total phenolic content.

The antimicrobial activity of pomegranate peel extract is presented in Figure 1. The antimicrobial activity was

assessed using *Escherichia coli* and *Staphylococcus aureus*. In both bacterial strains, a significant increase in the diameter of the inhibition zone was observed with increasing concentrations of pomegranate peel extract.

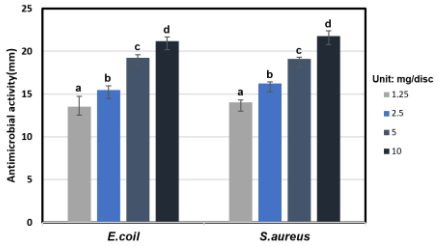


Figure 1. Antimicrobial activity of pomegranate peel extract.
Diameter of paper disc (8mm) was included in the value; [a-d] Means denoted by different superscripts between concentrations differ significantly (P<0.05).

TAB and VBN content of soy sauce stir-fried chicken product prepared with pomegranate peel extract (PPE) are presented in Figure 2. The TAB in all samples as the storage period progressed. From day 12 of storage, the samples containing 0.14% and 0.18% PPE showed significantly lower values than the control group. The VBN content also tended to increase with storage time. On day 16, the 0.14PPE and 0.18PPE groups exhibited significantly lower VBN values compared to the control, indicating an improvement in storage stability. These results suggest that pomegranate peel extract exerts antibacterial and antioxidant effects in soy sauce stir-fried chicken product, effectively inhibiting microbial growth and protein degradation.

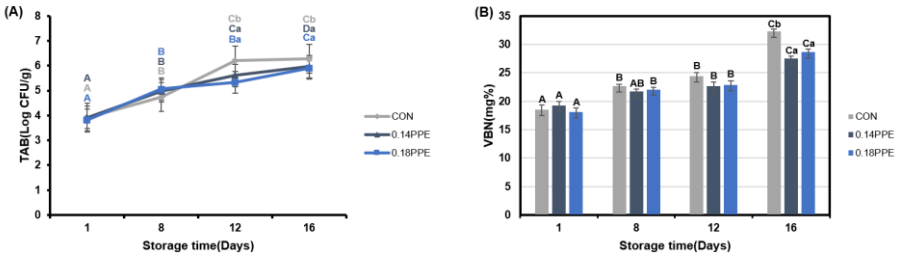


Figure 2. Effect of pomegranate peel extract on TAB(A) and VBN(B) of control, 0.14PPE and 0.18PPE during storage at 4℃.
CON, Control; 0.14PPE, stir-fried chicken product with 0.14% pomegranate peel extract addition; 0.18PPE, stir-fried chicken product with 0.18% pomegranate peel extract addition; TAB, Total aerobic bacteria; VBN, Volatile basic nitrogen; [A-D]Means denoted by different superscripts between storage days differ significantly (p<0.05); [a–c]Means denoted by different superscripts among treatments differ significantly (p<0.05).

IV. CONCLUSION

In this study, PPE significantly reduced total aerobic bacteria counts in stir-fried chicken product compared to the control group after 12 days of storage. The VBN levels on day 16 was also significantly lower in the PPE treated groups than that in the control group. Therefore, this study suggests that 0.14PPE is sufficient to enhance the storage stability of stir-fried chicken product made from Woorimatdag No. 1 breast meat by reducing microbial growth and protein degradation.

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