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Quality characteristics of broiler chickens fed with hydrolyzed collagen from pig skin (#471)

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Introduction

Recently, researches have studied peptides derived from protein hydrolysates as potential nutraceuticals and in relation to the development of functional foods. Collagen is a major protein in animal connective tissue, a fiber protein that makes up 70% of the dermis. Collagen content is important to the structure and quality of meat and to the functional properties of emulsion products. Collagen constitutes the major protein in skin, bone, tendon, and cartilage. In the food industry, it is used for the purpose of improving the quality of the final product after heating and improving the processing aptitude. However, porcine collagen is so large in molecular weight that it absorbs only about 2% in the body. Recently, porcine collagen has undergone many studies to maximize the uptake by biochemical hydrolysis. Thus, this study was conducted to investigate quality characteristics of broiler chickens fed with hydrolyzed collagen from pig skin.

Methods

We obtained vacuum packed pig skin from Hansalim. 6L of water and 3 kg of pig skin were put into an electronic pressure extractor and collagen was extracted at 80°C for 8 hours. The extracted collagen was adjusted to pH 3.0 by adding citric acid. Then, a liquid meat tenderizer containing papaya as a main ingredient was added and hydrolyzed at 35°C and 60°C. The hydrolyzed collagen was mixed with broiler feed according to the addition amount. This experiment is based on addition level (CON: No addition, T1: 0.1% collagen, T2: 0.5% collagen, T3: 1.0% collagen, PC: 0.1% Commercial collagen). Hydrolyzed collagens were stored at 4°C for 24 hours and used immediately for analysis. Broiler chickens were ordered for 28 days (4weeks), and analysis proceeded to chicken breasts. Statistical analyses were carried out using the generalized linear model procedure of the SAS package Release 9.4 (SAS Institute, Cary, NC, USA). Means were compared using Duncan's multiple range test at a level of significance of $p<0.05$.

Results

Table 1 shows physicochemical characteristics of broiler chicken with fed collagen extracted from pig skin. The water content of the control was significantly higher than other treatments ($p<0.05$). Protein content was in the range of 17.61-18.53 and there was no significant difference between treatments. In the study by Kim (2018), the moisture content ranged from 74.95 to 75.75 and the protein content ranged from 17.34 to 17.68. Similar results were obtained in this study. Fat and ash contents were not significantly different between treatments ($p>0.05$).

Quality characteristics of broiler chickens with fed hydrolyzed collagen from pig skin are shown in Table 2. The drip loss of CON was significantly higher than other treatments ($p<0.05$). There was no significant difference between treatments in cooking loss. Lightness tended to decrease as the amount of hydrolyzed collagen increased. Yellowness was 9.56 in T1 treatment, which was significantly lower than other treatments ($p<0.05$). There was no significant difference in water holding capacity, pH and shear force between treatments.

Collagen contents of broiler chicken fed with hydrolyzed collagen from pig skin are shown in Table 3. Collagen content of breast was significantly lower in CON than other treatments ($p<0.05$), and increased as the amount of collagen extract increased. Collagen content of skin was in the range of 0.16-0.50, and the collagen content of T1 treatment was 0.50g / 100g, which was significantly higher than other treatments.

Conclusion

When hydrolyzed collagen was fed to the broiler chickens, the physicochemical characteristics and quality characteristics were not deteriorated. The amount of collagen in the breasts increased as the addition level of hydrolyzed collagen increased, but the amount of collagen was low-level. Chicken skin collagen showed the highest level at 0.1% treatment (T1). Therefore, Hydrolyzed collagen is believed to have a positive effect by increasing the absorption of the body, and may be used as a functional raw material.

References

Kim. H. J., Kim. H. J., Jeon. J. J., Oh. S. J., Nam. K. C., Sim. K. S., Jeong. J. H., Kim. K. S., Choi. Y. I., Kim. S. H., & Jang A. R. (2018). Comparison of quality and bioactive compounds in chicken thigh meat from conventional and animal welfare farm in korea. *Korean J. Poult. Sci 45:261-272.*

Notes

Table 2. Proximate analysis of the pyeonyuk according to the addition level of TP.

Item	CON	T1	T2	T3
Moisture (%)	67.48±0.98 ^{a}	65.78±1.61 ^{b}	64.53±3.36 ^{c}	64.17±0.38 ^{c}
Protein (%)	14.71±1.19 ^{b}	18.44±0.82 ^{a}	18.84±3.98 ^{a}	18.50±0.80 ^{a}
Fat (%)	16.91±0.40 ^{a}	13.99±0.43 ^{b}	15.97±1.08 ^{a}	16.62±0.53 ^{a}
Ash (%)	0.40±0.02 ^{c}	0.73±0.04 ^{a}	0.63±0.00 ^{b}	0.69±0.03 ^{a}
pH	6.47±0.01 ^{a}	6.34±0.01 ^{b}	6.36±0.01 ^{b}	6.36±0.00 ^{b}

1)CON (Control): No addition, T1: Turmeric 0.1%, T2: Turmeric 0.3%, T3: Turmeric 0.5%
$^{a-c}$Means±SD with different superscript letters indicate significant differences ($p<0.05$).

Table 2.
Proximate analysis of the pyeonyuk according to the addition level of TP.

Table 3. Color, WHC and Cooking loss of the pyeonyuk according to the addition level of TP.

Item		CON	T1	T2	T3
Hunter color*2)	L	71.23±4.39 ^{a}	69.91±1.39 ^{b}	68.93±1.22 ^{c}	67.16±2.38 ^{d}
	a	1.12±0.60 ^{a}	-1.99±0.77 ^{b}	-3.82±0.16 ^{c}	-3.58±0.22 ^{c}
	b	14.84±0.70 ^{d}	33.35±1.23 ^{c}	46.69±1.34 ^{b}	52.05±1.20 ^{a}
WHC(%)3)		72.56±29.54 ^{a}	61.73±12.29 ^{b}	51.52±4.02 ^{c}	73.95±7.65 ^{a}
Cooking loss(%)		46.72±7.99	42.30±17.06	46.72±7.99	47.40±3.41

1)CON (Control): No addition, T1: Turmeric 0.1%, T2: Turmeric 0.3%, T3: Turmeric 0.5%
2)L*: lightness, a*: redness, b*: yellowness
3)WHC: Water holding capacity
$^{a-d}$Means±SD with different superscripts in the same row differ significantly ($p<0.05$).

Table 3.
Color, WHC and Cooking loss of the pyeonyuk according to the addition level of TP.

Table 4. Sensory evaluation of the pyeonyuk according to the addition level of TP.

Items	CON	T1	T2	T3
Texture	2.60±0.54 ^{b}	2.60±0.54 ^{b}	3.20±0.83 ^{a}	3.40±0.54 ^{a}
Color	2.60±0.44 ^{c}	2.60±0.54 ^{c}	3.60±0.54 ^{b}	4.10±0.89 ^{a}
Juiciness	3.20±0.54 ^{a}	3.20±0.44 ^{a}	2.60±0.54 ^{ab}	2.40±0.54 ^{b}
Flavor	3.20±0.54	3.20±0.44	3.40±0.89	3.20±0.83
Total acceptability	3.00±0.54	3.10±0.54	3.10±0.74	3.00±0.93

1)CON (Control): No addition, T1: Turmeric 0.1%, T2: Turmeric 0.3%, T3: Turmeric 0.5%
$^{a-b}$Means±SD with different superscripts in the same row differ significantly ($p<0.05$).

Table 4.
Sensory evaluation of the pyeonyuk according to the addition level of TP.

Notes