RELATIONSHIPS BETWEEN PHYSICOCHEMICAL AND SENSORY TRAITS OF BROILER AND KOREAN NATIVE CHICKEN BREAST

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Abstract – This study was conducted to compare the physicochemical traits and descriptive sensory attributes of commercial broiler (BR) and Korean native chicken (KNC) breast meats, and investigate correlations between these sensory attributes and instrumental measurements. There are little composition difference between BR and KNC breast, except moisture content. However, KNC breast had greater chewiness and gumminess than the BR in texture profile. In fatty acid composition, the content of oleic acid was higher in BR than in KNC. However, the content of arachidonic acids was higher in KNC than in BR. For descriptive sensory evaluation, BR breast presented higher juiciness than KNC, whereas KNC breast had higher chewing number. Additionally, the chewing number of breast meat are highly correlated to gumminess and chewiness (r=0.66, 0.67). High negative correlations (r=-0.80) were observed between chewing number and juiciness.

Key Words – Broiler, Korean native chicken, descriptive sensory attribute, physicochemical parameter

I. INTRODUCTION

Chicken meat contains relatively low fat and cholesterol contents. Therefore, it is recognized as a healthier food compared to red meat [1]. The per capita chicken meat production and consumption showed dramatic increases during recent decades in many Asian countries [2]. Commercial chicken breeding companies have developed fast-growing broiler strains to produce chicken meat at global scale of consumption [1]. Broilers grown under an intensive rearing regime are harvested at 5 to 6 weeks with live weights of approximately 1.5 kg, to provide high yields of meat [3]. As a result, native chicken breeds in Asian countries including Korea have become endangered or even extinct because of their poor commercial performance when compared with imported commercial synthetic breeds [4].

Native chicken meat usually has a unique taste and texture that attracts a price 2-3 times higher than that of commercial broilers [5]. There are great distinction of sensory attributes between broilers and native chickens due to the different genetic traits and growth pattern. The difference of meat components and quality parameters results in the characteristic sensory attributes of a chicken breed. It is important to define sensory attributes of a poultry meat and determine related analytical parameters. However, basic information about the descriptive sensory quality attributes of broilers and Korean native chickens, and the relationship between human- and instrument-based methods is poorly documented. Therefore, this study was performed to compare descriptive sensory attributes between broilers (BR) and Korean native chickens (KNC) and to determine the physicochemical analytical parameters correlating with the characteristic sensory attributes.

II. MATERIALS AND METHODS

Each twenty BR and KNC was randomly purchased from local markets. KNC (*Gallus domesticus*) were aged approximately 100 days and commercial BR (Ross strain) was aged 32 days. The breast (*pectoralis*) was deboned, and the visible skin and excessive connective tissues were removed. Proximate composition, collagen, pH, cooking loss, fatty acids, shear force, and texture profiles were analyzed. Descriptive sensory attributes of breast meat were evaluated by 8 trained sensory panelists. The data were statistically analyzed by t-test and Pearson correlation.

III. RESULTS AND DISCUSSION

As shown in Table 1, BR breast meat had greater moisture content, compared with the KNC ($p<0.05$). In texture profile, KNC breast had greater gumminess and chewiness than the BR ($p<0.05$).

Table 1 Instrumental analyses

Item	BR	KNC	SEM[1]
Moisture (%)	74.46[a]	73.66[b]	0.16
Crude protein (%)	22.84	23.16	0.19
Crude fat (%)	0.87	0.69	0.10
Collagen (mg/g)	1.25	1.25	0.06
pH	6.03	5.87	0.06
Cooking loss (%)	12.24	14.60	1.13
Shear forces (Kgf)	2.15	2.53	0.18
Hardness (Kgf)	4.82	6.42	0.64
Springiness	0.86	0.85	0.01
Gumminess (Kgf)	1.36[b]	2.09[a]	0.21
Chewiness (Kgf)	1.29[b]	1.85[a]	0.16
Cohesiveness	0.30	0.31	0.01

[1]Standard error of the means (n = 20)
Values with different superscript [a-b] letters within a same row differ significantly ($p<0.05$).

In case of fatty acid composition, KNC breast had less oleic acid and greater arachidonic acid than the BR ($p<0.05$). This result was similar to those of previous study [6]. Genetics have been shown to be an important factor influencing fatty acid composition and meat quality [7], which is in good agreement with the results of the present study. For descriptive sensory evaluation, BR breast showed greater juiciness than KNC, while KNC breast did greater chewing number ($p<0.05$).

Table 2 Fatty acid composition and descriptive sensory attributes

Item	BR	KNC	SEM[1]
C16:0 (%, palmitic acid)	22.57	23.25	0.35
C18:0 (%, stearic acid)	7.79	7.88	0.35
C18:1 (%, oleic acid)	38.30[a]	34.36[b]	0.88
C18:2 (%, linoleic acid)	15.13	15.86	0.38
C20:4 (%, arachidonic acid)	3.09[b]	4.61[a]	0.28
Tenderness	4.20	4.77	0.23
Juiciness	6.00[a]	4.25[b]	0.13
Chewing number to swallow	19.05[b]	23.48[a]	0.62

[1]Standard error of the means (n = 20)
Values with different superscript [a-b] letters within a same row differ significantly ($p<0.05$).

There were more distinctive correlations between descriptive sensory attributes and objective texture parameters. The chewing number of breast meat was correlated with gumminess and chewiness ($r=0.66$ and 0.67, respectively) which influence meat eating qualities greatly. High negative correlations ($r = -0.80$) were observed between the chewing number and the juiciness (Table 3).

Table 3 Pearson correlations between instrumental analysis and descriptive sensory attributes

	Hardness	Gumminess	Chewiness	Tenderness	Juiciness	Chewing number
Hardness	1.00					
Gumminess	0.97***	1.00***				
Chewiness	0.97***	1.00***	1.00***			
Tenderness	0.07	0.13	0.10	1.00		
Juiciness	-0.38	-0.41	-0.40	-0.44	1.00	
Chewing number	0.65	0.66*	0.67*	0.38	-0.80**	1.00***

Significant correlations are shown in * ($p<0.05$); ** ($p<0.01$); *** ($p<0.001$).

The meat quality attributes are significantly different between BR and KNC. There are also significant correlations between sensory and analytical attributes. The objective analytical parameters can be used for determining the characteristic sensory qualities of different poultry breeds.

IV. CONCLUSION

There is increasing consumers' need for native chicken breeds with characteristic meat qualities in especially Asia. Poultry industry is interested in the objective tools used to defining sensory characteristics of poultry meat. The present study will provide a basic information on objective standards to differentiate the sensory meat attribute of each chicken breeds.

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