

Development Rule of Intramuscular Fat Content in Chicken

¹Chang Guo-Bin, ¹Lei Li-Li, ²Zhang Xue-Yu, ^{2,3}Wang Ke-Hua,
¹Chen Rong, ¹Luan De-Qin and ¹Chen Guo-Hong
¹College of Animal Science and Technology, Yangzhou University,
Yangzhou, Jiangsu, 225009, China
²Institute of Poultry Science, Chinese Academy of Agriculture Science,
Yangzhou, Jiangsu, 225003, China
³Xianglong Poultry Development Co., Ltd., Yangzhou, Jiangsu, 225261, China

Abstract: The content of Intramuscular Fat (IMF) of Anka chicken, Wenchang chicken and Rugao chicken from 4-12 weeks old were tested in this study. The results showed that Intramuscular fat content in three chicken breeds increased with the age. Herein, the IMF of breast muscle in Anka chicken sharply increased after 8 weeks old and was higher than that of Wenchang and Rugao chicken. But, there was no significant difference between different breeds before 8 weeks old. The IMF of hen is higher than that of cock in all three breeds, but only in Wenchang chickens the significant difference were detected between different sex.

Key words: Chicken, intramuscular fat, breast muscle, age, breed, development rule

INTRODUCTION

Due to the fact that chicken is very popular in many countries, its quality should meet the requirements of consumers. Intramuscular Fat (IMF) is the fat that deposited between the muscle. IMF refers to the chemically extractable fat, which form the meat marble in a muscle sample, predominantly from adipocytes and myocytes. IMF is the energy reservoir matter of livestock and poultry. It is very important in flavor quality and food value. The IMF content is the key index in muscle quality evaluation, which affects some characteristics such as tenderness, juiciness and flavor and of its acceptability by consumers. In this study, the content of Intramuscular Fat (IMF) of Anka chicken, Wenchang chicken and Rugao chicken from 4-12 weeks old were tested, in order to lay a foundation on improve the meat quality in meat-type chicken and keep the especial meat flavor in Chinese native chicken breeds.

MATERIALS AND METHODS

Animal care: The Anka chicken, Wenchang chicken and Rugao chickens were from conservation basis in Poultry Institute, China Academy of Agricultural Sciences. Every chicken breeds belongs to one group, 120 chickens each group (half male, half female). The chicken population is rearing on floor, *ad libitum* and fed with complete pellet feed.

Ten chickens of three breeds were randomly selected from three populations in 4, 6, 8, 10 and 12 weeks old. After 12 h fasting, chickens of three groups were slaughtered by exsanguination with veins in the neck. After slaughter tissue sample were taken immediately. At 12 weeks old, the remained chickens were all slaughtered.

Breast meat sampling: Twenty gram breast meat was chosen after slaughtering. The visible fat in sample is wiped off. The samples were kept in seal bag in -20°C and prepared to determine the contents of IMF.

IMF test: Twenty gram breast muscle was taken from the refrigeratory and placed on the surface of the drying watch glass compiled in numbers. Smooth the meat samples after shearing. Place the prepared watch glass in electrothermal constant-temperature dry box. Dry the samples at 65°C 12 h and then at 105°C 12 h. Take out the watch glass, crush the dried meat sample. Weigh 2 g samples into filter paper which had been dried 5-6 h at 105°C and weighed. Put the filter paper package into the dry box, 8 h at 105°C, take out the dish, weigh the package after 30 min in the desiccator, record as weight 1. Then put above-mentioned paper package into Soxhlet extraction device and extract 48 h. When extraction finished, weigh the package after 8 h at 105°C and 30 min in desiccator, record as weight 2. Calculate the content of IMF according to formula.

RESULTS AND DISCUSSION

Content of IMF in breast muscle in three chicken groups in different age: Table 1 is the contents of IMF of Anka, Wenchang and Rugao chicken in different weeks old. As shown in Table 1 the content of IMF increased with the age old as a whole. The Intramuscular fat in breast muscle of Anka chicken increased significantly after 8 weeks old, moreover, IMF of Rugao and Wenchang chicken increased remarkably after 12 weeks old.

Comparison of IMF contents in three breeds in the same weeks age proposed that there was no significant difference between Anka chicken and Rugao and Wenchang at 4 and 6 weeks old ($p > 0.05$). IMF content of Anka chicken is higher than that of other breeds after 6 weeks age ($p < 0.05$).

Comparisons of IMF content in different sex at 12 weeks old: Table 2 is the comparison of IMF content in different sex chicken population in 12 weeks old. The IMF of hen is higher than the IMF of cock in three kinds of chickens in 12 weeks old. The difference in different sex in Wenchang chicken is significant, but in Ankas chickens and Rugao chickens are not significant.

Content of IMF in breast muscle in three chicken groups in different age: Recent studies have pointed out that the difference of IMF content is the reason of difference chicken taste (Xiang and Jing, 2008). The ability to use energy to synthesize fats increased with weeks age (Jiang and Huanlu, 2004). Muscle fibers of young chicken is thin in general and has better taste, but chicken fat deposition was few at this time, which led to bad flavor. Fat deposition increase with age and the flavor enhance after cooking (Sun *et al.*, 2006). As age increasing (90-140 days old), chicken IMF content will continue to increase to a certain level and this time also reached flavor taste best. Before this stage, the law of IMF deposition increases with age (Chen *et al.*, 2005). When in adult, chicken's muscle fiber swell and tenderness decreased and the rate of abdominal fat increased, but the IMF was no longer increased or began to decline, which resulted in the comprehensive flavor of chicken meat dropped. The results of this study shown that the content of IMF increased with age as a whole, which indicated that breed is key issues that affect IMF content. IMF content of breast muscle in Anka chicken was significantly higher than those of local chicken breeds, Wenchang chicken and Rugao chickens ($p < 0.05$), but there is no significant difference in early age. This indicated that breast muscle

Table 1: Content of IMF in breast muscle in three chicken groups in different period

Breeds	Weeks				
	4	6	8	10	12
Anka	2.30±1.67 ^a	2.80±1.97 ^{ab}	3.60±1.02 ^b	4.38±2.10 ^c	4.76±0.79 ^c
Wenchang	2.35±0.65 ^a	2.74±1.02 ^a	2.85±1.65 ^a	3.11±1.63 ^a	3.99±0.88 ^b
Rugao	2.38±2.10 ^a	2.68±1.26 ^a	2.99±1.03 ^a	2.99±1.54 ^a	3.82±0.32 ^b

Means within a column or row lacking a common superscript differ ($p < 0.05$)

Table 2: Comparison of IMF content in different sex chicken population at 12 weeks old

Sex	Anka chicken	Rugao chicken	Wenchang chicken
Male	4.28±1.38 ^a	3.65±1.47 ^a	3.20±1.45 ^a
Female	4.80±1.02 ^a	4.05±1.65 ^a	3.90±1.09 ^b

Means within a row lacking a common superscript differ ($p < 0.05$)

fat deposition rate of fast-growing species is not consistent with early growth advantage. The early growth was mainly the increase and cumulative of protein.

CONCLUSION

Gender is an important factor, which affects fat deposition. In general, male poultry fat deposition is lower than that of female. This study has proved this view. Comparison of IMF content in different sex chicken at 12 weeks old indicated that IMF content of hens is higher than that of cocks and there is significant difference in the Wenchang chicken ($p < 0.05$). Perhaps, this will partly explain the difference cooking ways of cock and hen under normal circumstances. As to the related mechanism it remains to be studied further.

ACKNOWLEDGEMENTS

This research was supported by National 863 Program of China (2008AA101009) and National and Jiangsu Scientific Technology Program (2008BADB2D07, BE2008359).

REFERENCES

- Chen, J., W. Jie and W. Shubai *et al.*, 2005. Studies on the characteristics of deposition of chicken IMP and IMF (J). *Acta Vet. Zootechnica Sinica*, 36 (8): 843-845.
- Jiang, X. and S. Huanlu, 2004. Measurement and analysis of intra-muscle fat and fatty acid in poultry meat (J). *J. Food Sci. Biotechnol.*, 23 (5): 26-28.
- Sun, H., T. Yun and H. Hongxuan *et al.*, 2006. Review of the factors and genes on intramuscular fatty acid (J). *Progress in Vet. Med.*, 27 (11): 49-53.
- Xiang, Y. and L. Jing, 2008. Research progress on influencing factors of chicken quality (J). *Meat Res.*, 1 (107): 7-8.