71st ICoMST
GIRONA - CATALONIA - SPAIN
3rd-8th August - 2025

COMPARATIVE STUDY ON THE FATTY ACID, NUCLEOTIDES, AND BIOACTIVE COMPOUNDS OF JEJU HORSES AND THEIR CROSSBREEDS

Jinwoo Park[1], Sangrok Lee[1], Dongwook Kim[1], Soomin Oh[1], Aera Jang[1]

[1] Department of Applied Animal Science, College of Animal Life Sciences, Kangwon National University, Chuncheon, Korea

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

I. INTRODUCTION

Horse meat is nutritionally superior since it contains two to three times higher palmitoleic acid than other meats, along with rich protein and iron levels [1]. Jeju horses have higher meat quality grades than cattle but lower yield grades, limiting their economic value. To address this, researchers proposed crossbreeding large-sized horses with Jeju horses to improve both meat yield and quality [1]. Thoroughbreds, the most widely bred horse breed in Korea (14,328 head), are primarily used for racing and riding and were included in this study as a comparison group to evaluate meat quality and nutritional differences [5]. This study aims to analyze fatty acid composition, bioactive compounds, and nucleotide content in Jeju horses and their crossbreeds, providing key data for improving meat quality and developing a medium-sized fattening horse.

II. MATERIALS AND METHODS

Loin (m. longissimus dorsi) meat samples from Thoroughbred (TB), Jeju Horse (JH), and crossbreeds T1 (JH♂ × Haflinger♀) and T2 (JH♀ × Haflinger♂) were collected from abattoir in Jeju. Fatty acids, Coenzyme Q10 (CoQ10), L-carnitine, creatine, creatinine, carnosine, and anserine in loin of each breed were analyzed using established methods [2], and nucleotides were measured using a modified method [3]. Fatty acids were extracted with Folch solution and analyzed by GC. CoQ10 was analyzed via HPLC (C18 column, 275 nm), L-carnitine by HClO4 homogenization and absorbance at 415 nm. Creatine, creatinine, carnosine, and anserine were analyzed by HPLC (0.01N HCl); detection was at 214 nm (creatine, carnosine, anserine) and 236 nm (creatinine). Nucleotides were analyzed by HPLC (0.7M PCA). Results were analyzed using SAS (ver. 9.4) with ANOVA and Tukey's test, and data were expressed as mean ± SEM. All experimental procedures involving animals were conducted in accordance with institutional ethical guidelines.

III. RESULTS AND DISCUSSION

The major fatty acid composition of the loin by breed is presented in figure 1. Intramuscular fatty acid composition is known to influence sensory properties and nutritional value, making it an important indicator of meat quality [4]. In particular, the oleic acid content, which enhances umami and savory flavors, was higher in crossbreeds (T1, T2) than in TB but lower than in JH. For linoleic acid (C18:2n6), an essential fatty acid, T1 and T2 had higher levels than JH but lower than TB.

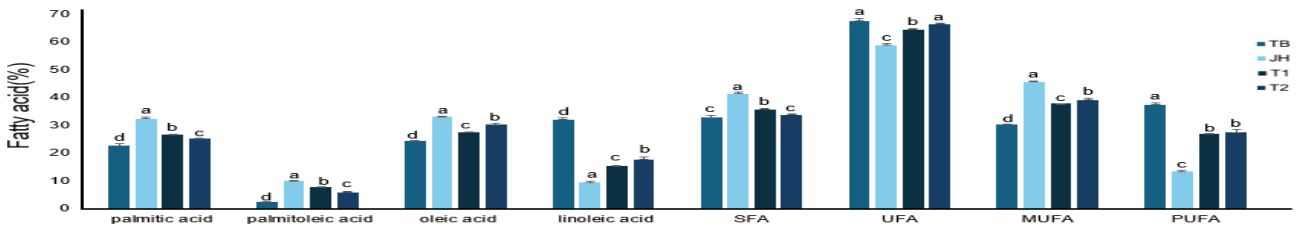


Figure 1- Fatty acid composition of loin muscle from horses of different breeds.

[a-d]Means denoted by different superscripts between varieties differ significantly (P<0.05). TB, Thoroughbred; JH, Jeju horse; T1, Haflinger(♀) × Jeju horse(♂); T2, Haflinger(♂) × Jejuhorse(♀); SEM, Standard errors of the mean; SFA, saturated fatty acid; UFA, unsaturated fatty acid; MUFA, monosaturated fatty acid; PUFA, polyunsaturated fatty acid

The major nucleotide contents of the loin by breed are shown in figure 2. IMP and GMP, nucleotides known for enhancing umami and meat flavor, were significantly higher in T1 and T2 than in both TB and JH [5], suggesting that crossbreeding may have a positive impact on meat flavor characteristics.

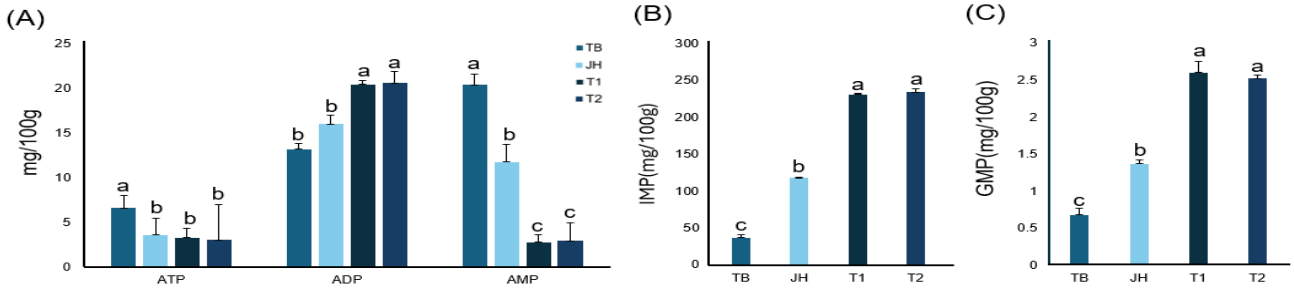


Figure 2 - Nucleotide contents of loin muscle from horses of different breeds.

[a-d]Means denoted by different superscripts between varieties differ significantly (P<0.05). TB, Thoroughbred; JH, Jeju horse; T1, Haflinger(♀) × Jeju horse(♂); T2, Haflinger(♂) × Jeju horse(♀); ATP, adenosine triphosphate; ADP, adenosine diphosphate; AMP, adenosine-5'-monophosphate; IMP, inosine-5'-monophosphate; GMP, guanosine-5'monophosphate; SEM, Standard errors of the mean

The major bioactive compounds of the loin by breed are shown in Figure 3. CoQ10 levels were higher in crossbreeds (T1, T2) than in JH but lower than in TB. L-carnitine was higher in T1 than in JH but lower than in TB, while T2 showed similar levels to JH. Creatine and creatinine, involved in energy metabolism and antioxidant activity [3], showed distinct trends: creatine was higher in T1 and T2 than in TB but lower than in JH, while creatinine was lower than in JH but higher than in TB.

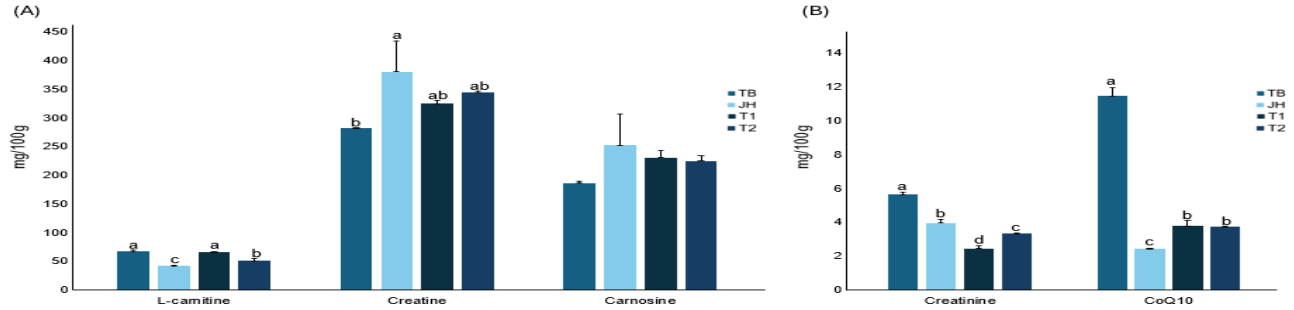


Figure 3 - Bioactive compounds of loin muscle from horses of different breeds.

[a-d]Means denoted by different superscripts between varieties differ significantly (P<0.05). CoQ10, Coenzyme Q10; TB, Thoroughbred; JH, Jeju horse; T1, Haflinger (♀) × Jeju horse (♂); T2, Haflinger(♂) × Jeju horse(♀).

IV. CONCLUSION

This study demonstrated that meat quality and bioactive compound contents vary significantly among horse breeds. TB showed higher CoQ10 and creatinine levels, while JH had higher creatine content. Notably, crossbreeds (T1 and T2) had a well-balanced nucleotide profile, enhancing umami and meat flavor, indicating potential for meat quality improvement. These results suggest that crossbreeding Jeju horses with larger breeds may effectively enhance both meat quality and yield. Further studies are needed to assess the long-term effects of crossbreeding on meat traits and bioactive compounds.

ACKNOWLEDGEMENTS

This research was carried out with the support of "Cooperative Research Program for Agriculture Science and Technology Development" (Project No. PJ016207) of the Rural Development Administration, Korea.

REFERENCES

1. National Institute of Animal Science. (2019). Study of farm unit breeding environment and growth characteristics in coldblood horses (Project No. PJ011910). Rural Development Administration.
2. Kim, H. J., & Jang, A. (2021). Correlations between the levels of the bioactive compounds and quality traits in beef loin and round during cold storage. *Food Control*, *120*, 107491.
3. Chen, L., Zeng, W., Rong, Y., & Lou, B. (2021). Characterisation of taste-active compositions, umami attributes and aroma compounds in Chinese shrimp. *International Journal of Food Science and Technology*, *56*(12), 6311-6321.
4. Wood, J. D., Richardson, R. I., Nute, G. R., Fisher, A. V., Campo, M. M., Kasapidou, E., ... & Enser, M. (2004). Effects of fatty acids on meat quality: a review. *Meat science*, *66*(1), 21-32.
5. Horsepia. (2025). *Horse Registration Status*. Retrieved from https://www.horsepia.com/hp/pa/ss/PASS1010/index.do. Accessed March 19, 2025.