

## The effect of substitution to DL-methionine with L-methionine and dietary protein levels on Expression Myogenic Genes in Japanese quail

Keyaram Koohgivi<sup>1</sup>, Hedaiat allah Rooshanfekr<sup>2</sup>, Mahmood Nazari<sup>3\*</sup> and Ahmad Tatar<sup>3</sup>

<sup>1</sup> MSc Graduated of Animal genetic and Breeding, Faculty of Animal Science and Food Technology, Agricultural science and Natural Resources University of Khuzestan, Mollasani, Iran

<sup>2</sup> Professor, Department of Animal Science, Faculty of Animal science and Food Technology, Agricultural Science and Natural Resources University of Khuzestan, Mollasani, Iran

<sup>3</sup> Assistant Professor, Department of Animal Science, Faculty of Animal science and Food Technology, Agricultural Science and Natural Resources University of Khuzestan, Mollasani, Iran

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### Abstract

This research was conducted to investigate the effect of different levels of protein (20 and 24%) and the replacement of methionine DL with L methionine on the expression of myogenic genes (atrogen-1 and MYF-5) using the RT-qPCR technique in Japanese quail. This experiment was done in the form of a 2×2 factorial with 4 treatments and 4 repetitions and 15 quail in each replicate. The first treatment included DL-methionine and 20% protein (control group). The second treatment consisted of L methionine and 24% proteins, and the third treatment included L methionine and protein 20% and the fourth treatment included DL-methionine and protein 24%. After 35 days of feeding and keeping the quails, with 8 hours interval of hunger, 2 quails were slaughtered in each replicate, and a piece of their chest has been removed immediately and was transferred to the laboratory with Liquid nitrogen, and froze in -80°C. After extraction of the whole RNA, its quality was measured and was used to generate and synthesis the cDNA. Eventually, the expression of myogenic genes was measured by the real-time PCR method. In this method,  $\beta$ -actin gene, as the source gene, was used to normalize the data. The results showed that by decreasing the protein level from 24% to 20%, atrogen-1 gene expression increased and the MYF-5 gene expression decreased. Also, the replacement of methionine DL with L-methionine did not have a significant effect on the expression of myogenic genes. The results indicated that DL-methionine could be replaced with L methionine, and a 24% protein level is more suitable than 20% in the Japanese quail diet.

**Keywords:** Japanese quail, Atrogen-1, Gene expression, Myogenic genes

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\* **Corresponding Author:** Mahmood Nazari, Assistant Professor, Department of Animal Science, Faculty of Animal science and Food Technology, Agricultural Science and Natural Resources University of Khuzestan, Mollasani, Iran, E-mail: m.nazari@asnrukh.ac.ir



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## References

- Aghaei, A., Khosravinia, H., Mamoei, M., Azarfar, A., Shahriari, A., and Ghorbanpor, M. (2018). Effects supplementation of zinc and Vit E on antioxidant enzyme, sexual hormone and some biochemical parameters in breeder flock of Japanese Quails. *Iranian Veterinary Journal*, 4 (2), 14-24. (In Persian)
- Dersjant-Li, Y. and Peisker, M. (2011). A Review on Recent Findings on Amino Acids Requirements in Poultry Studies. *Iranian Journal of Applied Animal Science*, 1(2), 73-79.
- Dilger, R.N., Kobler, C., Weckbecker, C., Hoehler, D. and Baker, D.H. (2007). 2-keto-4-(Methylthio) butyric acid (Keto analog of methionine) is a safe and efficacious precursor of L-Methionine in chicks. *Journal of Nutrition*, 137, 1868-1873.
- Evonik Industries, AG Health and & Nutrition (2015). Nutritional value of L-Methionine is comparable to DL-Methionine in growing broilers from 14 to 27 days of age. *Facts & Figures*, 15113.
- Hyankova, L., Dedkova, L., Knizetva, H. and Klecner, D. (1997). Responses in growth, food intake and food conversion efficiency to different dietary protein concentrations in meat-type lines of Japanese quail. *British Poultry Science*, 38, 564-570.
- Huyghebaert, G. (1993). Comparison of DL-methionine and methionine hydroxy analog-free acid in broilers by using multi exponential regression models. *British Poultry Science*, 34, 351-359.
- Kaur, S., Mandal, A., Singh, K. and Kadam, M. (2008). The response of Japanese quails (heavy body weight line) to dietary energy levels and graded essential amino acid levels on growth performance and immunocompetence. *Livestock Science*, 117, 255-262.
- Lee, J., Giordano, S. and Zhang, J. (2012). Autophagy, mitochondria and oxidative stress: cross-talk and redox signaling. *Journal of Biochemistry*, 441, 523-540.
- Nasiri Moghadam, H., Hesabi Nameghi, A. and Madayeni, M.M. (2007). Effect of supplementation of methionine and lysine amino acids on yield and carcass characteristics of broiler chicks. *Journal Iranian Agriculture*, 20, 183-192. (In Persian)
- National Research Council. (1994). *Nutrition of Poultry*. National Academy Press. Washington D. C., U.S.A.
- Parvin, R., Mandal, A.B., Singh, S.M. and Thakur, R. (2010). Effect of dietary level of methionine on growth performance and immune response in Japanese quails (*Coturnix coturnix japonica*). *Journal Science Food Agriculture*, 90, 471-481.
- Pfaffl, M.W., Horgan, G.W. and Dempfle, L. (2002). Relative expression software tool (REST©) for group-wise comparison and statistical analysis of relative expression results in real-time PCR. *Nucleic Acids Research*, 30, pp.1-10.
- Ribeiro, A., Dahlke, F. and Kessler, A.M. (2005). Methionine sources do not affect performance and carcass yield of broilers fed vegetable diets and submitted to cyclic heat stress. *Brazilian Journal of Poultry Science*, 7(3), 159-164.
- Sabourin, L.A. and Rudnicki, M.A. (2000). The molecular regulation of myogenesis. *Clinical Genetics*, 57(1), 16-25.
- SAS Institute, (1999). SAS/STAT Users Guide. SAS Inc, NC.
- Shen, Y.B., Ferket, P., Park, I., Malheiros, R.D. and Kim, S.W. (2015). Effects of feed grade l-methionine on intestinal redox status, intestinal development, and growth performance of young chickens compared with conventional dl-methionine. *Journal of Animal Science*, 93, 2977-2986.
- Shen, Y.B., Weaver, A.C. and Kim, S.W. (2014). Effect of feed grade L-Methionine on growth performance and gut health in nursery pigs compared to conventional DL-Methionine. *Journal of Animal Science*, 92, 5530-5539.
- Vesco, A.P., Gasparino, E., Oliveira Neto, A.R., Guimarães, S.E. and Marcato, S.M. (2015). Effects of Methionine Supplementation on the Expression of Protein Deposition-Related Genes in Acute Heat Stress-Exposed Broilers. *PLoS One*, 10(2), e0115821.
- Wen, C., Chen, X., Chen, G.Y., Wu, P., Chen, Y.P., Zhou, Y.M. and Wong, T. (2014). Methionine improves breast muscle growth and alters myogenic gene expression in broilers. *Journal of Animal Science* 92(3), 1068-1073.