

Effects of dietary supplementation of rumen-protected L-tryptophan (RPT) under heat stress conditions on milk yield and compositions in Holstein dairy cows

Won-Tae Choi^{1,2}, Jung-eun Kim^{1,2}, Won-Seob Kim^{1,2}, Dong-Qaio Peng^{1,2}, Tae-Bin Kim^{1,2}, Jang-Hoon Jo^{1,2}, Jung-Keun Suh^{1,2}, Jay Ronel V Conejos¹, Jae-Sung Lee¹, Ghassemi Nejad Jalil¹, Jin-Seung Park³, Jun-Ok Moon³ and Hong-Gu Lee^{1,2}

¹Department of Animal Science and Technology, Konkuk University, Seoul, Korea

²Team of An Educational Program for Specialists in Global Animal Science, Brain Korea 21 Plus Project, Konkuk University, Seoul, Korea

³Research Institute of Biotechnology, CJ, Suwon, Republic of Korea

Introduction

Increasing temperature-humidity index (THI) above critical thresholds are related to decreased dry matter intake (DMI), milk yield, and milk composition quality (West, 2003). Among essential amino acids, L-tryptophan may be one of the limiting ones in protein metabolism which plays a putative role in synthesis of milk protein and positive effect in heat stressed dairy cow (Sutoh, 2018). However, the effects of dietary supplementation of rumen-protected L-tryptophan (RPT) while cows are under moderate-sever heat stress conditions have not yet to be investigated.

Aim

We investigated the effect of RPT supplementation on milk yield and compositions under moderate-severe heat stress conditions in Holstein dairy cows.

Methods

Sixteen Holstein dairy cows were randomly assigned to four groups of control (n = 4), RPT 15g (n = 4), RPT 30g (n = 4), RPT 60g (n = 4). Animals were kept in individual pens and were fed diets as TMR in the morning (0400 h) once a day. RPT was treated as top-dressing on TMR. The experiment was proceeded for 11 weeks including adaptation period (1 weeks) and experimental period (10 weeks). Temperature and relative humidity were monitored at hourly intervals throughout the trial by using a temperature-humidity data logger device. Average temperature-humidity index (THI) in the farm was **64 to 86** throughout the experiment calculated based on NRC (1971) recommendation. The pooled composited milk samples were analyzed for concentrations of fat, protein, and urea using a Foss 4000 milko Scan (Foss electronic, France). Data were analyzed using GLM procedure of SPSS (version 24.0) and the means were compared for significance by Tukey's test. Statistical differences were considered significant at $P < 0.05$ and the tendency was reported at $0.1 \leq P \leq 0.05$.

Results

Although statistical analysis of interaction between THI and diet during the experimental period showed no significant difference in the milk yield and composition of the experimental cows ($P > 0.05$), the milk yield in moderate-sever heat stress period (THI 80~89) was higher in RPT 30g group than the other groups ($P < 0.05$). In addition, lactose percentage showed a higher tendency in RPT 30g compared with the other groups ($P = 0.074$). However, there were no differences in fat-corrected milk, energy corrected milk, fat and protein both for percentage and kg ($P > 0.05$).

Conclusion

Taken together, these results demonstrate that supplementation of RPT 30g in TMR during moderate-sever THI period can prevent the decrease of milk production due to heat stress.