Title: Effects of *Radix Bupleuri* extract supplementation on lactation performance and rumen fermentation in heat-stressed lactating Holstein cows

Author: L. Pan D.P. Bu J.Q. Wang J.B. Cheng X.Z. Sun L.Y. Zhou J.J. Qin X.K. Zhang Y.M. Yuan

PII: S0377-8401(13)00246-0
DOI: http://dx.doi.org/doi:10.1016/j.anifeedsci.2013.09.008
Reference: ANIFEE 12961

To appear in: *Animal Feed Science and Technology*

Received date: 8-4-2013
Revised date: 13-9-2013
Accepted date: 15-9-2013

Please cite this article as: Pan, L., Bu, D.P., Wang, J.Q., Cheng, J.B., Sun, X.Z., Zhou, L.Y., Qin, J.J., Zhang, X.K., Yuan, Y.M., Effects of *Radix Bupleuri* extract supplementation on lactation performance and rumen fermentation in heat-stressed lactating Holstein cows, *Animal Feed Science and Technology* (2013), http://dx.doi.org/10.1016/j.anifeedsci.2013.09.008

Effects of *Radix Bupleuri* extract supplementation on lactation performance and rumen fermentation in heat-stressed lactating Holstein cows

L. Pan [a], D. P. Bu [a,*], J. Q. Wang [a], J. B. Cheng [a], X. Z. Sun [a], L.Y. Zhou [a], J. J. Qin [b], X. K. Zhang [c], Y. M. Yuan [c]

[a] *State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences, Beijing 100193, P. R. China*

[b] *Beijing Centre Biology Co., Ltd., Beijing 102206, P. R. China.*

[c] *Shanghai Bright Hostan Co., Ltd., Shanghai 200436, P. R. China.*

ABSTRACT: *Radix Bupleuri* extract (RBE) has been shown to mitigate negative effects of high ambient temperature. This experiment was conducted to investigate effects of RBE supplementation on lactation performance and rumen fermentation in Holstein cows under heat stress. Forty Holstein cows (75±15 d in milk, 37.5±1.8 kg of milk/d, and 1.7±0.4 parity) were randomly assigned to one of four groups (n=10). One of four treatment diets, assigned randomly to one of four groups, consisted of RBE supplementation at 0, 0.25, 0.5 or 1.0 g/kg of the basal diet (concentrate and roughage) based on dry matter (DM). Cows were housed in a tie-stall barn and were individually fed the treatment diets. The experiment lasted for 10 wk in hot summer. During the experiment, average ambient temperatures and temperature-humidity indexes (THI) were respectively 27.5±1.5°C, 29.8±1.9°C and 28.1±1.7°C, and 78.2±2.7, 79.8±3.3 and 78.3±3.4 at 0600, 1400 and 2200 h. Average respiration rates (RR) with RBE at 0.25, 0.50 and 1.0 g/kg were 65.6, 60.3 and 67.4, respectively vs. 71.4 (breaths/min) for the control (P<0.01). Average rectal temperatures (RT) were 39.1, 39.0 and 39.1 vs. 39.3ºC for the control (P<0.01). Moreover, cows supplemented with RBE increased dry matter intake (DMI, 22.8, 21.6 and 22.1 vs. 20.9 kg/d) (P<0.05) and milk production (34.2, 33.4 and 32.4 vs. 31.6 kg/d) (P<0.01) compared with control. Percentages of milk protein and fat were similar among groups, while milk protein yield increased with increasing level of RBE (0.97, 0.95 and 0.92 vs. 0.89 kg/d for the control) (P<0.01). Milk fat yield also increased with RBE (1.13, 1.12 and 1.09 vs. 1.02 kg/d for the control) (P<0.05). There was no treatment effect on diet apparent digestibility or volatile fatty acid (VFA) concentration among groups. Overall, supplemental RBE at 0.25 or 0.5 g/kg could mitigate the negative effects of heat stress on production in lactating Holstein cows.

Keywords: Dairy cow; *Radix Bupleuri* extract; Heat stress; Lactation performance; Rumen fermentation

Abbreviations: RBE, *Radix Bupleuri* extract; DM, dry matter; DMI, dry matter intake; THI, temperature-humidity index; RR, respiration rate; RT, rectal temperature; VFA, volatile fatty acid; AOAC, Association of Official Analytical Chemists; CP, crude protein; EE, crude fat ether extract; C, control; SCC, somatic cell count; SCC, milk urea nitrogen; FCM, 4% fat-corrected milk; ECM, energy-corrected milk.

1. Introduction

Environmental-induced hyperthermia compromises efficient animal production and jeopardizes animal welfare and therefore is a significant financial burden in the dairy industry (Wrinkle et al., 2012). Dairy cows suffering from heat stress during the summer markedly decreased feed intake and milk yield (Wheelock et al; 2010), compromised rumination and nutrient absorption (Collier et al., 1982), and increased respiratory rate and sweating (West, 2003). Unabated heat stress could decrease more than 50% of feed intake and more than 10% of milk production (Wheelock et al; 2010). Additional maintenance requirements were thought to exceed 30% for homeothermia in heat-stressed cows (Fox and Tylutki, 1998). Heat-stressed lactating cows presented a negative energy balance due to these collective changes. The decline in nutrient intake has previously

* Corresponding author: D.P. Bu, State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences, No.2 Yuanmingyuan West Road, Haidian District, Beijing, 100193, P. R. China. Tel: 86-10-62813901; Fax: 86-10-62897587; E-mail: burdenpan@gmail.com; panlong8809@163.com;