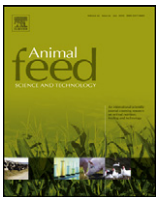
Animal Feed Science and Technology 154 (2009) 276–283

Contents lists available at ScienceDirect

Animal Feed Science and Technology

journal homepage: www.elsevier.com/locate/anifeedsci



Short communication

Effects of protected fat supplements on production of early lactation Holstein cows

M. Ganjkhanlou[a], K. Rezayazdi[a], G.R. Ghorbani[b], M. Dehghan Banadaky[a,*], H. Morraveg[a], W.Z. Yang[c]

[a] Department of Animal Science, University of Tehran, P.O. Box 3158711167-4111, Karaj, Iran
[b] Department of Animal Sciences, Isfahan University of Technology, Isfahan 84156, Iran
[c] Lethbridge Research Centre, Agriculture and Agri-Food Canada, P.O. Box 3000, Lethbridge, Alberta, T1J 4B1 Canada

ARTICLE INFO

Article history:
Received 21 July 2008
Received in revised form 14 September 2009
Accepted 14 September 2009

Keywords:
Rumen protected fat
Intake
Milk production
Dairy cows

ABSTRACT

This study was conducted to evaluate production response of early lactating cows to rumen protected fat. Twelve Holstein cows (26 ± 4 days in milk) were used in a replicated 3 × 3 Latin square design with 21-day experimental period and three treatments: control (no fat supplementation), and supplemented with 30 g/kg prilled protected fat (Energizer-10) or 35 g/kg Ca salt of protected fat (Magnapac). Cows were fed *ad libitum* a total mixed ration consisting of 200 g/kg corn silage, 200 g/kg alfalfa hay and 600 g/kg concentrate mix. Each period had 14 days of adaptation and 7 days for sampling. Intakes of dry matter (DM), organic matter (OM) and neutral detergent fibre (NDF) were decreased with supplementation of rumen protected fat in cows ($P<0.05$). Production of milk and energy corrected milk (ECM), composition and yield of milk fat, protein and lactose were not affected ($P>0.05$) by fat supplements in cows. As a result, milk efficiency (ECM/DM intake) was improved from 1.35 for control to 1.47 and 1.44 with supplementation of Energizer-10 and Magnapac, respectively ($P<0.01$). Feeding fat supplements increased ruminating time. Body condition score and body weight changes were similar among the treatments in all cows. These results indicate that supplementation of early lactating diet with rumen protected fat decreased feed intake but without

Abbreviations: BCS, body condition score; DMI, dry matter intake; NDF, neutral detergent fibre; MUN, milk urea nitrogen; NEL, net energy for lactation.

* Corresponding author at: Department of Animal Science, Campus of Agriculture and Natural Resources, University of Tehran, P.O. Box 3158711167, Karaj, Iran. Tel.: +98 261 2248082; fax: +98 261 2246752.
E-mail address: dehghanb@can.ut.ac.ir (M. Dehghan Banadaky).

0377-8401/$ – see front matter
doi:10.1016/j.anifeedsci.2009.09.008

altering milk production, milk composition and body weight, thus improved milk efficiency.

1. Introduction

Early lactation Holstein cows have high energy demands to sustain milk secretion. Maximizing energy intake by increasing dietary energy density is a logical strategy (Grummer, 1988). Excessive grain feeding increases dietary energy but may disturb rumen function and cause milk fat depression (Grummer, 1988). Feeding fat can increase energy density of the diet; however, feeding high amounts of unprotected fat can be toxic to microbial populations and exert a detrimental effect on rumen fermentation. Rumen protected fat increases caloric density without reducing dietary fibre content and digestion, thus improving efficiency of energy use by rumen microbes and the host animal (Schauff and Clark, 1989). Flaked and prilled fatty acids and calcium salts of palm fatty acids are commercially available as Magnapac (Laki dam pars Co., Inc., Shahriar, Iran) and Energizer-10 (Kani dam Co., Inc., Hashtgerd, Iran). They are insoluble in the rumen and widely used in the different areas such as in the Far East.

Effects of those type of protected fat in mid lactation dairy cows were different and data suggested that Ca salts of fatty acids and prilled fatty acids did not greatly alter milk production and composition when fed at recommended amounts of 30–40 g/kg DM intake (Schauff and Clark, 1989). Several studies (Palmquist and Jenkins, 1980; Kronfeld et al., 1980; Chalupa et al., 1986) reported additional fat in the diet increased milk production and efficiency without negatively affecting milk fat percentage, also beneficial effects of supplemental fat in the reduction of tissue mobilization, were detected. Little direct evidence is available to show the tissue-sparing effect of dietary fat in early lactation (Madhave et al., 1998). However, there is limited data for determining the effects of feeding high level of Ca salts of fat or prilled fatty acids to early lactating dairy cows, with focus on chewing behaviors and tissue mobilization. The objectives of this study were to determine and compare the effects of two conventional types of rumen protected fat supplements on feed intake, milk production and composition, body reserve changes and feeding behavior of lactating dairy cows.

2. Materials and methods

2.1. Cows, diet and treatments

Twelve Holstein lactating dairy cows (26 ± 4 days in milk) with an average body weight (BW) of 631 ± 39 kg were randomly assigned in a replicated 3×3 Latin square design with 21-day periods according to the parity. Each experimental period had 14 days of adaptation followed by 7 days for data collection. The experiment was carried out at the dairy barn of the Department of Animal Science of Tehran University in Karaj, Iran. Cows were placed in individual pens with concrete floors that were cleaned regularly and fed a total mixed ration *ad libitum* intake. Diet consisted of 200 g/kg corn silage, 200 g/kg alfalfa hay and 600 g/kg concentrate mix (dry matter [DM] basis) (Table 1). Treatments were: control (no fat supplementation), and supplemented with 30 g/kg prilled protected fat (Energizer-10) or 35 g/kg Ca salt of protected fat (Magnapac). Calcium salts of palm oil fatty acids contained predominantly palmitic acid (440 g/kg) and oleic acid (400 g/kg). Prilled fat comprised greater than 850 g/kg palmitic acid. Lipid content of the control diet was 26 g/kg DM (Table 1). Dietary lipid content was increased to 55 g/kg DM by adding two types of fats. Cows were fed twice daily at 08:00 and 16:00 h allowing for 50–100 g orts/kg DM offered, which were weighed daily. Water and mineralized salt stone were available for cows through the entire experiment. The diet was formulated to meet or exceed the recommendations of the NRC (2001). Cows were milked three times per day at 03:50, 12:00 and 20:00 h. Daily milk yields were recorded throughout the experiment. Milk samples were collected for six consecutive milking on days 18 and 19 of each experimental period for determining milk composition.