



Fatty acid composition of milk from dairy cows fed fresh alfalfa based diets

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Abstract

Objectives were to study effects of seasonal variation and feed additives on milk fatty acid (FA) composition of dairy cows fed fresh alfalfa based diets. To meet the first objective, a survey of eight selected alfalfa-grazing dairy farms was conducted in which the farms were visited four times in the four seasons of the year to obtain information on diet composition, herd management, days in milk (DIM) and milk yield. The proportion of alfalfa pasture in the total diet averaged 680 ± 167 g/kg of dry matter (DM), and estimated DM intake and milk yield averaged 15.0 and 15.1 kg/cow/d, respectively. Mean concentrations of conjugated linoleic acid (CLA) (13.6 g/kg fat) and *trans* 18:1 (48 g/kg fat) were positively associated with the proportion of alfalfa in the diets, while short chain FA (*i.e.*, C4–C14) proportions of milk FA were lower in spring high alfalfa diets *versus* winter low alfalfa diets with intermediate values in summer and autumn. The opposite trend occurred for most of the medium and long-chain FA (*i.e.*, >C14). Seasonal variations of milk FA composition were associated with the proportion of alfalfa pasture in the diet, particularly for CLA and *trans* 18:1. To

Abbreviations: FA, fatty acids; DIM, days in milk; DM, dry matter; CLA, conjugated linoleic acid

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study effects of feed additives on milk FA composition of milk from dairy cows fed fresh alfalfa based diets, impacts on milk FA composition of different feed additives used to control rumen fermentation was evaluated. The treatments were a control diet (Control), composed of *ad libitum* freshly cut pre-bloom alfalfa pasture, and three feed additives: Control +200 g/cow/d of dietary buffers (DB; calcium carbonate 400 g/kg; sodium bicarbonate 300 g/kg; magnesium oxide 150 g/kg; bentonite 150 g/kg), Control + antibiotics (MV; 300 mg monensin/cow/d and 30 mg virginiamycin/cow/d) and Control + 15 g/cow/d of a yeast culture (YC). No feed additives affected DM intake, milk yield, milk composition or milk FA composition, including CLA (12.9 g/kg milk FA), in mid lactation primiparous or late lactation multiparous dairy cows fed fresh alfalfa, and there were no differences between primiparous and multiparous cows in milk FA composition.

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1. Introduction

In recent years, the composition of human diets has received more attention as a strategy to improve health (Parodi, 1999). Because of its relationship to human health, milk FA composition has been extensively studied (Belury, 2002; Jensen, 2002). Conjugated linoleic acids (CLA) are a group of conjugated or non-methylene interrupted dienoid C18:2 FA, in which the *cis*9 *trans*11 is the main isomer, and it is considered a potential anti-carcinogen (Parodi, 1999; Jensen, 2002). The first studies on CLA as a potential agent to inhibit development of mammary tumors were conducted with animal models (Ip et al., 1991). These positive findings led to interest in dairy cattle nutrition as a way to alter the FA profile of milk fat (Grummer, 1991; Palmquist et al., 1993). Two common dietary strategies that have been used to alter the milk FA profile include fat supplementation (Chouinard et al., 2001; Jensen, 2002; Drackley et al., 2003; Ruppert et al., 2003; Onetti and Grummer, 2004), use of pasture (Kelly et al., 1998a; Dhiman et al., 1999; Schroeder et al., 2005; Bargo et al., 2006) or both (Schroeder et al., 2003).

Although there have been numerous studies on effects of nutrition and among cow variation in milk FA and *cis*9 *trans*11 CLA (Jensen, 2002), there is limited information on relationships between milk FA profiles and animal production variables (Lock et al., 2005). Palmquist et al. (1993) concluded in their review that seasonal and regional differences in milk FA composition are measurable, most likely because of local differences in feeds. Information on seasonal variation of milk FA from grazing dairy cows is particularly limited. Previous pasture studies have been conducted on cows grazing ryegrass/white clover pasture as the entire diet (Auld et al., 1998) or ryegrass/white clover pasture supplemented with low levels of corn grain (Mackle et al., 1997). Information is lacking on seasonal variation in milk FA composition of dairy cows grazing alfalfa pasture supplemented with concentrates and silage.

Grazed alfalfa is one of the most common feeds in diets of lactating dairy cows in Argentina. Alfalfa pasture has a high crude protein (CP) content and rumen degradability, high risk of bloat, low NDF, and often results in low rumen pH (Rearte and Santini, 1989; Castillo, 1999; Bargo et al., 2003). These effects differ from those seen when alfalfa is

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