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Effect of whole-crop barley and oat silages on the performance of mature suckler cows and their progeny in outdoor winter feeding

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Abstract

This study was undertaken to assess during the winter feeding period the effects of replacing grass silage (G) with whole-crop barley silage (B) or whole-crop oat silage (O) on suckler cow and calf performance. Forty-eight Hereford cows with an initial live weight of 741 kg (S.D. 78.5) were selected for the experiment. The diet was either G, B or O as a sole feed. The aim was to offer the cows the same amount of energy in all diets. Therefore, the energy content of the silages was evaluated prior to the experiment by measuring the in vitro organic matter digestibility which resulted in 11.7 MJ metabolizable energy (ME)/kg dry matter (DM) for G and 9.9 MJ ME/kg DM for B and O. During the experiment, the digestibility of the silages was measured by both in vitro and in vivo methods.

The ME values of G, B and O evaluated by the in vivo method were 11.2, 10.5 and 9.5 MJ/kg DM, respectively. The DM intake on diets G, B and O averaged 9.2, 10.5 and 10.3 kg which resulted in ME intakes of 102, 109 and 97 MJ ME/d, respectively. The type of roughage affected the in vivo apparent protein digestibility co-efficients which for G, B and O were 0.841, 0.698 and 0.498, respectively (G versus B, $P < 0.05$; G versus O and B versus O, $P < 0.01$). The initial cow body condition score

Abbreviations: AAT, amino acids absorbed in the small intestine; AIA, acid insoluble ash; B, whole-crop barley silage; BCS, body condition score; CP, crude protein; DM, dry matter; DOM, digestible organic matter; DOMD = D value, digestible organic matter in dry matter; F, female; G, grass silage; IU, international unit; K, potassium; LU, livestock unit; LW, live weight; LWG, live weight gain; M, male; ME, metabolizable energy; N, nitrogen; NDF, neutral detergent fibre; O, whole-crop oat silage; OM, organic matter; OMD, in vitro organic matter digestibility; P, phosphorus; S.D., standard deviation; S.E.M., standard error of means

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(BCS) averaged 3.2 (S.D. 0.23). Pre-grazing the change of BCS and the live weight gain (LWG) for G, B and O cows was on average 0.23, 0.09 and −0.39 (G versus O and B versus O, $P < 0.001$) and −20, −9 and −56 kg (G versus O, $P < 0.05$; B versus O, $P < 0.01$), respectively. All calves were born before the grazing season and milk and grass were the sole feeds at pasture. The pre-weaning calf LWG was not affected by the diets averaging 1357 g/d. The daily milk yield on diets G, B and O averaged 11.4, 10.3 and 9.5 kg (G versus O, $P < 0.05$), respectively. Forty-two out of 48 cows entered the mating period of which all were observed to be pregnant. The interval from calving to conception averaged 89 days. B and O proved to be suitable winter feeds for mature suckler cows in cold winter circumstances. Especially O had a lower energy and protein content than G but fulfilled the energy and protein demands of mature, pregnant beef cows in good body condition.

Keywords: Feeding; Beef; Body condition; Grazing; Milk; Reproduction; Whole-crop cereal silage

1. Introduction

Generally, the primary target of farming beef cows is to convert the grazed forage into weaned calves (Petit et al., 1992). In Latin America and Oceania, millions of suckler cows live year-round on pastures without any supplementary feeding. In West Europe and North America, grazed grass also supplies from 60 to 80% of the annual nutrient intake. In marginal areas like Finland, suckler cow production is carried out in circumstances characterized by a long winter period and a rather short, mostly five-month, grazing period. Therefore, innovative winter feeding strategies with alternative, inexpensive feeds are important for farmers seeking to expand suckler cow production and to increase its profitability.

In Finland, winter feeding of beef cows is usually based on inexpensive, low-energy feeds such as straw, treated straw (Manninen et al., 2000), or in same regions, also industrial by-products (Manninen et al., 2004). Grass silage is offered in restricted amounts or together with low-energy feeds like straw but is not usually recommended ad libitum as the energy content is too high for dry beef cows. In addition, freezing of unwilted grass silage may also cause problems in uninsulated buildings or in outdoor facilities. Harvesting whole-crop cereal silage allows increased use of silage-making equipment, enables crop rotation and manure utilization in the fields, gives relatively high crop yields per hectare harvested in one single operation, has no effluent production, enables the use of grain grown on the farm and reduces feed production costs. The low protein content and digestibility of whole-crop cereal silage may be the main disadvantages but are not critical for beef cows. Secondly, there may be problems of the instability in air of whole-crop cereal silages (Tetlow and Wilkinson, 1992). Wheat is probably the cereal most commonly used for whole-crop cereal silage worldwide, because the grain pericarp is not as hard and lignified as in barley (Tetlow and Wilkinson, 1992). In Finland, barley and oats are more potential and common cereals for whole-crop silages.

The effects of whole-crop cereal silages on milk production (Robinson and Kennelly, 1991; Hameleers, 1998; Sutton et al., 2001; Meeske et al., 2002) and on beef production (Christensen et al., 1977; Deschard et al., 1988; O'Kiely and Moloney, 1995; Moloney