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Beef heifer production as affected by indoor feed intensity and slaughter age when grazing semi-natural grasslands in summer

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Abstract

Only limited knowledge exists on how to produce high-quality beef carcasses when the cattle also are grazing semi-natural grasslands for nature conservation purposes. The objectives of the two factorially-designed trials were to determine the effects of indoor feed intensity (low vs. high) and slaughter age (18 vs. 22 months) on performance and carcass quality of beef heifers, raised from weaning until slaughter and grazing semi-natural grasslands during growing seasons. In the first trial, 56 Charolais heifers were used of which 28 were fed only grass-clover silage *ad libitum* (low; CL), and another 28 heifers were fed 2.0 kg of grain daily in addition to the silage (high; CH). In the second trial, 28 Angus heifers were fed grass-clover silage at 80% *ad libitum* (low; AL), whereas another 28 heifers were fed silage *ad libitum* (high; AH). According to a national nature conservation score, the grazing pressure on the semi-natural grassland was classified as having been satisfactory to maintain the floristic diversity as no litter had been accumulated onto the sward. From weaning until slaughter, no difference in average daily gains (ADG) was found between the CH and the CL, whereas the AH had higher ADG than the AL (693 vs. 573 g, $P<0.001$). Heifers in both trials had higher carcass weights and more fat, Charolais heifers also had better conformation and Angus heifers had higher dressing percentage at 22 months than at 18 months of slaughter age ($P<0.05$). In conclusion, carcass traits in both trials were more affected by slaughter age than by feed intensity and desirable grazing effects were achieved on the pasture.

Keywords: Beef heifers; Feed intensity; Slaughter age; Semi-natural grasslands

1. Introduction

Semi-natural grasslands are important from many natural and cultural perspectives (Ihse and Norderhaug, 1995). For example, they contain many endangered plant and animal species (Gärdenfors, 2000). A prerequisite for maintaining the values of the grasslands is a continued grazing management. Unfortunately, large acreages of semi-natural grasslands in Sweden have been abandoned during the last decades. In some regions, only about 10% of these are managed compared to 50 years ago (Mejersjö and Kronqvist, 2000). Today, 13% of the remaining 270,000 hectares (ha) of valuable grasslands are threatened by reduced land management and a continuing decrease in grazing livestock is forecasted (Kumm, 2003; Persson, 2005a). The scarcity of grazers is a natural outcome of the decline in Swedish animal production in general. In addition, if only beef production aspects are taken into account, intensive indoor production is more profitable than extensive rearing on pasture (Lewis et al., 1990; Kumm, 2006).

To promote grazing of semi-natural grasslands, farmers can receive environmental monetary support

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for commitments to maintain grazing animals on these areas (Official Statistics of Sweden, 2006). These stewardships have made extensive beef production on pasture instead of indoor rearing more economically interesting for the producers. The main prerequisite to receive the environmental support is a sward height at the end of the growing season short enough to ensure no litter is accumulated onto the sward (Swedish Board of Agricultural, 2004).

Young bulls reared in intensive indoor production dominate the Swedish national supply for slaughter. The supply is distributed irregularly throughout the year, with a surplus in late autumn and a deficiency in early spring and summer, whereas the demand is constant all through the year. To finish heifers of beef breeds instead of slaughtering them as fattening calves, which used to be the practise, is a possible solution to even out the supply of beef throughout the year. Heifers have lower weight gain capacities than bulls and steers and they should be fed relatively extensively to avoid excessive fatness at low liveweights (McMillin et al., 1990; Steen and Kilpatrick, 1995; McCaughey et al., 1999). When finishing on pasture, heifers have more marbling and a more desirable colour in rib eye than steers (McCaughey et al., 1999). In 2005, there were 177,000 suckler cows in Sweden (Official Statistics of Sweden, 2006). If 50% of the heifer calves born of these cows were raised as finishing heifers using semi-natural grasslands, they could graze 20,000 to 40,000 ha of grasslands depending on herbage mass. Consequently, finishing of beef heifers in production systems including grazing of semi-natural grasslands may result in an even supply of bovine carcasses, management of valuable pastures and greater profitability for the farmers.

As in other European countries, the European Union Carcass Classification Schemes EUROP, modified to the Swedish system using 15 classes (SJVFS, 1998; Commission of the European Communities, 2005), establishes the quality of Swedish carcasses. The EUROP classes can be transformed to numerical figures for conformation score (1 = P−, poorest, and 15 = E+, best) and fatness (1 = 1−, leanest, and 15 = 5+, fattest). The classification reflects the values of the carcasses for the industry and forms the basis of the payment to the farmer. In Sweden at this time, full payment is received for carcasses from 250 to 400 kg, conformation ≥ 7 and fatness from 6 to 10. Only one-third of Swedish beef heifers achieve all these criteria, mainly because carcasses are too fat and too small (Helena Stenberg, pers. comm.). A high dressing percentage and great amounts of valuable retail cuts are of economical interests for the farmer and the industry, respectively.

There is limited recent published research on raising beef heifers, especially when grazing semi-natural grasslands in summer. Consequently, there is a need for more research investigating the possibilities to produce marketable carcasses from beef heifers that have grazed semi-natural grasslands. The objective of this study was to evaluate alternative production systems differing in indoor feed intensity and slaughter age of Charolais and Angus heifers to produce high-quality, market-oriented carcasses when the animals graze semi-natural grasslands in summer for nature conservation purposes.

2. Materials and methods

2.1. Experimental design

The study, that was conducted at Götala Research Station, The Swedish University of Agricultural Sciences, Skara, in southwestern Sweden (long 13°21′E, lat 58°42′N; elevation 150 m), included two trials with two different beef breeds, where heifers were raised from weaning until slaughter. Trial 1 started in November 2000 and trial 2 started in November 2001. Both trials had a 2×2 factorial design with two feed intensities during indoor periods (low and high) and two slaughter ages (18 and 22 months) each. For all animals, one indoor period followed by a grazing period was included in the study. Heifers slaughtered at 18 months of age were slaughtered directly after the grazing period, whereas heifers at 22 months of slaughter age were kept for another indoor period. Times of slaughter were chosen to respond to the demand of the beef market. As the trials were not conducted simultaneously, no comparisons between breeds could be made.

2.2. Animals

Weaned heifer calves, bought from commercial suckler herds, were 8 months of age at the initiation of the trials. The heifers were fed 2.0 kg of grain daily and grass-clover silage *ad libitum* indoors at Götala Research Station during two weeks prior to the start of the trials. Trial 1 included 56 heifers with at least 75% Charolais breed and trial 2 included 56 heifers with at least 75% Angus breed. Charolais heifers had an average initial liveweight of 291 (SD 35) kg and Angus heifers had an average initial liveweight of 203 (SD 38) kg. During indoor periods, heifers of each breed were housed in eight pens with two pens per treatment combination of feed intensity and slaughter age. One Charolais heifer and five Angus heifers were excluded from the study at time of turn-out to pasture; one