High quality sustainable beef from the dairy sector: dairy cows and crossbred calves

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Introduction: Beef from dairy offspring have low carbon footprint per kg carcass (Mogensen et al., 2015), and poses an opportunity for sustainable production of high quality beef in line with the Danish demands. Jersey is known for their high eating quality and high marbling degree, but also for low growth rates (Cole et al., 1964). Beef crossbreeding could address this issue and result in increased growth rates, feed efficiency and better carcass characteristics compared with purebred Jersey (Jaborek et al., 2019). This research aims to examine the opportunities for high quality beef production from beef sire × Jersey cow crossbreeds in comparison with meat from highly marbled Holstein (HOL) dairy cows and HOL × Danish Blue (H×B) calves.

Materials and Methods: Thirty-five crossbred Jersey calves (Jersey × Angus (JA) and Jersey × Hereford (JH)) were raised on pasture at two farms from 3 mos. of age with 8 heifers and 8 steers on farm 1 and 7 heifers and 12 steers on farm 2. Bulls were castrated at 4 mos. of age. The animals were slaughtered between 16 18 mos. Finishing with access to roughage and either restricted concentrate (farm 1) or ad libitum dry rolled grain (farm 2) started 2 4 mos. before slaughter. Slaughter weights were 214 ± 18 kg for heifers and 248 ± 31 kg for steers. From each animal, longissimus lumborum muscle (LL) from the fifth lumbar vertebra and supraspinatus muscle (SS) were removed. Eighteen days post mortem, pH, color (Minolta, 30 min. blooming), Warner-Bratzler shear force (WBSF) and intra-muscular fat (IMF) content (Weibull-Stoldt and Soxhlet) was determined. Sensory descriptive analyses were performed on LL samples by a trained 9-member panel, evaluating aroma, flavor and texture (unstructured intensity scale from 0 to 15). The results were analyzed with the mixed model procedure in SAS® version 9.3. IMF and color of LL from Jersey crossbreeds were compared with LL from HOL dairy cows and H×B calves (8 12 mos.) measured 3 days post mortem.

Results: pH and lightness (L*) did not differ between crossbreeds, sex and farm, but LL from farm 2 were more red (a* = 28.0 vs. 26.1) and more yellow (b* = 13.2 vs. 11.9) than from farm 1 (farm 2 vs. farm 1, respectively). The same trend was found for SS (farm 2, a* = 29.3, b* = 13.6; farm 1, a* = 27.8, b* = 12.6). IMF content was higher in LL from farm 2 (4.1%) compared with farm 1 (2.9%), in JA crossbreds (4.1%) compared with JH (2.9%) and in heifers (4.5%) compared with steers (2.5%). For both LL and SS, there was a significant effect of farm on WBSF, where farm 2 resulted in lower WBSF than farm 1 (LL, 26 N vs. 41 N; SS, 38 vs. 46 N, respectively). The sensory analyses supported this, with more tender (8.8 vs. 7.5) and less chewy (6.8 vs. 8.3) LL meat from farm 2 than farm 1. LL from farm 1 scored significantly higher on meaty aroma than LL from farm 2 (8.6 vs. 7.9).

In comparison with LL from HOL dairy cows, LL from the Jersey crossbreeds perform similarly on both lightness (L* = 39.4 vs. 39.2), redness (a* = 24.3 vs. 27.1) and yellowness (b* = 11.8 vs. 12.5, respectively). LL from H×B calves were lighter (L* = 49.7), less red (a* = 21.8) and similarly yellow (b* = 11.5). LL from H×B calves had less IMF compared with Jersey crossbreeds (2.2% vs. 3.4%), whereas LL from the HOL dairy cows had the highest IMF contents (10.9%).

Conclusion: The two Jersey crossbreeds performed similarly on most of the meat and eating quality traits for the two muscles. Management due to feed, had a significant impact on redness, yellowness, IMF, WBSF, sensory texture and meat aroma. The Jersey crossbreeds are comparable in color with beef from older animals, but the amount of IMF and WBSF is dependent on finishing feeding and should be optimized in order to compete with mature beef.

Literature:

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