USE OF CARCASS-SIDE VOLUMES TO EVALUATE MEAT YIELD IN DOUBLE MUSCLED AND NORMAL CATTLE

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SUMMARY

To evaluate meat yield in double muscled and normal cattle a laser technique measuring carcass-side volumes was tested.

The trial was performed on 48 carcass-sides of young bulls, 24 double muscled (H: 12 Piemontese, HP, and 12 crossbred Piemontese x Friesian, HPxF) and 24 normal (N: 12 Piemontese, P, and 12 Friesian, F). Carcass-side weight (CSW), carcass-side length (CSL) and volumes (fore-quarter, FQV; hind-quarter, HQV; and total, CSV) measured before commercial dissection, and meat yield weights (fore-quarter, FQM; hind-quarter, HQM; carcass-side, CSM; 1st quality, 1QM; 2nd quality, 2QM; 3rd quality, 3QM; Longissimus dorsi, LDM) were recorded and some ratios were calculated. Data were studied by ANOVA, using a hierarchical model (2 x 2) with 12 replications, and total correlation matrix and linear regressions ($y = a + bx$) were also analysed.

Differences between double muscled and normal cattle were found in FQV (77.25±6.09 vs 72.49±5.04 l, $P \leq .001$) and in CSV/CSL (1.13±0.07 vs 1.03±0.07, $P \leq .05$), and differences among ethnic groups were found in HQV ($P \leq .05$), in CSW ($P \leq .05$), in CSL ($P \leq .001$), in meat yield weights (CSM, FQM, HQM, 1QM, 2QM, and LDM, $P \leq .001$), and in CSW/CSV and CSV/CSM ratios ($P \leq .001$). Among volume measures FQV was correlated with all recorded measures ($P \leq .01$), HQV with some of them (CSV, HQV, FQM, and 3QM, $P \leq .05$), and CSV with more (FQV, HQV, CSM, FQM, 1QM, 2QM, and 3QM, $P \leq .05$), thus some linear equations (x= CSV, FQV, and HQV; y= meat yield weights) could be calculated and tested for prediction of meat yield in cattle.

Introduction

The evaluation of carcass conformation is interesting in all beef cattle but it is essential in hypertrophied animals, in order to estimate the genetic value of bulls.

Few accurate information concerning carcass composition of double muscled animals are available from experiments involving complete anatomical or commercial dissection, and often the information are obtained from a little number of subjects (some time only from one). A recent complete research was performed in USA on cattle classed as "double muscled" but the animals American breeds represent a quite different type of muscular hypertrophy (Boccard, 1981).

Aim of this trial was to evaluate meat yield in double muscled and normal cattle measuring carcass-side volumes by a laser technique and using as references the results of the commercial dissection of carcasses.

Materials and methods

The trial was performed on 48 carcass-sides of young bulls, 24 double muscled (H: 12 Piemontese, HP, and 12 crossbred Piemontese x Friesian, HPxF) and 24 normal (N: 12 Piemontese, P, and 12 Friesian, F), slaughtered at 14-16 months of age and at 450-500 kg of live weight.

Before commercial dissection, 7 days from slaughtering, on each carcass-side was recorded the weight (CSW) and the carcass length (CSL), measured in the conventional EAAP method (De Boer et al., 1974).

In order to obtain fore-quarter (FQV), hind-quarter (HQV), and total volume (CSV) we utilised an experimental station, employing structured light illumination (laser), CCD sensor, optics and fast processing circuits, based on 3D non-contact sensors and systems for high speed acquisition and elaboration of 3D images,

named LARIS - Laser Range Imaging System (by Axis, USA) and applied to carcass measurement (by Pertel, Italy) (Lazzaroni and Pagano Toscano, 1993).

During the commercial dissection of the carcass-sides the meat yields from fore-quarter (FQM), hind-quarter (HQM), and carcass-side (CSM), the weights of 1st quality (1QM), 2nd quality (2QM), and 3rd quality meat (3QM), so as Longissimus thoracis et lomborum weight (LDM) were recorded and some ratios (CSW/CSV, CSW/CSL, CSV/CSL, and CSV/CSM) were calculated.

Data were studied by ANOVA, using a hierarchical model (2 x 2) with 12 replications, and total correlation matrix and linear regressions ($y = a + bx$) were also analysed.

Results and discussion

As showed in table 1, in animals with the same total carcass-side volume, few of the studied parameters differed between double muscled and normal cattle: the FQV (77.25±6.09 vs 72.49±5.04 l, $P \leq .001$) and the CSV/CSL ratio (1.13±0.07 vs 1.03±0.07, $P \leq .05$), both higher in double muscled animals and indicating a more blocky shape with a bigger fore-quarter.

Significant differences among ethnic groups were found in most of the recorded parameters (table 2): in HQV ($P \leq .05$), in CSW ($P \leq .05$), in CSL ($P \leq .001$), in meat yield weights (CSM, FQM, HQM, 1QM, 2QM, and LDM, $P \leq .001$), and in CSW/CSV, CSW/CSL, and CSV/CSM calculated ratios ($P \leq .001$), with F presenting the less favourable values. No significant differences were found only in FQV and CSV/CSL ratio, in which influence of muscular hypertrophy is higher, and in CSV and 3QM.

Among volume measures FQV was correlated with all recorded measures ($P \leq .01$), HQV with some of them (CSV, HQV, FQM, and 3QM, $P \leq .05$), and CSV with more (FQV, HQV, CSM, FQM, 1QM, 2QM, and 3QM, $P \leq .05$; table 3).

The linear equations were calculated and tested for prediction of meat yield in cattle, and the significant ones were reported in table 4. In order to evaluate the meat yield related to wholesale cuts quality the FQV gave the most interesting equations.

Conclusion

In animals, with the same total carcass-side volume, the fore-quarter volume and the carcass-side volume/length ratio give a good evaluation of the shape, that provide a characterisation of double muscled cattle. The hind-quarter volume seems be more influenced by the ethnic group, so as the carcass-side weight/volume ratio.

The fore-quarter volume, correlated to all the recorded measures, is the most interesting parameter to characterise the hypertrophic carcasses and to evaluate the meat yield of wholesale cuts quality.

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