



Effects of chicory roots on finishing performance and CLA and fatty acid composition in longissimus muscle of Friesian steers

Mogens Vestergaard, H. Refsgaard Andersen,
P. Lund*, T. Kristensen, L. Lydehøj Hansen
and K. Sejrsen

Danish Institute of Agricultural Sciences, Tjele,

*Danish Technical University, Lyngby, Denmark

Background



- Low profitability is believed to be the greatest hindrance for a more extensive use of dairy breed bull calves in organic beef production systems
- Among certain consumers, there is an increasing interest for organic beef production
- However, there is a need for reliable information about and documentation for production parameters, methods for rearing and housing, feeding strategies etc. to be able to increase the consumption of beef meat based on dairy calves in Denmark
- Specifically, we believe there will be increased focus on improving animal health and welfare and product quality in the steer production systems
- There will also be a wish from the society and EU to use and preserve the biodiversity of the marginal grazing areas

Background



- The project reported here arises from a larger project investigating the effects of grazing system (set stocking vs. two-paddock rotation) for steers and the use of bioactive crops (especially chicory)
- Chicory is used because of the possible positive influence on animal health, i.e., parasite control, meat quality and sensory quality of meat from both steers and pigs (including CLA content, selenium and antioxidative status, drip loss and boar taint/androstenone levels)
- The overall objective of the entire project was to develop production methods/strategies that could improve the quality aspects of organic meat

Chicory



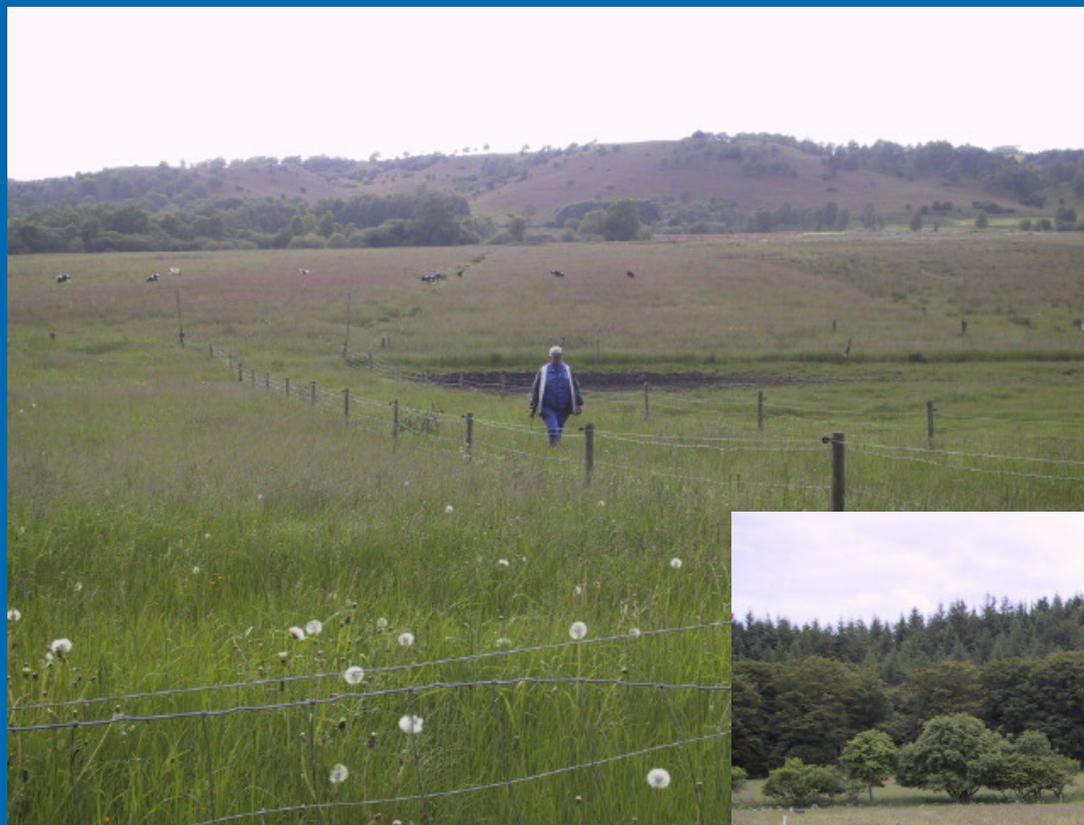
Objective



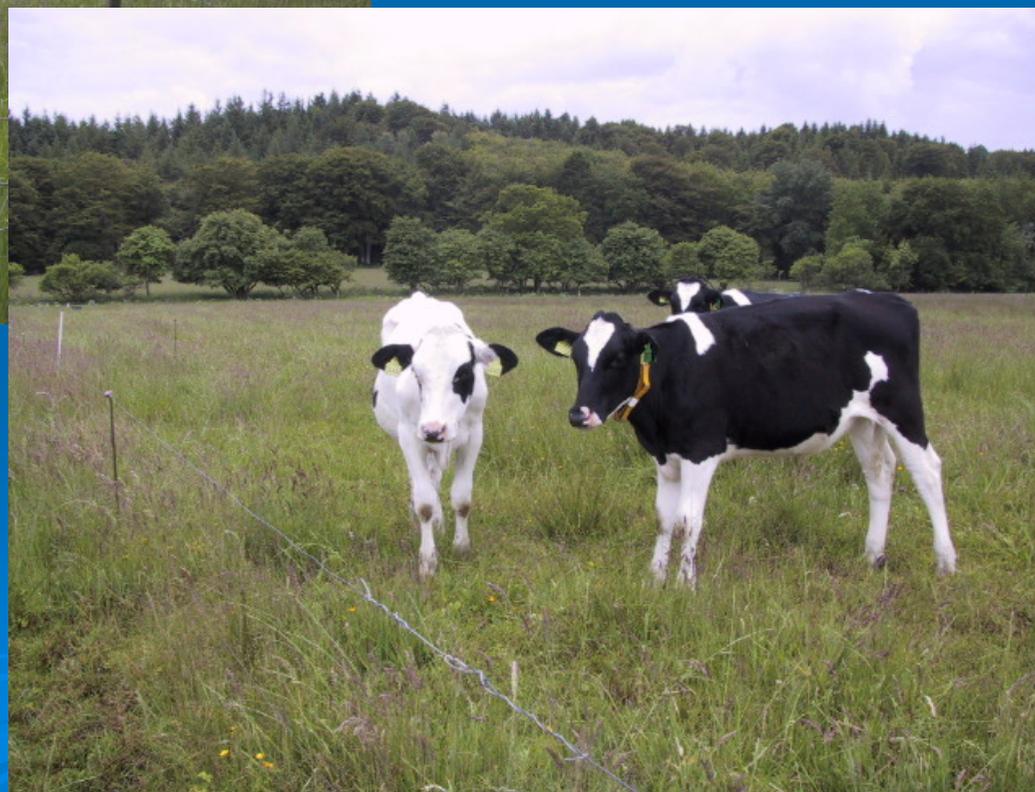
- Investigate the influence of a bioactive crop, chicory roots, on performance, carcass quality and fatty acid composition and CLA content of meat from finishing-fed steers

Material and Methods (I)

- 40 autumn-born Friesian bull calves
 - Bull calves were castrated at 2 mo. of age
 - Steer calves were grazing lowland non-fertilized pastures for two summers
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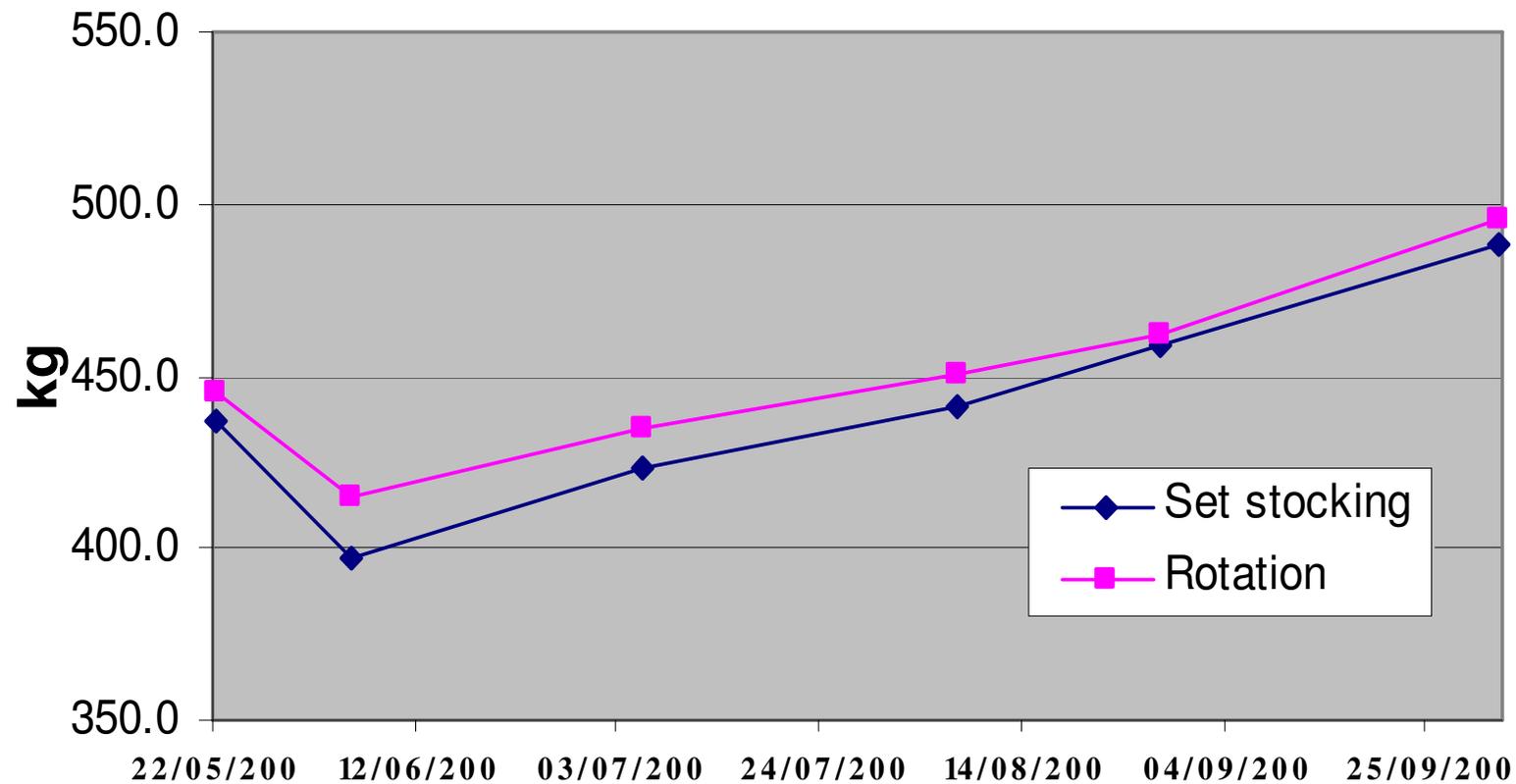
Low land organically-farmed pastures (wet marginal grasslands) at Fussingø



Material and Methods (II)

- 40 autumn-born Friesian bull calves
- Bull calves were castrated at 2 mo. of age
- Steer calves were grazing lowland non-fertilized pastures for two summers
- During the 2nd summer, growth rate (ADG) was 380 g/d

Live weight changes during 2nd summer depending on grazing system (Set stocking vs. Rotation)



(Kristensen et al., in preparation)

Material and Methods (III)



- In October, at two years of age (492 kg LW), steers were housed in tie stalls and finishing-fed for 10 weeks
- In total, 39 steers completed the finishing period
- LW every two weeks
- Daily individual feed intake recordings
- Carcass evaluation at slaughter
- Intramuscular fat in *M. longissimus*
- Fatty acid composition including CLA in *M. longissimus*
- Sensory analysis (Derek V. Byrne, KVL, Copenhagen)

Material and Methods (IV)

Design of experiment



- Steers were allocated to 4 treatment groups based on sire (n=3), block (n=5) and previous grazing system (n=2):
 - B-1.7: 1.7 kg DM of barley
 - B-3.4: 3.4 kg DM of barley
 - C-1.7: 1.7 kg DM of chicory roots
 - C-3.4: 3.4 kg DM of chicory roots
- Treatments were arranged in a 2 x 2 factorial design with two types (B vs. C) and two levels (1.7 vs. 3.4) of concentrates
- Beside the fixed concentrate allowances, steers had free access to medium quality clover grass silage

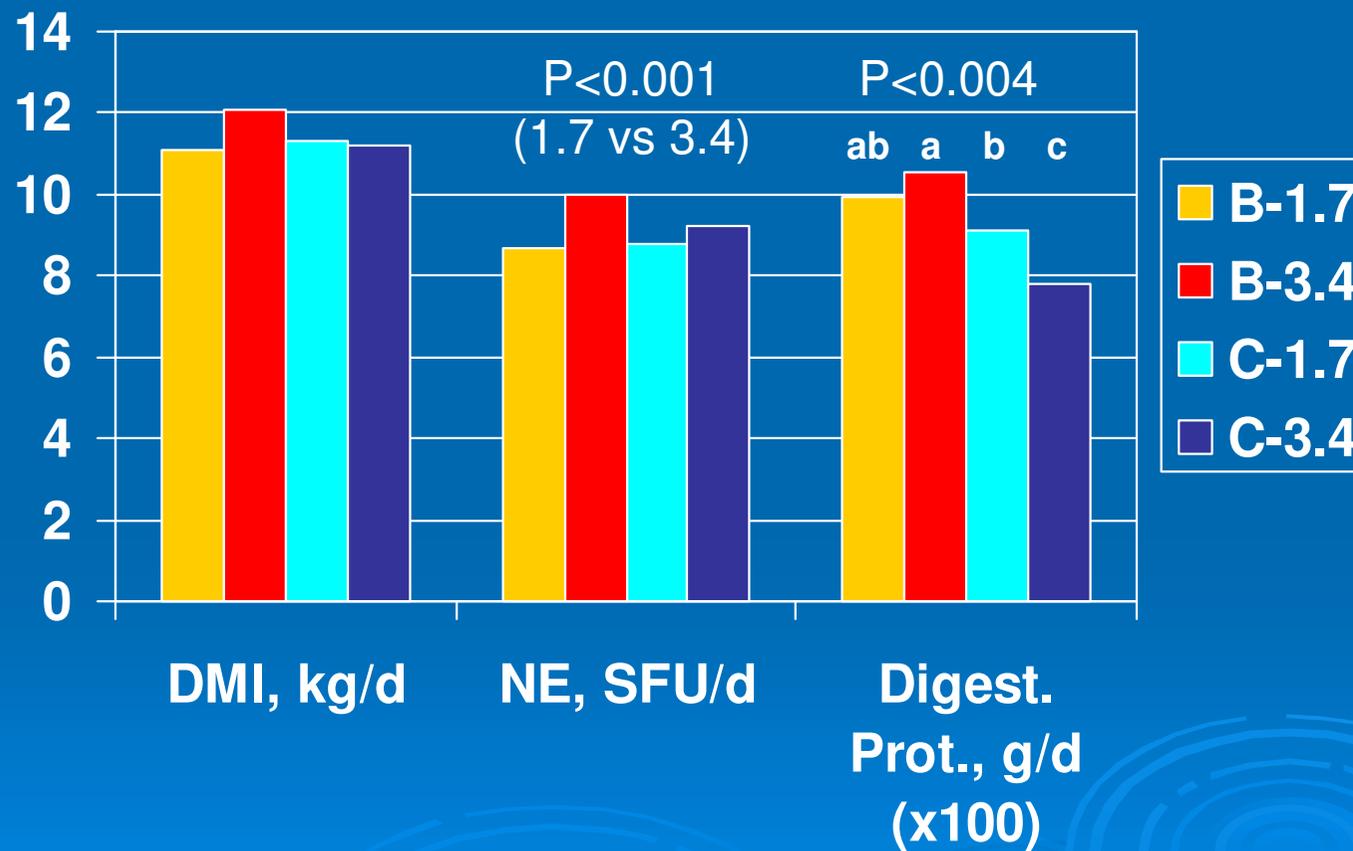
Results



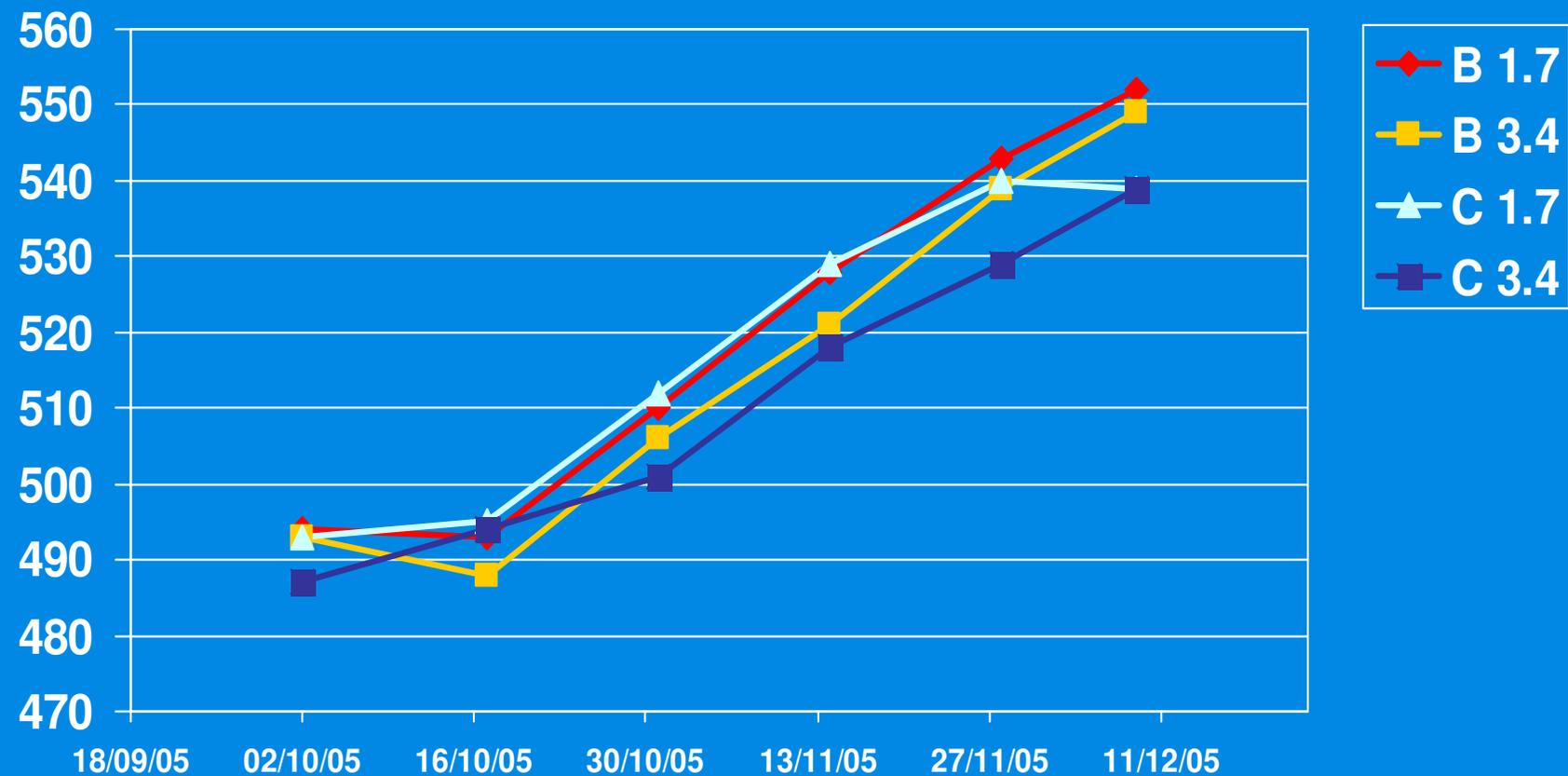
Results

- All chicory roots were eaten
- The high concentrate level increased total ME intake ($P < 0.001$)
- Digest. protein intake was affected ($P < 0.004$)
- Overall, there was no difference in ADG (887 ± 40 g/d) between treatments, but numerically, C-steers gained 13% ($P < 0.12$) less than B-steers.

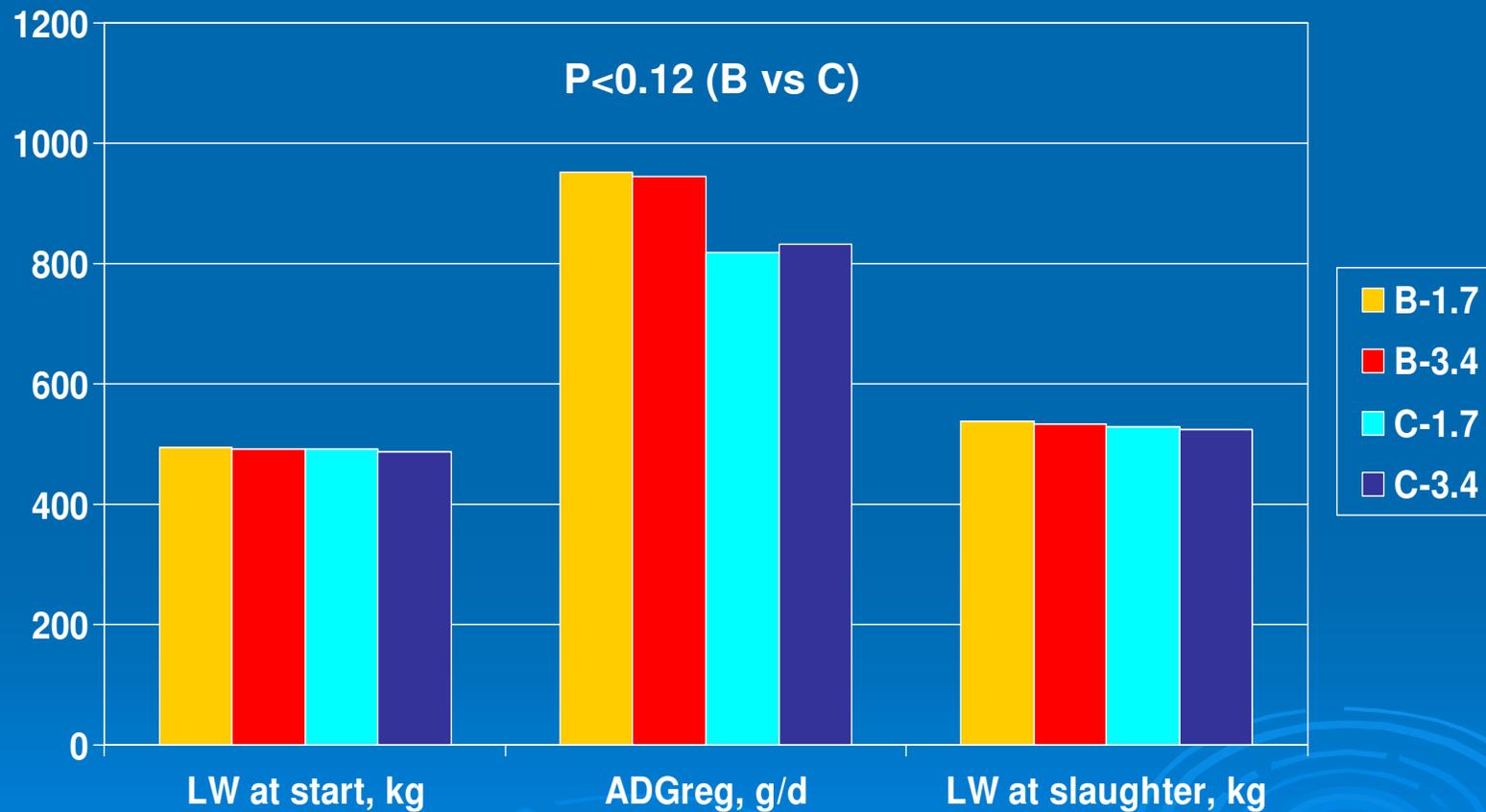
Feed intake of steers during finishing



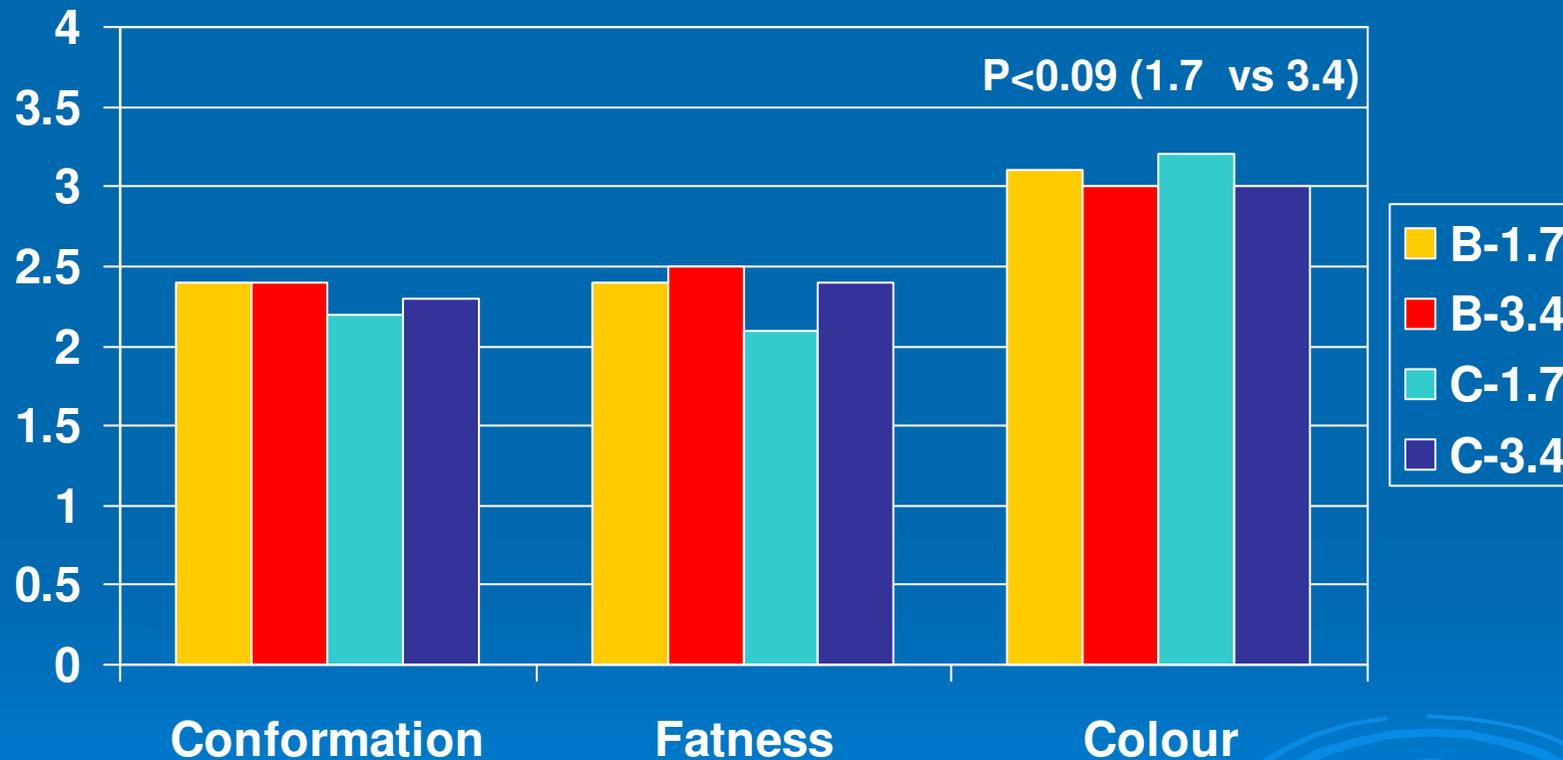
Growth curves for the four treatment groups during finishing feeding



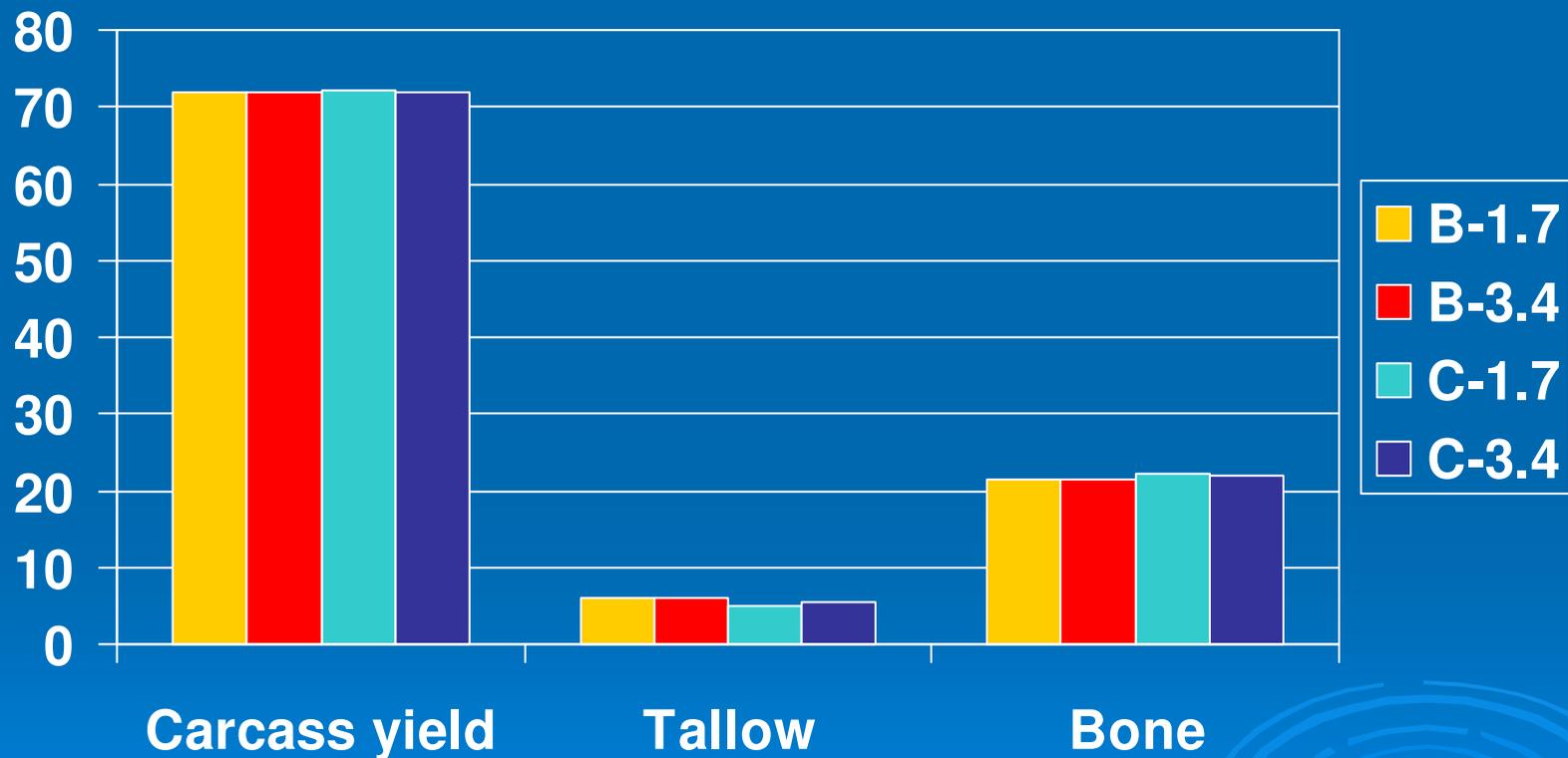
LW at start and at slaughter and ADG during finishing



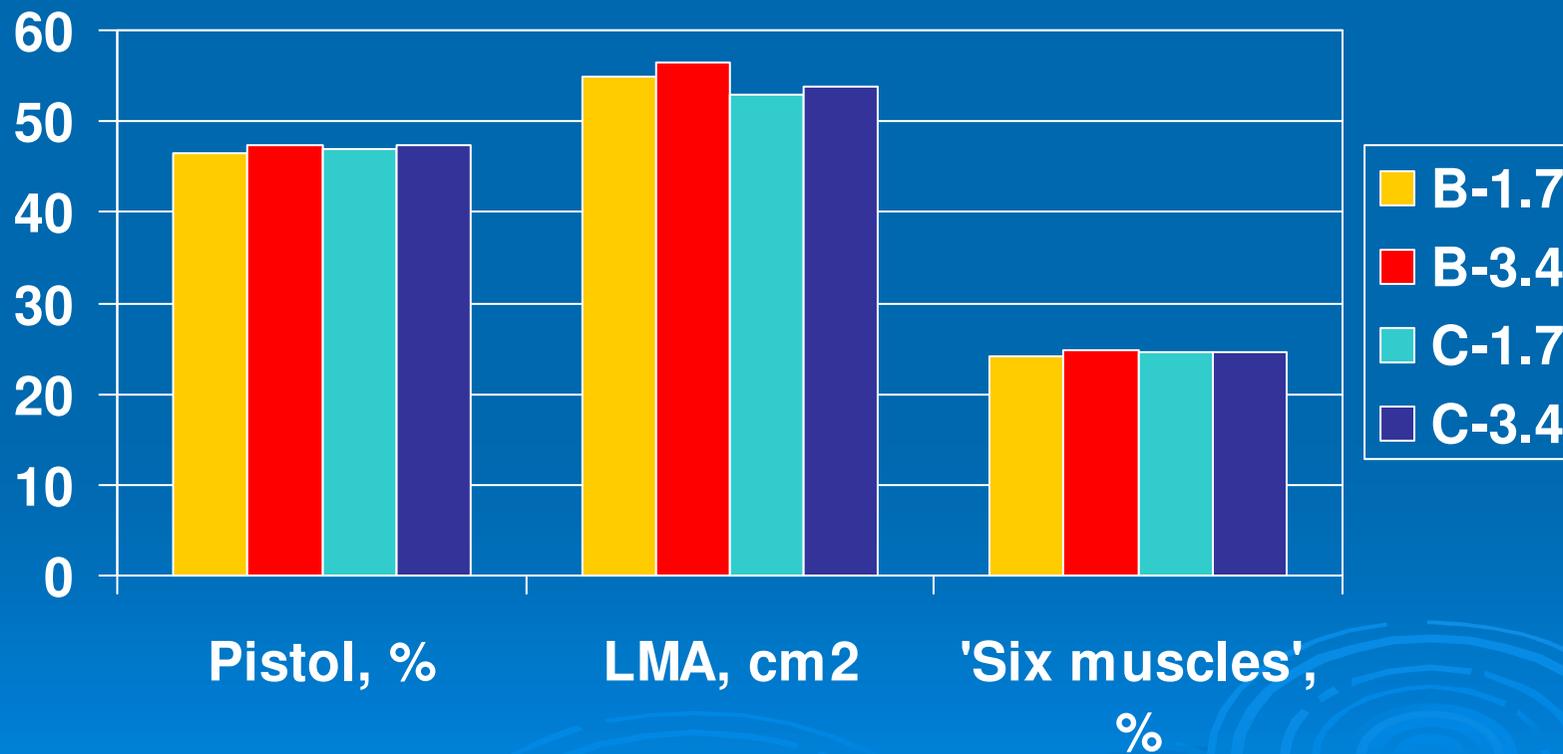
EUROP Conformation and Fatness and Lean/fat colour of steers



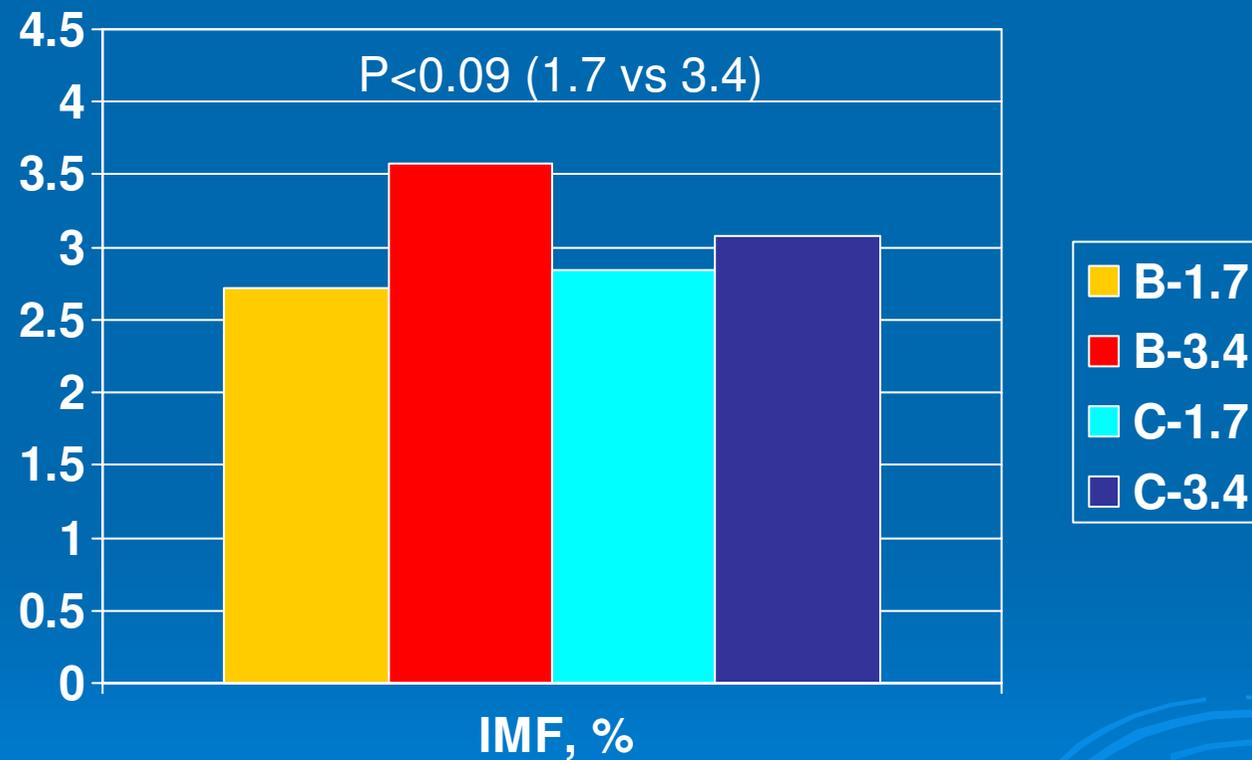
Carcass yield, tallow and bone in carcass estimated by KKC-2 (n=34)



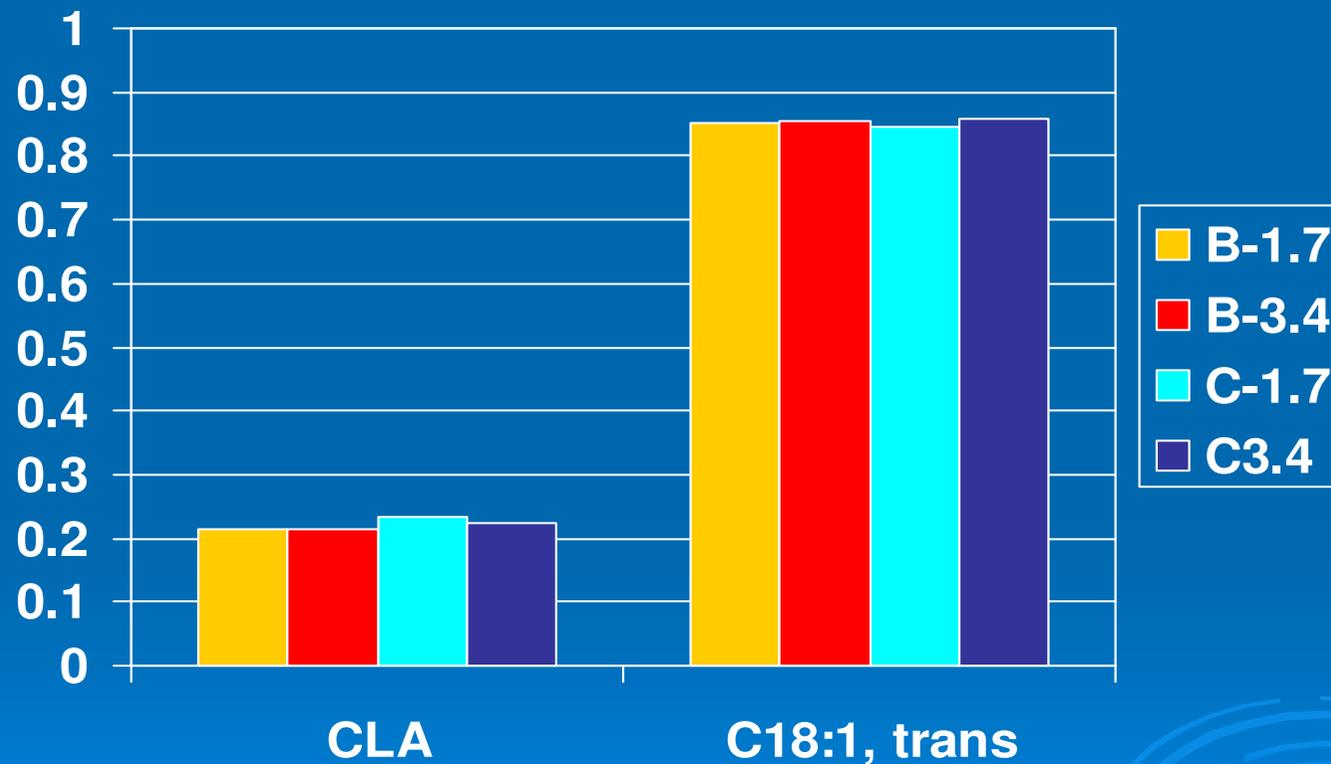
Pistol percentage, Longissimus muscle area (LMA) and 'six muscles percentage' (n=34)



Intramuscular fat (IMF) in *M. longissimus* of steers



CLA, *cis-9, trans-11* and vaccenic acid (C18:1, *trans-11*) in *M. longissimus*



Intramuscular fat and fatty acid composition in *M. Longissimus*

- The high concentrate level increased IMF ($P < 0.09$)
- Neither treatment affected the content of *cis*-9, *trans*-11 CLA (0.22 mg/100 mg of FA), vaccenic acid (C18:1, *trans*-11) or linoleic acid (C18:2 n -6)
- Longissimus muscle of C- compared with B-steers had 10% less C18:0 ($P < 0.01$) and 7 to 17% more C16:1, C18:1 and C18:3 ($P < 0.03$)

Eating quality – sensory profile

- Derek V Byrne et al. (in preparation)
- Next year.....



Conclusions (chicory vs. barley)



- The results showed that steers finishing-fed with 15 to 30% of the net energy intake coming from chicory roots compared with barley had:
 - slightly lower gain
 - similar carcass quality
 - more unsaturated fat in the meat, but
 - similar CLA content in the meat

Acknowledgements

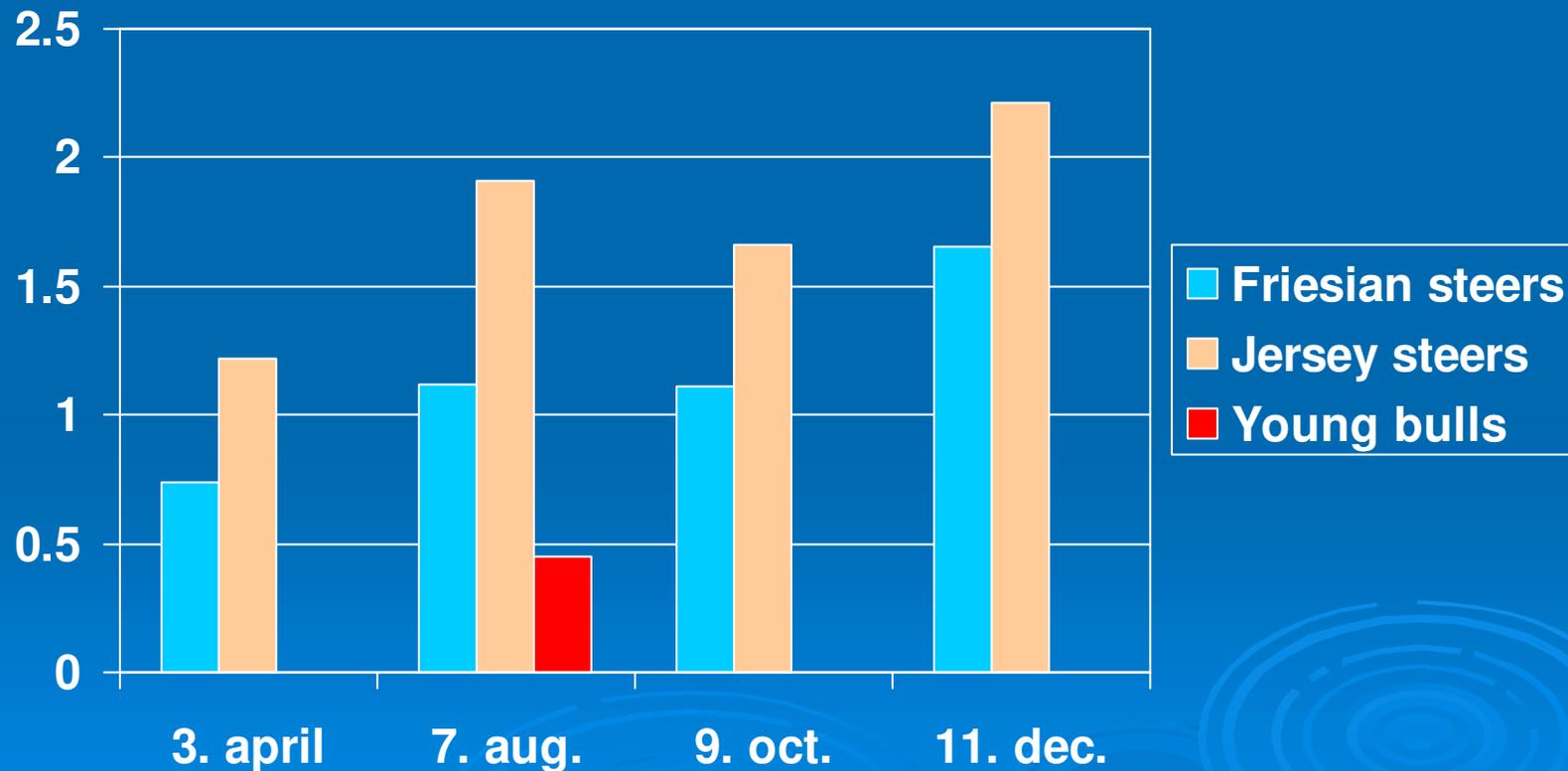


- The technical skills of research technicians (The FUSSINGØ crew) are greatly acknowledged. Body condition scoring was performed by Orla Nielsen. Financial support was received from DACROFF (FØJO II) under the project PROSBIO/PROSQUAL



CLA (C18:2, *cis*-9, *trans*-11) content in tallow from 44 Friesian and 44 Jersey steers and 10 reference-young bulls

(Vestergaard et al., 2003)



CLA And fatty acid composition in tallow from 44 Jersey steers (Skovgaard)

(Vestergaard et al., 2003)

