

# THE CARCASS QUALITY OF SOME CATTLE BREEDS AND THEIR CROSSES

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## INTRODUCTION

Diferent countries try to maintain the balance between milk and beef production in different ways. Thus e.g. the USA and Canada produce milk almost exclusively with highly specialized dairy breeds and therefore their carcass quality is in a subordinate position. In these countries beef production is regulated mostly by the ratio of specialized beef breeds. In European countries most beef is produced with dual purpose breeds where some more emphasis is given to the genetic progress for milk production than for beef; so a decreasing tendency has been noticed in the carcass quality of dual purpose breeds. There exists a similar trend also in our country.

Milk production per cow increases faster than the needs for milk, therefore the needs for milk, therefore the number of cows for milk production decreases gradually. In order to prevent beef production from decreasing as well there is a need for increased cattle breeding exclusively for beef. Another possibility for increase and particularly for an improvement of carcass quality is crossing of that part of dairy and dual purpose breed cows which for any reason do not contribute to herd reproduction with the best beef breeds.

Numerous authors have been studying carcass quality of separate breeds and their crosses and the possibilities for its improvement (Beström, 1973; Candiff, 1970; Čepin, 1978-1984; Končar et al., 1970, Ernst, 1967, 1970; Leuenberger et al., 1977; Neuman, 1977; Osterc et al. 1978-1983; Otto and Tilsch, 1976 and others). The majority of these authors present very favourable results of crossing which has been known for a long time in pig-

breeding and in poultry-breeding. The purpose of our research was to widen the study of carcass traits by studying muscle fibres and the sensoric qualities of roasted meat. The diameter and number of muscle fibres are in close connection with growth capacity (Osterc, 1974; Staun, 1972), while the connection with carcass quality is still less known and calls for intensive examination.

## MATERIAL AND METHODS

The study comprises results of eight different experiments performed in the last ten years where the fattening and carcass results of our most important breeds and their crosses such as charolais, limousin, angus, simmental, brown and holstein-friesian were examined.

In the experiment 256 bulls were slaughtered and their right sides used for dissection into separate more important parts of carcass sides where lean meat, lightly separable fat, bones and tendons were separated. On the cross section between the first and the hind quarter (the sixth and the seventh or the seventh and the eighth rib) the diameter and the number of muscle fibres were determined on samples of the musculus longissimus dorsi. In all breeds and crosses the sensoric qualities of roasted meat were examined on six samples of lean meat of long. dorsi muscle (between the sixth and the tenth rib) by classification with 1 to + where 1 is the worst and + the best mark.

The results of different experiments have been treated by the least square method; the total results are presented only in mean values.

## RESULTS AND DISCUSSION

The table presents some more important results of experimental slaughter, dissection of carcass sides, examination of muscle fibres and study of the sensoric qualities of roasted meat.

## RESULTS OF EXPERIMENTAL SLAUGHTER

	Charolais n=8	Brown x Charolais n=16	Brown x Limousin n=27	Brown x Angus n=22	Brown x Simmental n=12	Simmental x Limousine n=8	Simmental n=63	Brown n=68	Brown x Brown Swiss n=8	Brown x Holstein Friesian n=8	Holstein-Friesian n=16
Weight before slaughter, kg	570	552	498	448	522	512	530	506	483	481	476
Dressing percentage	61,7	61,2	61,5	60,5	59,8	60,8	59,5	59,2	58,2	57,9	56,8
Carcass composition, %											
- lean meat	75,6	75,0	75,3	74,2	74,4	75,5	74,0	73,9	71,1	70,9	69,3
- fat	8,9	9,1	9,1	10,0	9,4	8,8	9,2	9,2	10,8	11,0	11,3
- bones	14,0	14,3	14,1	14,2	14,7	14,1	15,2	15,4	16,6	16,6	17,8
- tendons	1,5	1,6	1,5	1,6	1,5	1,6	1,6	1,5	1,5	1,5	1,6
% meat per weight before slaughter	46,6	45,9	46,3	44,9	44,5	45,9	44,0	43,7	41,4	41,1	39,4
Lean meat: bones	5,4	5,2	5,3	5,2	5,1	5,4	4,9	4,8	4,3	4,3	3,9
Lean meat: fat	8,5	8,2	8,3	7,4	7,9	8,5	8,0	8,0	6,6	6,4	6,1
Muscle fibre diameter	58,2	64,3	67,0	59,2	-	59,7	59,9	62,3	65,1	-	67,2
Number of muscle fibres per mm <sup>2</sup>	390	375	311	371	-	397	351	348	329	-	335
Number of muscle fibres on the cross section of MLD (in 000)	2.531	1.926	1.680	1.907	-	1.822	2.109	2.015	1.600	-	1.765
Sensoric results:											
- tenderness	5,5	5,6	5,9	5,6	5,4	5,2	4,5	5,2	5,0	4,9	4,7
- juiciness	5,2	4,9	5,1	5,3	3,4	4,6	4,2	4,2	3,6	2,9	2,9
- flavour	4,7	4,8	4,5	5,4	3,7	4,3	4,5	4,4	3,8	3,3	3,0

The animals were slaughtered at the optimal degree of fattening, so their live weight varied from the lowest 448 kg with crosses between brown and angus to the highest 570 kg with pure charolais breed. The mean weight of all groups of animals before slaughter (after 24 hours of fastening and transport) was 507 kg.

The reessing percentage as one of the objective criteria of carcass quality was high on the average: 59,7 % with significant variations between 56,8 % with specialized dairy holstein friesian breed and 61,7 % with pure charolais breed. The dressing percentage was significantly better with the charolais breed and with crosses of beef breeds and dual purpose breeds in comparison with combined simmental and brown breed; it was the worst with pure holstein friesian breed and its crosses and with crosses of the brown swiss breed.

The most objective indicator of carcass quality is the carcass composition with regard to the percentage of lean meat, lightly separable tallow, bones and tenders and amounted on the average to 73,6 % of lightly separable tallow, 15,2 % of bones and 1,5 % of tenders. The carcass composition with over 75 % of lean meat, 9 % of fat and a good 14 % of bones was found in bulls of pure charolais breed and crosses of charolais and limousin. A little, but not significantly worse carcass quality is that of bulls of dual purpose breeds (simmental and brown), while significantly the worst carcass composition is that of pure holstein friesian breed and crosses of holstein friesian and brown swiss.

A very good objective indicator of carcass quality is the percentage of lean meat on live weight before slaughter which comprises dressing percentage as well as carcass composition and amounts on the average to 44,0 %. Also according to this measure the best carcass quality was established with pure charolais breeds and crosses of charolais and limousin and the worst with pure holstein friesian breed and crosses of holstein friesian and brown swiss. The ratio between meat and bones and meat and tallow in carcass sides shows us a similar succession of carcass quality.

The diameter and number of muscle fibres are important parameters for growth capacity (Osterc, 1974; Lawrie, 1985). The connection between the diameter and the number of muscle fibres and carcass quality has been less

studied, although several authors present positive correlations between the number of muscle fibres on the cross section of the musculus longissimus dorsi and the animal's fleshness (Osterc et al. 1974, 1976).

In our case there were no significant differences between groups in the muscle fibre diameter which is on the average  $63 \mu$ ; this is due to great variability. Nevertheless there exists a tendency towards a smaller diameter on the average with beef breeds and their crosses and a greater one with the specialized dairy breed. The mean number of muscle fibres per  $\text{mm}^2$  is 356 with the reversed trend than, that of the muscle fibre diameter, but for the same reason the differences are not significant. The total number of muscle fibres on the cross section of MLD was on the average 1.928.000. The differences between breeds and crosses are great and significant. On the one hand there is the charolais breed with the greatest number of muscle fibres and on the other hand the holstein friesian breed and crosses of the brown breed with brown swiss and with brown limousin with the smallest number of muscle fibres on the cross section of MLD.

In the evaluating of sensoric qualities the mean values were 5,2 points for tenderness, 4,2 for juiciness and 4,2 for flavour. Because of the low number of samples and the great variability there were no significant differences between groups; there was a slight tendency of worse sensoric qualities with pure holstein friesian and breed and with crosses of holstein friesian and brown swiss.

The examination of muscle fibres as well as of sensoric qualities did not give us satisfactory results so that these researches will have to be pursued and made thorough.

#### CONCLUSION

Studying of the quality of carcass sides and meat with different breeds and their crosses has shown great and significant differences in the dressing percentage and carcass composition of dairy and beef breeds; dual purpose breeds and crosses of dual purpose and beef breeds stay only a little behind the beef breeds.

Studying of the diameter and number of muscle fibres has shown that because of a great variability within breeds there were no significant differences between them, although a strong tendency is indicated of a greater muscle fibre diameter and a smaller number of muscle fibres per  $\text{mm}^2$  and on the entire cross section of the long dorsal muscle with dairy breeds their crosses.

Also testing of the sensoric qualities of roasted meat gave no significant differences because of a smaller number of samples and considerable variability, although here, too, a tendency of lower meat quality is indicated with dairy breeds and their crosses.

#### REFERENCES

1. Bergström, P.L., 1973: Gebruikskruising voor vleesproductie bij rundvee. Rapport B 117, I.V.O. Schoonoord, Zeist.
2. Candiff, L.V., 1970: Experimental Results on Crossbreeding Cattle for Beef Production. J. Animal Sci., 30, 5, 694-705.
3. Čepin, S., 1977: Dosadašnja istraživanja kapaciteta naših pasmina goveda za proizvodnju mesa i mogućnosti za njihovo poboljšavanje. Kvalitet mesa i standardizacija. Zbornik V. jugoslov. savj. o problemima kvalitete mesa, Sarajevo.
4. Čepin, S., 1979: Pitovne in klavne lastnosti rjave in lisaste pasme. SK 3, 132-235.
5. Ernst, E., 1970: Erfahrung mit Charolais-Kreuzungen. Der Tierzüchter, 19, 14, 465-467.
6. Ernst, E., 1970: Die Effektivität der Einkreuzung von Charolais-Bullen und Deutsche Schwarzbunte Rinder aus Züchterischer und ökonomischer Sicht. Züchtungskunde 42, 1, 12-23.
7. Lawrie, R.A., 1985: Meat Science. Fourth edition. Pergamon Press, Oxford.
8. Leuenberger et al., 1977: Gebrauchskreuzungen mit Fleischrassen. Ergebnisse und vorläufige Schlussfolgerungen, Schweiz. landwirt. Monatshefte 55, 5/6, 138-150.

9. Končar, L. et al., 1970: Efekat ukrštanja domačeg šarenog goveda sa charolais pasmom na toвне i klanične osobine. Savremena poljoprivreda 1.
10. Neuman, A.L., 1977: Beef Cattle. Seventh Edition. John Wiley & Sons, New York.
11. Osterc, J., 1974: Diameter and number of muscle fibres in musculus longissimus dorsi in connection with production properties of some cattle breeds in Slovenia. Dissertation, Ljubljana, Yugoslavia.
12. Osterc et al., 1976: Studies of muscle fibres in bulls of brown breed and in crossbreeds with brown swiss, The 4<sup>th</sup> Yugoslav, Livestock Conference, Mostar.
13. Osterc, J. et al., 1978: Prireja mesa in klavna kakovost bikcev rjave (R) in lisaste (L) pasme ter njihovih križancev s charolais in limousin. Znanost in praksa v govedoreji 2. zvezek.
14. Otto, E., Tisch, K., 1976: Schlachtwert von Fleischrinderbullen. Tierzucht 3.