

A COMPARISON OF CARCASS AND MEAT CHARACTERISTICS OF  
HEREFORD AND HEREFORD X CHAROLAIS CROSS STEERS<sup>1/</sup>

W. H. Kennick, <sup>2/</sup> Joe D. Wallace, <sup>3/</sup> R. J. Raleigh, <sup>3/</sup> and Lois A. Sather <sup>4/</sup>  
Oregon State University  
Corvallis, Oregon

There is a considerable interest in Charolais cattle and their crossbred offspring in the United States. However, there has been very little research reported concerning the productivity of Charolais cattle or their crossbred offspring and even less concerning their meat characteristics as determined by cooking and flavor evaluation. The production data which have been published (Damon *et al.* 1959, Damon *et al.* 1960, and Klosterman *et al.* 1963) generally indicate a superior rate of gain for Charolais and Charolais-British crosses as compared with straight British breeds.

Damon *et al.* (1960) and Klosterman *et al.* (1963) reported that Charolais crosses produced carcasses which graded lower than carcasses from British breeds but because of their having less fat the carcasses from Charolais crossbreds yielded a higher percent of trimmed edible meat. Both research groups reported that the carcasses from crossbreds had lower marbling scores than did the carcasses from British breeds.

#### EXPERIMENTAL PROCEDURE

Fifty-six uniform Hereford cows were stratified according to age and randomly allotted to two breeding groups. In 1960 one group was bred to a Charolais bull while the other group was bred to Hereford bulls in a multiple sire breeding program. In 1961 the mating scheme of the two groups was reversed. Steer calves (18 crossbred and 15 Herefords in two years) from these groups were placed on a finishing ration about 60 days after weaning and fed until the average for all steers was approximately 450 kg. This required 207 and 228 days for the 1961 and 1962 calf crops, respectively.

The steers were slaughtered at a commercial abattoir where slaughter and carcass data were obtained. The 10-11th rib from the left side of each carcass was purchased for cooking and flavor tests. Each cut was aged ten days before being wrapped in aluminum foil and locker paper, sharp frozen at  $-30^{\circ}\text{C}$  and held at  $-18^{\circ}\text{C}$  until cooking tests were initiated.

#### COOKING TEST

The frozen rib roasts were removed from storage immediately prior to cooking. The roasts were weighed, placed rib side down in weighed open roasting pans, after which they were placed in an oven which had been preheated to  $160^{\circ}\text{C}$ .

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<sup>2/</sup> Department of Animal Science.

<sup>3/</sup> Squaw Butte Experiment Station, Burns, Oregon.

<sup>4/</sup> Department of Food Science and Technology.

From three to six roasts were cooked in a commercial style gas oven at the same time. After two hours in the oven, the roasts were removed, thermocouples quickly inserted into the center of the eye muscle (Longissimus dorsi) and the roasts immediately returned to the oven. The thermocouples were attached to a recording potentiometer. The roasts were cooked to an internal temperature of 71°C. The weight of the cooked roasts and the pans plus drip were recorded. In determining the minutes per kilogram to cook, no time was deducted for the time roasts were out of the oven for insertion of the thermocouples.

#### FLAVOR TESTING

Lean samples approximately 4 mm thick were taken from the center of the rib eye muscle. Fat samples were taken from the seam of fat between the Longissimus dorsi and Lattissimus dorsi muscles. The samples were served on warm porcelain dishes to judges seated in individual flavor testing booths. A trained flavor panel composed of staff and employees of the Food Science and Technology and Animal Science Departments scored the samples. Most of the eleven members of the panel served both years.

A seven point scale was used to record the degree or intensity of the flavor of lean, juiciness, tenderness, flavor of fat and overall desirability.

#### RESULTS AND DISCUSSION

The slaughter and carcass data are summarized in Table 1. The crossbred steers were heavier at slaughter and, with no significant difference in dressing percentage, produced heavier carcasses.

Table 1. Dressing percentage and carcass data for Hereford and Hereford X Charolais steers.

Breed	1962		1963		Two year average	
	H	CXH	H	CXH	H	CXH
Number	5	6	10	12	15	18
Slaughter weight, kg.	441.8	489.4**	423.7	479.9**	429.7	483.1**
Warm carcass weight, kg.	266.5	302.0**	259.1	286.4**	261.6	291.6**
Dressing percentage	60.3	61.7	61.2	59.7	60.9	60.4
Conformation score <u>1/</u>	15.2	14.8	17.0	16.9	16.4	16.2
Marbling score <u>2/</u>	7.2	5.8	8.2	5.7*	7.9	5.7*
U.S.D.A. grade <u>3/</u>	12.8	12.3	13.8	12.4*	13.5	12.4*
Fat thickness, mm	8.0	8.2	9.9	6.5**	8.6	7.1*
Loin eye area, sq. cm.	68.4	76.1*	67.7	74.8*	67.7	75.5**
Yield grade <u>3/</u>	2.8	2.8	3.1	2.7*	3.0	2.7

\*\* P < .01 within time period.

\* P < .05 within time period.

1/ 11 = Av. standard, 14 = av. good, 17 = av. choice.

2/ 6 = Av. traces, 9 = av. slight amount.

3/ 2 = 53.1% and 3 = 50.8% trimmed retail cuts from the round, loin, rib and chuck.

There was no significant difference in conformation but the crossbred steers had significantly less marbling in 1963 and for the two years combined had lower U.S.D.A. grades. The crossbred steers produced leaner carcasses, larger loin eyes and a higher percent of trimmed edible meat. The difference in trimmed edible meat was significant in 1963 but not in 1962.

Table 2. Sample weight, cooking loss and minutes per pound to cook rib samples

Breed	1962		1963		Two year average	
	H	CXH	H	CXH	H	CXH
Raw weight, kg.	2.59	2.69	2.24	2.26	2.36	2.40**
Cooked weight, kg.	2.02	2.09	1.72	1.78	1.81	1.91**
Percent total loss	21.71	22.10	22.84	20.96*	22.5	21.33
Percent drip	7.77	6.09	8.31	5.99**	8.13	6.02**
Percent volatile loss	13.94	16.01	14.53	14.97	14.37	14.31
Min./kg. to cook	105.77	106.31	123.97	121.28	117.95	116.18**
Min./lb. to cook	47.98	48.22	56.23	55.01	53.50	52.70

\*\* P < .01 within time period.

1 kg = 2.2046 lbs.

\* P < .05 within time period.

The cooking tests, summarized in Table 2, indicate very small but highly significant differences between the groups for the data covering two years in all characteristics measured except percent cooking loss, which was significant only for the 1963. Cooking time is inversely related to sample weight and to percent fat in the sample; since Hereford steers produced lighter and fatter samples these two factors tend to counteract one another and confound the cooking results. Percent total loss and especially percent drip are closely associated with fat in a cooking sample. This is evident in a comparison of fat thickness and cooking loss data. The 1963 crossbred steers had significantly less outside finish which was reflected in a reduced cooking loss and percent drip. The combined data for the two years did not show a significant difference in percent total loss but did show a highly significant difference in percent drip.

The flavor test results, summarized in Table 3, indicate a small but significantly higher flavor of fat in crossbreds for 1962 which was reversed and non-significant in 1963. The significantly higher marbling scores for Hereford steers in 1963 was reflected in a significantly higher juiciness score (Blumer, 1963). When the data for the two years were analyzed together, taking out year effect, there were no significant differences in any flavor factors evaluated.

Table 3. Flavor 1/ panel evaluation of rib roasts

	1962		1963		Two year average	
	H	CXH	H	CXH	H	CXH
Tenderness	4.25	4.05	4.85	4.60	4.65	4.42
Juiciness	5.13	5.08	5.00	4.62*	5.04	4.77
Flavor of lean	5.26	5.30	5.12	5.04	5.17	5.13
Flavor of fat	4.57	4.93*	4.95	4.70	4.82	4.78
Overall score	4.77	4.60	4.94	4.63	4.88	4.62

\* P < .05 within time period.

1/ Flavor factors scored on a 1 to 7 intensity scale, 1 the lowest and 7 the highest possible score.

It is evident from the design of this experiment that it does not compare Hereford and Charolais cattle as total populations. It does, however, add to the weight of evidence for this comparison and provide some information on the use of these breeds in crossbreeding.

#### SUMMARY

A comparison of carcass, cooking, and flavor characteristics between Hereford and Hereford X Charolais crossbred steers was carried out on 33 steers over a two year period. The crossbred steers produced larger carcasses with larger loin eyes, less backfat and marbling, and lower U.S.D.A. grade than did the Herefords. There were small but highly significant differences in cooking losses and minutes per kilogram to cook attributable to size and fat content of the rib samples. The combined data for two years indicated that there was no significant difference in any flavor characteristic evaluated.

#### LITERATURE CITED

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