

## LIVE AND CARCASS CHARACTERISTICS OF BULLS AND STEERS CASTRATED AT THREE DIFFERENT AGES

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**OPSOMMING:** LEWENDE, LIGGAAMS- EN KARKASEIENSKAPPE VAN BULLE EN OSSE GEKASTREER OP DRIE VERSKILLENDE OUDERDOMME

Vier-en-vyftig Sussex bulkalwers is by geboorte toegeken aan die volgende 4 behandelings: (i) gekastreer binne 24 uur na geboorte met rubber-ringe, (ii) en (iii) gekastreer op 3 en 6 maande met 'n burdizzo en (iv) geen kastrasie. Nadat die diere gespeen is op ongeveer 7 maande en wat gevolg is deur 'n vetmestingsfase (matige voedingspeil), is almal geslag op tussen 12 en 13 maande ouderdom. 'n Linière afname in skofhoogte is waargeneem namate die ouderdom van kastrasie vertraag is. Die ossies wat op 3 maande gekastreer is het deurgaans die swakste gepresteer. Die bulle het die swaarste karkasse geproduseer. Hierdie karkasse was egter deurgaans die maerste en hulle het ook die laagste gegradeer asook die laagste marmering vertoon. Behalwe vir die osse wat gekastreer is op 3 maande was daar geen betekenisvolle verskille in finale liggaamsmassa, karkasmassa, slagpersentasie, gradering, marmering en vetdikte op die oogspier tussen osse wat gekastreer is binne 24 uur na geboorte en wat gekastreer is op 6 maande.

### SUMMARY:

Fifty four Sussex male calves were allotted at birth to the following 4 treatments: (i) castrated within 24 hours after birth with elastrator rings, (ii) and (iii) castrated at 3 and 6 months using a burdizzo, and (iv) left as entire males. After weaning at approximately 7 months and following a finishing period on a moderate level of nutrition the animals were slaughtered at 12 to 13 months of age. There was a linear decrease in height at wither's as the age at castration was delayed. The steers castrated at 3 months had the poorest performance throughout the trial. The bulls produced the heaviest carcasses as well as the leanest and had the lowest grading and marbling. Except for the steers castrated at 3 months there was no significant difference in final live body mass, carcass mass, slaughter percentage, grading, marbling and fat thickness on the eye muscle between steers castrated within 24 hours after birth or at 6 months.

The history of castration is probably almost as old as the history of the domestication of animals by man to fulfil his requirements for meat, animal products and draft power (Turton, 1969). In South Africa the majority of beef male calves are castrated between the ages of 2 and 6 months. The occasional producer castrates his male calves within the first seven days of age while some do not castrate at all.

Numerous studies on "Bulls vs Steers" have been conducted, most of which have indicated that bulls grow faster, are more efficient and produce leaner carcasses than steers (Turton, 1969; Wilson, Rugh, Ziegler & McAllister, 1974; Griffiths, 1980). Because of market demands in this country, only a small percentage of entire males are finished in feedlot and marketed at approximately 12 to 14 months of age. By far the majority of animals are castrated and marketed at ages varying from weaners (7 to 8 months) to  $\frac{3}{4}$ -year-old steers. The importance of castration is thus evident.

An important consideration in deciding upon the age at castration is the availability of manpower and/or proper handling facilities for restraining calves. It is obvious that

the later castration is delayed the more manpower is required. Furthermore, beef producers are generally of the opinion that later castration (more than 3 months) favours growth and development of the steers compared with early castration (less than 1 month). Therefore, the objectives of this study were to compare the growth and development, feedlot performance and carcass measurements of steers/bulls castrated either within 24 hours after birth, or at 3 months, or at 6 months, or left as entire males and slaughtered at between 12 and 13 months of age.

### Procedure

#### *Animals and treatments*

Fifty four Sussex male calves from one herd and nutritional background were allotted at birth to the following four treatments:

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- Group 1: Castrated within 24 hours after birth using elastrator rings.
- Group 2: Castrated at an average of 3 months using a burdizzo.
- Group 3: Castrated at an average age of 6 months using a burdizzo.
- Group 4: Not castrated and left as entire males.

Throughout the suckling period the cows remained in the same herd, thus receiving similar treatment.

#### *Body measurements*

At approximately 3, 6, 9 and 12 months of age, body mass, body length, wither's height and chest depth measurements were recorded. Body measurements were determined by using a 2m long steel caliper with one fixed and one sliding arm. Measurements were only taken when the calves were standing evenly on their feet and their heads firmly secured in a head clamp. Body length was measured from the pin bone to the dorsal-anterior part of the scapula. The other measurements are self explanatory.

#### *Finishing period and carcass assessment*

All the calves were weaned on one day at approximately 7 months of age. During the adaption period of 7 days and the feeding period all the animals received a basal diet of maize silage *ad lib.* plus 0,5 kg of a high protein concentrate mixture (CP = 40%, NPN free). Because of a deterioration in the quality of the maize silage, it was decided after approximately 110 days of feeding to add maize meal to the diet. Over a 10 day period the amount of maize meal was gradually increased until each animal received 5 kg. Surplus silage not consumed by the animals was regularly removed twice weekly and weighed.

In order to eliminate the effect of age at slaughter, the fattest 3 to 4 animals from each group were killed on a weekly basis over a 4 week period. Weekly selection of these animals for slaughter was done by the same person and solely by visual appraisal.

After quartering between the 10th and 11th ribs the eye muscle area and thickness of the fat cover on the eye muscle across the broadest part of the eye muscle was measured. Marbling of the eye muscle was subjectively scored on the scale 1 to 5. Grading was performed by graders of the Division of Inspection Services according to the 1972 grading regulations and was quantified as follows: Super = 8; Prime A = 7; Prime B = 6; Gr. 1A = 5; Gr. 1B = 4; Gr. 2 = 3; Gr. 3 = 2; Gr. 4 = 1. All carcasses were sold by public auction.

One steer that was castrated at 6 months became ill during the feeding period. None of the data pertaining to this animal was included in the analysis. Mean differences in data were compared by least-squares analysis of variance and co-variance with age in days as co-variate.

## **Results and Discussion**

#### *Body measurements*

Neither age at castration or the effect of castration (bulls vs steers) had any significant effect on body mass, wither's height, chest depth or body length until 6 months of age (Table 1). At 9 months of age significant differences were only found for the steers castrated at 3 months, their body mass being lower than all three the other treatments ( $P < 0,05$ ) and body length being shorter than the bulls ( $P < 0,05$ ). At 12 months of age the bulls weighed significantly more ( $P < 0,05$ ) than the steers castrated at 3 months. Similarly, the steers castrated within 24 hours and at 3 months were significantly ( $P < 0,05$ ) higher at the withers than the bulls while body length of the bulls ( $P < 0,05$ ) and the steers castrated within 24 hours ( $P < 0,05$ ) were greater than that for the steers castrated at 3 months (Table 1). All the measurements recorded until 12 months were corrected for age.

From these results it would appear that the steers castrated at 3 months were consistently inferior in respect of corrected body mass compared with the other three groups. Furthermore, there was a linear relationship between corrected wither's height at 12 months and the age at castration, i.e. the earlier the castration the greater the wither's height. This is in agreement with Bonsma (1973) who stated that the ossification of the epiphysis of the long bones is dependent upon the secretion of testosterone in the case of the bull. Thus, the secretion of testosterone in the male causes the long bones to ossify and the overall growth of the animal is stopped. On the other hand, if ossification is delayed the animal continues to grow and becomes taller and taller (Bonsma, 1973).

#### *Feedlot performance and carcass measurements*

The average intakes of silage for the steers castrated within 24 hours, at 3 & 6 months and the bulls were 15,1; 14,9; 15,4 and 14,3 kg respectively. Since silage was the only variable feed supplied it would appear that the bulls were more efficient in feed conversion. This is in keeping with the studies carried out by Galbraith, Dempster & Miller (1978) and Griffiths (1980).

Both the final live mass and the carcass mass for the bulls were significantly greater ( $P < 0,05$ ) than that for

**Table 1**

*Average live body measurements, feedlot performance and carcass measurements of steers/bulls castrated either within 24 hours after birth, at 3 or at 6 months of age and not castrated at all and slaughtered at between 12 and 13 months*

Average measurements / animal	Age at castration				Significance
	Within 24 hours	3 months	6 months	Bulls	
	Group 1	Group 2	Group 3	Group 4	
Number of animals	14	14	12	13	
<b>Live measurements:</b>					
<b>3 months of age</b>					
Body mass (kg)	112,3	107,2	114,3	112,8	NS
Height (mm)	830,2	833,9	836,8	824,9	NS
Depth (mm)	396,5	394,9	395,9	388,1	NS
Length (mm)	870,1	884,8	897,1	883,1	NS
<b>6 months of age</b>					
Body mass (kg)	182,3	171,5	184,9	182,7	NS
Height (mm)	960,4	946,8	951,8	943,2	NS
Depth (mm)	476,5	470,5	479,1	474,7	NS
Length (mm)	1 051,7	1 037,2	1 063,4	1 058,4	NS
<b>9 months of age</b>					
Body mass (kg)	241,7	219,4	239,5	244,8	1, 3, 4 > 2 *
Height (mm)	1 029,7	1 021,0	1 024,2	1 008,7	NS
Depth (mm)	522,3	517,7	527,9	521,5	NS
Length (mm)	1 161,6	1 129,9	1 162,8	1 167,8	4 > 2 *
<b>12 months of age</b>					
Body mass (kg)	315,1	305,5	324,3	337,6	4 > 2 *
Height (mm)	1 126,2	1 113,8	1 106,3	1 082,5	1 > 4 **; 2 > 4 *
Depth (mm)	588,7	587,0	594,1	583,4	NS
Length (mm)	1 294,6	1 258,4	1 283,0	1 313,8	4 > 2 **; 1 > 2 *
<b>Feedlot performance and carcass measurements</b>					
Final live body mass (kg)	351,2	332,1	348,3	357,5	4 > 2 *
Carcass mass (kg)	183,6	171,3	184,0	187,2	4 > 2 *
Gross value realised (R)	421,71	384,14	423,92	428,83	1, 3, 4 > 2 *
Slaughtering (%)	52,3	51,5	52,8	52,3	NS
Grading (8 points)	7,29	6,79	7,67	5,85	1, 2, 3 > 4 *; 3 > 2 *
Marbling (5 points)	2,42	2,32	2,05	1,46	1, 2, 3 > 4 *
Eye muscle area (cm <sup>2</sup> )	55,1	54,7	52,9	58,9	4 > 3 *
Fat thickness on eye muscle (across broadest part of eye muscle) (mm)	7,9	7,0	7,9	4,1	1, 2, 3 > 4 *

Grading: Super = 8, Prime A = 7, Prime B = 6, Gr. 1A = 5, Gr. 1B = 4, Gr. 2 = 3, Gr. 3 = 2, Gr. 4 = 1  
 NS = Non Significant; \* P > 0,05; \*\*P > 0,01

the steers castrated at 3 months (Table 1). The average daily gain from the start of the feeding period until the last weighing before slaughtering started for the steers castrated within 24 hours, at 3 & 6 months and the bulls were 0,767; 0,742; 0,758 and 0,780 kg/head/day, respectively. Although the growth rate of the bulls were the highest of the four treatments, the only significant difference ( $P < 0,05$ ) was that between bulls and steers castrated at 3 months. These results are in accordance with the work of Galbraith, *et al.* (1978) and Griffiths (1980). However, the differences in growth rate in favour of the bulls were more pronounced, probably due to the higher levels of nutrition applied in their studies (Galbraith, *et al.* 1978 & Griffiths (1980).

The bulls graded significantly poorer ( $P < 0,05$ ), had the thinnest layer of fat on the eye muscle and had the lowest marbling score ( $P < 0,05$ ) compared to the three castrated groups (Table 1). These results agree with most other studies viz that entire males grade lower than

steers because of less marbling and fat cover on the carcass (Turton, 1962, Landon, Hendrick & Thompson, 1978). On the other hand, Joubert & Dreyer (1965) observed no significant differences between carcasses of bulls and those of castrates (at 7 months) in any of 9 carcass measurements when slaughtered at 14 months.

It may be concluded that although bulls gained faster, had larger eye muscle areas and hence produced heavier carcasses, there was no significant difference in gross value realised (Table 1), except for the steers castrated at 3 months which, as already stated, were consistently poorer in growth throughout the study. Furthermore, and possibly most important, there appears to be no justification in the criticism leveled against early castration (less than 24 hours). These steers graded second best and had the highest marbling score (Table 1) of all the treatments. What the effect of early castration will be on the growth and development of the steer until 2 to 3 years of age is not known and needs investigation.

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