S.-Afr. Tydskr. Veek. 1986, 16(4)

Relationships between growth parameters and scrotal circumference in Simmentaler bulls

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Received 19 June 1985

Data from 129 young Simmentaler bulls taken at the end of the Phase C growth tests, were used to study the relationship of mass and growth parameters on testes size. Scrotal circumference was positively correlated with body mass and average daily gain. Pre-weaning gain appears to positively influence testicular growth more than post-weaning gain during a feedlot test. Therefore the probability of finding bulls with relatively small testes among bulls selected for weaning mass would be relatively small. Minimum scrotal circumference at a specific age should be established for individual breeds.

Fase-C-groeitoetsdata van 129 jong Simmentalerbulle is gebruik om die verwantskap tussen groeiparameters en skrotumomvang te ondersoek. Skrotumomvang was positief gekorreleerd met liggaamsmassa en gemiddelde daaglikse toename. Uit die resultate blyk dit dat voorspeense groei 'n belangriker invloed op testikulêre ontwikkeling het as naspeense groei. Dus is die waarskynlikheid om bulle met 'n relatiewe klein skrotumomvang te vind relatief klein waar bulle vir speenmassa geselekteer word. 'n Minimum skrotumomvang op 'n spesifieke ouderdom behoort vir individuele rasse neergelê te word.

Keywords: Simmentaler bulls, scrotal circumference, growth parameters.

Scrotal circumference is an important component in examining beef bulls for breeding soundness (Maree, 1979). Scrotal circumference as an indicator of testes size is highly correlated with sperm production in growing bulls (Rossouw, 1975; Curtis & Amann, 1981; Coulter, 1982). Bosman (1981) reported highly significant correlations of $r = 0,69$ between scrotal circumference and semen quality and $r = 0,81$ between scrotal circumference and quantity of sperm produced. Many factors such as breed, age, season, and body mass influence testes size or scrotal circumference (Coulter & Foote, 1976; Fields, Burns & Warnick, 1979; Makarechian, Farid & Berg, 1984; Venter, van Zyl & Vasconcellos, 1984). Body mass affects scrotal circumference and is a function of birth mass, preweaning and feedlot growth rate and age, all of which may influence testes development (Makarechian, *et al.*, 1984). Information on the relationship between growth rate and scrotal circumference would be helpful when growth rate and testes size are both considered in the selection of young bulls. The objective of this investigation was to obtain reliable estimates of the relationship between growth parameters and scrotal circumference in young Simmentaler bulls.

Growth test data from Phase C (National Beef Cattle Performance and Progeny Testing Scheme) from 129 bulls were obtained from the Simmentaler Cattle Breeders' Society of Southern Africa. The processing of the data was done with the Univac 1100-computer at the University of the Orange Free State, Bloemfontein. Arithmetical averages and standard deviations were determined by standard procedures. Scrotal circumference of the bulls was measured at the beginning and end of the performance test. The mean scrotal circumference and growth parameters are presented in Table 1.

Table 1 The means and standard deviations of the scrotal circumference and growth parameters of the performance tested bulls.

Number of bulls (*n*)	129
Scrotal circumference (cm)	37,8 ± 2,0
Average daily gain (ADG in g)	1625 ± 219
Average daily gain per day of age (ADA in g)	1306 ± 141
Feed conversion ratio (FCR in kg)	6,99 ± 0,82
Final mass (kg)	533 ± 42
Age (days)	397 ± 27

The mean scrotal circumference at 13 months of age was 37,8 cm with a coefficient of variation of 5,34%. Therefore 67% of the bulls do not differ by more than 10,68% from each other. The remaining 33% shows a greater variation. Scrotal circumference has been reported to be a highly heritable trait, with most estimates around 0,60 (Coulter, 1982; Latimer, Wilson, Cain & Stricklin, 1982) and therefore rapid progress is possible through selection for this trait. It is evident from the data presented in Table 1 that a tested circumference of less than 34 cm is exceptional. These results are supported by those of Venter, Rossouw & Neville (1977) and Bosman (undated). Because scrotal circumference is related to breeding capacity the application of a minimum culling level is reasonable. It can therefore be recommended that bulls older than 12 months and with a circumference of less than 32 cm be culled. The correlations and regression coefficients of scrotal circumference on growth parameters are presented in Table 2. Highly significant correlations ($P < 0,01$) exist between initial body mass and scrotal circum-ference ($r = 0,321$) as well as between final mass and scrotal circumference ($r = 0,388$). According to a regression equation of $y = a + bx$ (Table 2),

Table 2 The correlation coefficients between scrotal circumference and growth parameters as well as the regressions of scrotal circumference on growth parameters.

Growth parameter	Correlation between scrotal circumference and growth parameters	Intercept	Regression coefficient (*b*) with 95% confidence intervals
Initial mass	0,321[a]	202	3,35 ± 4,52
ADG	0,132	1367	8,86 ± 11,50
ADA	0,147[b]	1122	6,57 ± 7,65
FCR	0,061	6,09	0,016 ± 0,739
Final mass	0,388[a]	382	4,85 ± 2,47
Age	0,150[b]	335	1,41 ± 1,61

ADG = Average daily gain, ADA = Average daily gain per day of age; FCR = Feed conversion ratio
[a]$P < 0,01$; [b]$P < 0,05$

it is clear that for each 4,85 kg increase in body mass there is an increase of 1 cm in scrotal circumference in young bulls for this specific test. These results agree with those of Venter, *et al.* (1977) who worked with Afrikaner, Hereford and Simmentaler bulls as well as with those of Makarechian, *et al.* (1984). Significant correlations ($P < 0,05$) exist between scrotal circumference and age ($r = 0,150$) and between scrotal circumference and average daily gain per day of age (ADA) ($r = 0,147$), which can be explained because ADA is a function of age and, in addition, according to Vasconcellos (1981), body mass and age are positively correlated in young animals.

The correlations between scrotal circumference and average daily gain (ADG) and feed conversion ratio (FCR) ($r = 0,132$ and $r = 0,061$ respectively) is not significant. From a biological point of view, this cannot be disregarded because ADG contributes to a higher final mass. Johnson, Robinson & Dillard (1974) reported a positive association between pre-weaning growth and testicular development in beef bulls. The results indicate that it would be unlikely that beef bulls with small testes would be selected for breeding when pre-weaning gain was considered in the selection programme. This also explains the significant correlation between scrotal circumference and average daily gain per day of age (ADA), but the non-significant correlation between scrotal circumference and average daily gain (ADG), because ADA included pre-weaning gain. It is evident that the preweaning stage is a critical period for testicular development and that the probability of finding bulls with smaller than average testes among bulls selected for weaning mass would be smaller than in bulls selected on average daily gain (ADG) in a feedlot test.

Acknowledgement

The authors wish to express their acknowledgement to personnel of the National Beef Cattle Performance and Progeny Testing Scheme, the Simmentaler Cattle Breeders' Society of Southern Africa and to Dr Martin van Zyl, statistical consultant at the University of the Orange Free State.

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