Short Communications

The influence of dietary supplementation on testicular growth rate in adult Merino rams

S.J. Schoeman* and G.C. Combrink

Department of Livestock Science, University of Pretoria, Pretoria, 0002 Republic of South Africa

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Thirty adult Merino rams were fed a ration with a 16% protein and 75% TDN content. Live body mass increased by 51,4% and testes volume by 111,7% in 210 days. Testicular growth responded rapidly to supplementation and testes volume increased by 86,5% in only 60 days. In another experiment diets of four groups of 15 Merino rams each, aged 14 months, were supplemented with lucerne hay, sunflower oil cake meal, fish meal and urea respectively. Testicular volume increased from 79,3 to 104,0% in the four groups in a 7-week period. Differences were, however, non-significant ($P > 0,05$).

Dertig volwasse Merinoramme is op 'n dieet met 16% ruprotei en en 75% TVV geplaas. Lewendeliggaams-massa het met 51,4% en testisvolume met 111,7% toegeneem oor 'n 210-dae-periode. Testesgroeitempo het vinnig op aanvullende voeding gereageer en met 86,5% in slegs 60 dae toegeneem by vier groepe, wat elk 15 14-maande-oue Merinoramme ingesluit het en met onderskeidelik lusernhooi, sonneblomoliekoekmeel, vismeel en ureum aangevul is. Testisvolume het in 'n 7-weke-periode met tussen 79,3 en 104,0% in die vier groepe toegeneem. Verskille was egter nie statisties betekenisvol nie ($P > 0,05$).

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* To whom correspondence should be addressed

The function of the testes, namely to produce spermatozoa and hormones, is sensitive to changes in nutrition. Setchell, Waites & Linder (1965) indicated that testes size, expressed as a percentage of body mass, declined in rams in a state of undernutrition, whereas the testes of rams in a good nutritional regime were relatively larger. Oldham, Adams, Gherardi, Lindsay & Mac Kintosh (1978) and Masters & Fels (1984) concluded that the testes seem to be particularly sensitive to changes in nutrition and that rams may gain or loose testicular volume at a greater rate than live mass.

In Merino rams Oldham, *et al.* (1978) and Lindsay, Gherardi & Oldham (1979) have shown that spermatozoa are produced at a relatively constant rate of about 20×10^6 spermatozoa/gram testis per day. Lino (1972) also reported a correlation of 0,83 between testes mass and sperm production in Merino rams. Supplementation also increases daily sperm output in other farm animals (Wilson, Johnson & Wetteman, 1977; Cameron, Fairnie, Curnow, Keogh & Lindsay, 1984; Purvis, Kilgour, Edey & Piper, 1984).

Mating often takes place when grazing sheep are subjected to reduced quality and availability of pasture. Supplementation on dry veld conditions should increase testicular size and increase the capacity of rams to produce spermatozoa. It is also important in advocating lower ram : ewe ratios (Allison, 1974).

Data were obtained from Merino rams at the experimental farm of the University of Pretoria. Thirty adult rams in a lean condition and with 6 months wool growth were moved in from dry winter veld after the end of a 6-week mating season. They were fed *ad lib.* a diet consisting of lucerne hay, fish meal and maize meal with a 16% crude protein and 75% TDN content.

Average feed intake was measured on a daily basis and body mass and testicular measurements were taken monthly for a period of 7 months. Testicular development was obtained by measuring testes volume (TV) and scrotal circumference (SC) as described by Islam & Land (1977) and Knight (1977).

The results demonstrated that testicular size was drastically increased over a short period when the diet was supplemented (Table 1). The rams gained 111,7% in testes volume whilst live body mass increased by 51,4% over the same period. Over the first 3 months corresponding figures were 34,3% for body mass and 95,9% for TV respectively.

It is therefore evident that TV initially increased at a higher rate than body mass. Lindsay, *et al.*(1979) also indicated that rams are capable of doubling the size of their testes in only 8 weeks after consuming feed supplemented by protein. These authors furthermore showed that the volume of the testes of rams fell at a constant rate of 40 ml per week during the breeding season regardless of the pre-joining feeding or ram:ewe ratio. Body mass also changed in the same direction but not to the same extent. These findings were supported by Sutherland & Martin (1980).

In another experiment 80 Merino rams aged 14 months were moved in from dry winter veld and were fed on a maintenance diet for 4 weeks. Equal numbers of rams (15) were allocated randomly to four feeding treatments to compare different protein concentrates. One group represented a control in which rams were fed lucerne hay supplemented with maize meal with a crude protein content of 11% and a TDN content of 70%. The other three groups were fed balanced rations with 16% crude protein and 70% TDN content (Table 2). The protein concentrates were sunflower oil cake meal (SF), fish meal (FM) and urea (UR) for the three treatments respectively. All diets were fed *ad lib.* Body mass and testicular measurements (testes volume, TV and scrotal circumference, SC) were recorded at the start of the experiment and on the 3rd, 7th and 11th weeks. During the first 3 weeks the rams were gradually adapted to the different rations.

The Kruskal-Wallis test was carried out to test for statistical differences ($P \leq 0,05$) between treatments at each stage (Steel & Torrie,1980).

Live body mass increased by 36,7; 42,2; 43,8 and 38,5% for the control, SF, FM and UR groups respectively (Table 2). Differences were non-significant ($P > 0,05$). Testes

Table 1 Average daily feed intake, live body mass and testicular measurements (± SD) during the 210-day experiment

Period (days)	Feed intake (kg/ram/day)	Body mass (kg)	Average increase (%)	Scrotal circumference (cm)	Average increase (%)	Testes volume (cm^3)	Average increase (%)
Initial	-	52,9(7,1)	-	31,0(2,9)	-	458(143)	-
1 - 30	1,59	61,0(6,1)	15,5	32,6(2,5)	5,2	616(145)	34,4
31 - 60	2,18	65,1(5,9)	6,7	35,6(2,2)	9,3	855(172)	38,8
61 - 90	1,82	71,0(4,7)	9,0	36,2(2,0)	1,9	897(170)	5,0
91 - 120	1,95	73,5(4,5)	3,6	36,6(1,9)	1,0	874(158)	-2,6
121 - 150	2,16	75,1(4,8)	2,1	36,8(2,1)	0,6	907(170)	3,8
151 - 180	2,28	76,3(4,8)	1,6	36,3(2,1)	-1,4	957(173)	5,5
181 - 210	2,18	80,0(4,7)	4,9	36,2(2,2)	-0,4	970(169)	1,3
Total	-	-	51,4	-	16,8		111,7

Table 2 Average live body mass and testicular measurements (≤ SD) for four groups of rams fed different protein supplements

	Diet			
	Control	SF	FM	UR
Initial				
Body mass (kg)	36,1(5,7)	38,5(5,3)	36,0(5,2)	38,0(4,0)
SC (cm)	26,7(2,5)	27,1(2,3)	27,1(2,1)	26,7(2,5)
TV (cm^3)	285(102)	282(100)	285(102)	285(100)
Third week				
Body mass (kg)	42,0(5,1)	44,7(5,2)	42,8(4,7)	43,1(3,2)
SC (cm)	27,4(2,3)	27,9(2,3)	28,1(2,2)	27,5(2,6)
TV (cm^3)	374(110)	354(102)	361(119)	372(138)
Seventh week				
Body mass (kg)	44,1(6,0)	49,3(5,5)	49,3(4,9)	48,3(4,8)
SC (cm)	28,9(2,7)	30,1(2,6)	31,3(2,2)	29,7(3,0)
TV (cm^3)	511(129)	556(135)	581(112)	537(153)
Eleventh week				
Body mass (kg)	49,4(7,0)	54,8(4,9)	51,8(5,4)	52,6(5,1)
SC (cm)	29,4(2,7)	31,1(1,7)	31,9(2,0)	30,7(3,0)
TV (cm^3)	582(124)	674(114)	678(143)	646(149)

volume (TV) increased by 79,3; 96,8; 104,0 and 88,2% after 7 weeks and 104,2; 138,6; 138,1 and 126,4% after 11 weeks for the four groups respectively. The average weekly gain in testicular volumes over the 11-week period was 27,0; 35,6; 35,8 and 32,8 cm^3 for the four groups respectively. Although testicular growth seems to be favoured by diets containing fish meal and sunflower oil cake meal, differences were not significant ($P>0,05$).

Pasture conditions in most parts of South Africa during the natural mating season (March - May) are dry and inadequate for maintenance of live mass. It seems likely, therefore, that supplementation of rams during this period should increase testes size and also increase the capability of rams to impregnate more ewes, especially under heavy breeding pressure. Furthermore, it is evident that there is no need to supplement rams for longer than 60 days prior to the mating season.

The practical value of these findings is that rams should receive additional protein supplementation on natural dry pasture prior to and during the mating season and particularly when the breeding season is relatively long.

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