Nutritive value of *Medicago truncatula* (cv. Jemalong) as pasture for sheep 2. Voluntary intake and animal production

T.S. Brand,* S.W.P. Cloete, T.T. de Villiers and F. Franck
Elsenburg Agricultural Development Institute, Private Bag, Elsenburg 7607, Republic of South Africa

J. Coetzee
Department of Sheep and Wool Science, University of Stellenbosch, Stellenbosch 7600, Republic of South Africa

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The experiment was conducted to (i) determine the excretion pattern of an indigestible marker for sheep, (ii) compare three different techniques used to determine intake, (iii) determine the crude protein (CP) and digestible organic matter (DOM) intake of wethers and reproducing ewes grazing medic pasture, and (iv) evaluate their production. The percentage of chromium excreted during the determination of the excretion pattern varied between 82,5 and 108,2 when expressed as percentages of representative grab samples taken throughout the day. The diurnal variation in the percentage of chromium excreted (y) was described by the equation, $y = 310{,}9 - 30{,}44x + 1{,}03x^2$ ($R^2 = 0{,}67$; $n = 40$), where x represents the time of sampling. Intake of DOM estimated by the total collection of faeces was significantly ($P \leq 0{,}01$) lower than values obtained by the total collection of chromium and 11h00 chromium grab samples, possibly due to losses of faeces from the bags. No significant difference occurred between the latter two techniques, which resulted in DOM intake results that were highly correlated ($r = 0{,}80$). Significant ($P \leq 0{,}01$) differences in DOM (variation between 370 and 716 g/d) and CP intake (variation between 55 and 227 g/d) by Merino wethers were observed between months, and a seasonal pattern was observed. The same trend was found with the reproducing South African Mutton Merino (SAMM) ewes; DOM intake varying between 445 and 1008 g/d, while CP intakes varied between 48 and 333 g/d. The live mass of the wethers (variation between 48 and 84 kg) and ewes (variation between 64 and 85 kg) differed significantly ($P \leq 0{,}01$) between months, generally following a seasonal trend corresponding to DOM and CP intakes. Wool production of the Merino wethers (6,5 sheep/ha) was 60,5 (1981) and 39,7 (1982) kg greasy wool/ha for two year periods. SAMM ewes (5,2 ewes/ha) produced 23,4 kg greasy wool/ha (1981), while meat production was 62,4 (1981) and 90,4 (1982) kg/ha. Lambs were weaned (*ca.* 100 days) at 31,8 (1981) and 33,8 (1982) kg, with average daily gains of 263 and 294 g/d in the respective years.

Die eksperiment is uitgevoer om (i) die uitskeidingspatroon van 'n onverteerbare merker vir skape te bepaal, (ii) drie verskillende tegnieke van innamebepaling te vergelyk, (iii) ruproteïen (RP)- en verteerbare oganiese materiaal (VOM)-inname van Merinohamels asook van reproduserende Suid-Afrikaanse Vleismerino (SAVM)-ooie op medicweiding te bepaal, en (iv) hul gepaardgaande produksie te evalueer. Die persentasie chroom in die grypmonsters soos in die uitskeidingskurwe bepaal, het tussen 82,5 en 108,2 gevarieer. Die persentasie chroom in die grypmonsters (y) is beskryf deur die vergelyking, $y = 310{,}9 - 30{,}44x + 1{,}03x^2$ ($R^2 = 0{,}67$; $n = 40$), waar x die tyd van monsterneming verteenwoordig. Die VOM-inname is betekenisvol ($P \leq 0{,}01$) laer deur die totale miskolleksietegniek beraam, moontlik as gevolg van verliese uit die missakke. Geen verskille het voorgekom tussen VOM-inname soos met die 11h00-chroomgrypmonsters en totale chroomkolleksie bepaal nie, met 'n hoogsbetekenisvol korrelasie tussen VOM-inname beraam volgens dié metodes ($r = 0{,}80$). Betekenisvolle ($P \leq 0{,}01$) verskille in VOM (variasie tussen 370 en 716 g/d)- en RP (variasie tussen 55 en 227 g/d)-inname by Merinohamels is tussen maande waargeneem, en inname het 'n tipiese seisoenale patroon gevolg. Dieselfde tendens het by die SAVM-ooie voorgekom (VOM-inname het tussen 445 en 1008 g/d gevarieer terwyl RP-inname tussen 48 en 333 g/d gevarieer het). Liggaamsmassa van die hamels (48 tot 84 kg) en ooie (64 tot 85 kg) het betekenisvol ($P \leq 0{,}01$) tussen maande gevarieer, en dieselfde seisoenale tendens as inname gevolg. Rouwolproduksie van die hamels (veebelading van 6,5 skape/ha) was 60,5 (1981) en 39,7 (1982) kg/ha onderskeidelik vir twee jare, terwyl die ooie (5,2 ooie/ha) 23,4 kg rouwol/ha (1981) geproduseer het. Lamsvleisproduksie deur ooie het 62,4 (1981) en 90,4 (1982) kg/ha bedra. Die 100-dae-speenmassas van die lammers was 31,8 (1981) en 33,8 (1982) kg, terwyl die ooreenstemmende gemiddelde daaglikse toenames van die lammers 263 en 294 g/d vir die onderskele jare was.

Keywords: *Medicago* spp., legume, medics, excretion pattern, chromium oxide, intake, sheep.

* To whom correspondence should be addressed.

Introduction

Medic pasture is usually recommended as a short-term pasture in the winter rainfall region of South Africa (Van Heerden & Tainton, 1987). Medics is recognized as a high-quality dryland pasture with recommended stocking rates of four to five Merino ewe units (one ewe plus one lamb) per hectare (Van Heerden & Tainton, 1987), four ewes per hectare (Brownlee & Denney, 1985), five SA Mutton Merino ewe units or 6,5 Merino wethers per hectare (De Villiers, 1982) in a continuous grazing system.

The feeding value of a pasture is, *inter alia*, related to intake (Purser, 1981). When herbage availability is increased, intake increases, and vice versa (Elsen *et al.*, 1988). Freer (1981) reviewed the effect of feed characteristics on voluntary intake and stated that a number of experimental studies have found that intake increase more or less linearly with increasing digestibility. Ulyatt (1973) pointed out that variation in voluntary intake accounted for at least 50% of the variation in feeding values of different herbage materials. As very few direct estimates of the nutritive value of medic pasture under grazing conditions have, however, been obtained (Purser, 1981), the purpose of this study was to complement the available knowledge on this topic.

Different techniques, based on determination of faecal output and pasture digestibility, have been used to evaluate the intake of pasture (Morgan *et al.*, 1976). Faecal output may be measured directly by using harnasses fitted with faecal collection bags. However, Hodgson & Rodriquez (1970) reported losses of faeces from these bags. Using an indigestible marker, together with the measurement of total faecal output, may alleviate this problem, although the technique remains laborious (Hodgson & Rodriquez, 1970) and may limit the intake and grazing behaviour of animals. Furthermore, this approach is difficult to use on ewes (Engels, 1983). However, grab samples may give an accurate estimation of the total amount of faeces excreted assuming that the outflow of the indigestible marker is constant. The validity of this technique may be questioned on the grounds that the diurnal pattern of marker excretion is not stable and varies with a change in feeding behaviour (Swart, 1989). Van Schalkwyk (1978) stressed the importance of determinating excretion patterns when grab samples of indigestible markers are used in herbage intake studies.

The current study was conducted firstly to determine the excretion pattern of an indigestible marker for sheep, in order to establish the correct sampling time for grab samples. Secondly, three different techniques to determine intake were compared, namely total faeces collection, total faeces collection in conjunction with an indigestible marker, and grab sampling of an indigestible marker to determine faecal output. Thirdly, the crude protein (CP) and digestible organic matter (DOM) intakes of wethers and reproducing ewes grazing medic pasture were determined. The meat and wool production of sheep grazing medic pasture during the experimental period were also measured.

Experimental procedure

Medic pastures were established on three different test plots at Elsenburg as described by Brand *et al.* (1991). One test plot was stocked at a density of 6,5 Merino wethers per hectare, while the other two test plots were stocked at a density of 5,2 South African Mutton Merino (SAMM) ewe units per hectare. The sheep grazed the pasture in a continuous grazing system over the two-year experimental period. A salt phosphate lick as well as a molasses lick (during late pregnancy and early lactation) was given *ad libitum* to the ewes. No supplementary feed was given to the wethers.

Excretion pattern

Excretion patterns of chromium were determined as described by Van Schalkwyk (1978) in order to determine the ideal time for obtaining representative faecal grab samples. For this purpose, eight Merino wethers were dosed daily at 11h00 and 18h00 with gelatin capsules containing 1 g Cr_2O_3 (684,2 mg chromium) each. Faecal sampling from the rectum began five days after the start of dosing and was continued for five successive days at 10h00, 12h00, 14h00, 16h00 and 18h00 daily, while night samples were taken at 22h00, 2h00 and 6h00, 8h00, 20h00 and 4h00 and 24h00 on those days. The samples collected on different days were pooled, oven dried at 100 °C, ground to pass through a 1 mm-screen and then analysed for chromium (Williams *et al.*, 1962, as modified by Swart, 1989). The chromium content of daytime samples were expressed as percentages of overall chromium content, to determine when representative grab samples could be recovered.

Comparison of techniques

The DOM intakes of Merino wethers were determined by the total collection of faeces technique as well as from the total collection of chromium in representative samples of the total faecal outputs (to correct for faecal losses). This parameter was also estimated from chromium faecal grab samples. Total collection of faeces and chromium was achieved with the aid of faecal bags, while faecal grab samples were taken once a day at 11h00; a time determined according to the excretion pattern. Sampling occurred for five successive days in the middle of each month. Equal masses of the dried material collected on the different days were pooled to give one sample per sheep. Seven Merino wethers were sampled for 23 successive months. Daily OM intakes were calculated indirectly using the quantity of OM excreted and the calculated *in vivo* OM digestibility of pasture samples selected by oesophageally fistulated sheep (Brand *et al.*, 1990). Feed intake was determined using the following equation (Morgan *et al.*, 1976):

$$\text{OMI} = \frac{100}{100-\text{OMDf}} \times \frac{\text{OM excreted (g/d)}}{1} \qquad (1)$$

where OMI = organic matter intake and OMDf = organic matter digestibility of the fistula samples. Faecal OM output in case of the total collection of chromium and faecal chromium grab samples was determined indirectly using the following equation (Read *et al.*, 1986):

$$\underset{\text{(g/d)}}{\text{OM excreted}} = \frac{\text{Mass Cr dosed/d}}{\text{\% Cr in faecal DM}} \times \frac{\text{\% OM in faeces}}{1} \qquad (2)$$

Intake study

Digestible organic matter and CP intakes were determined in seven Merino wethers and 14 productive SAMM ewes for 23 different months. Sampling and chromium determinations were done as described earlier. Daily OM intake was calculated indirectly by equation 1, using 11h00 grab samples.

Daily CP and DOM intakes were then calculated by multiplication with the respective contents of the pasture samples selected by the OF sheep. Faecal OM output was determined indirectly using equation 2.

Production data

The masses of ewes and wethers were measured once a month. Wool production was recorded once a year when animals were shorn. Wethers were shorn in September each year, while the ewes were shorn in October 1981 and August 1982. Ewes were mated in December each year and lambs were born in May. The lambs were weighed every two weeks, up to weaning at *ca.* 100 days of age. Weaning mass and preweaning growth were not corrected for sex or birth type of lambs, as the number of lambs available were insufficient for the computation of reliable correction factors.

Statistical analysis

The excretion pattern of chromium was determined by regressing recovery percentage of chromium on sampling time. Differences in chromium excretion and DOM and CP intakes between months were tested for significance by least significant difference (LSD) methods (Snedecor & Cochran, 1980). Means and standard deviations (*SD*) are given for continuous production data of animals, and reproduction data of ewes are given as percentages.

Results and discussion

Excretion pattern

The excretion pattern of chromium by the Merino wethers is presented in Figure 1. The mean percentage of chromium (± *SD*) excreted at different times varied between 108,2 ± 5,6% (10h00) and 82,5 ± 2,9% (16h00). Significant differences ($P \leq 0,01$) were found in the concentration of chromium determined in the grab samples collected at different times. The regression that fitted the excretion pattern best was a second degree polynomial function, namely:

$$y = 310,91 - 30,44\ (SE = 3,38)x + 1,03\ (SE = 0,14)x^2$$
$$(R^2 = 0,67;\ P \leq 0,01;\ n = 40)$$

where y = chromium concentration expressed as a percentage and x = the time of sampling.

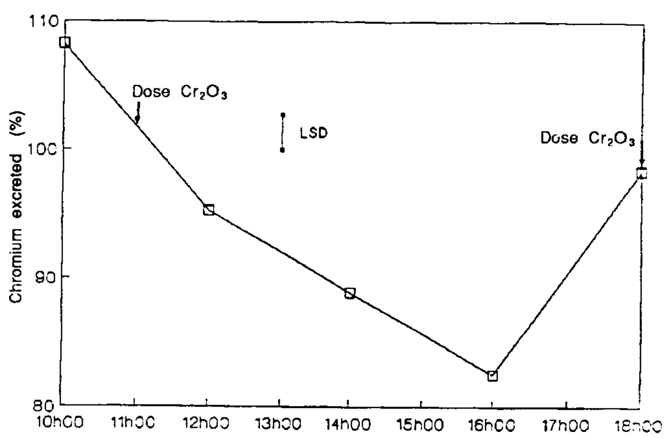

Figure 1 Chromium excreted (as percentage of the mean amount excreted) at different times during the day.

Interpolation of these results indicated that the percentage of chromium recovered from a grab sample acquired at 11h00 should be 100,7% and, therefore, 11h00 was selected as the ideal sampling time for the entire experimental period. The general pattern of Cr excretion found in our study agreed with corresponding patterns obtained by Swart *et al.* (P.J. Swart, F. Franck & J.A. Botha, 1981; personal communication), Ruggiero & Whelan (1977), Raymond & Minson (1955) and Smith & Reid (1955). These results also corresponded with those of others (Van Schalkwyk, 1978; Moran *et al.*, 1978; Swart, 1989), who also found diurnal variation in the percentage of chromium excreted.

Comparison of techniques

The DOM intake of Merino wethers, determined by the different techniques for 23 successive months, is presented in Figure 2. Mean DOM intake as estimated monthly by the total collection of faeces, varied between 287 ± 85 and 596 ± 72 g/d while DOM intake, as calculated from the total collection of chromium, varied between 371 ± 70 and 763 ± 102 g/d. Corresponding DOM intake values estimated from the chromium grab samples were 370 ± 69 and 716 ± 106 g/d. The DOM intake values, as estimated by the total collection of faeces, were significantly ($P \leq 0,01$) lower than values obtained by the total collection of chromium and chromium grab samples, while no significant differences were observed between the latter techniques. Significant ($P \leq 0,01$) differences in DOM intake between months were found, while no month-by-technique interaction was observed. The highest and lowest DOM intake values were found within the same months by the different techniques, and similar trends in DOM intake between months were found. The lower intake figures obtained from the total collection of faeces were possibly due to faecal losses from the bags, which was also reported by Hodgson & Rodriquez (1970).

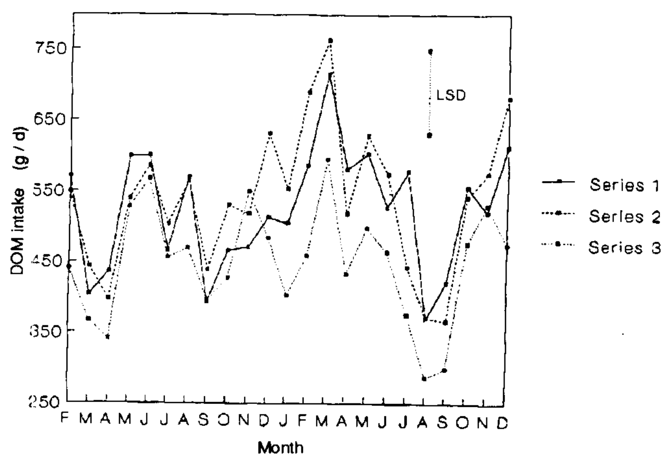

Figure 2 Digestible organic matter (DOM) intake of Merino wethers from medic pasture during different months as estimated by 11h00 chromiun grab samples (series 1), total collection of chromium (series 2) and total collection of faeces (series 3).

Significant ($P \leq 0,01$) correlations were found between DOM intake values determined by the total collection of chromium and chromium grab samples ($r = 0,80$), the total collection of chromium and total collection of faeces ($r = 0,75$), and total collection of faeces and chromium grab samples ($r = 0,67$). If the assumption is made that the total collection of chromium is the most accurate technique to determine DOM intake values, results suggest that DOM intake values obtained from the total collection of faeces may be corrected by the following regression equation:

$$y = 117{,}2 + 0{,}94\ (SE = 0{,}06)\,x$$
$$(r = 0{,}75;\ P \leq 0{,}01;\ n = 160)$$

where y = the corrected DOM intake and x = DOM intake estimated by the total collection of faeces.

However, this study indicates that chromium grab samples, when taken at a representative time, is an accurate (r = 0,80) criterion to estimate OM excretion and a feasible technique to determine intake.

Intake study

The calculated monthly DOM and CP intakes of the Merino wethers are presented in Figure 3. Significant ($P \leq 0{,}05$) differences occurred between months. The mean DOM intake of the wethers varied between 370 ± 70 g/d (August 1982) and 716 ± 106 g/d (March 1982). The CP intake varied between 55 ± 10 g/d (November 1982) and 227 ± 82 g/d (March 1981). Calculation of the maintenance requirements of 60 kg wethers as expressed in terms of DOM requirements (Jaqusch & Coop, 1971), resulted in daily requirements of 521 g DOM (ARC, 1980) and 104 g CP (NRC, 1985). It seemed that the DOM intake of the wethers was insufficient to meet DOM requirements during several of the experimental months. Crude protein intake, on the other hand, exceeded requirements, except during the dry season (December, January and February) and in the

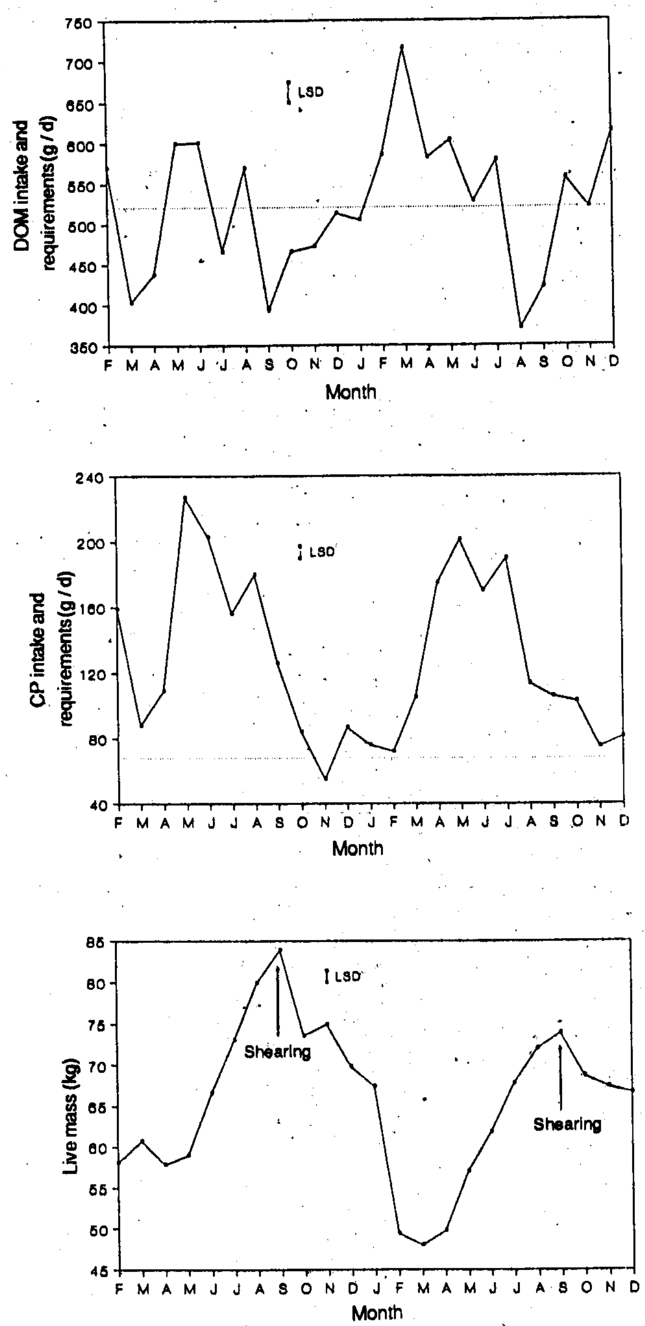

Figure 3 Digestible organic matter (DOM) intake (unbroken line), crude protein (CP) intake (unbroken line) and requirements (dotted line), as well as live mass change of Merino wethers continuously grazing medic pasture for 23 months at 6,5 sheep/ha.

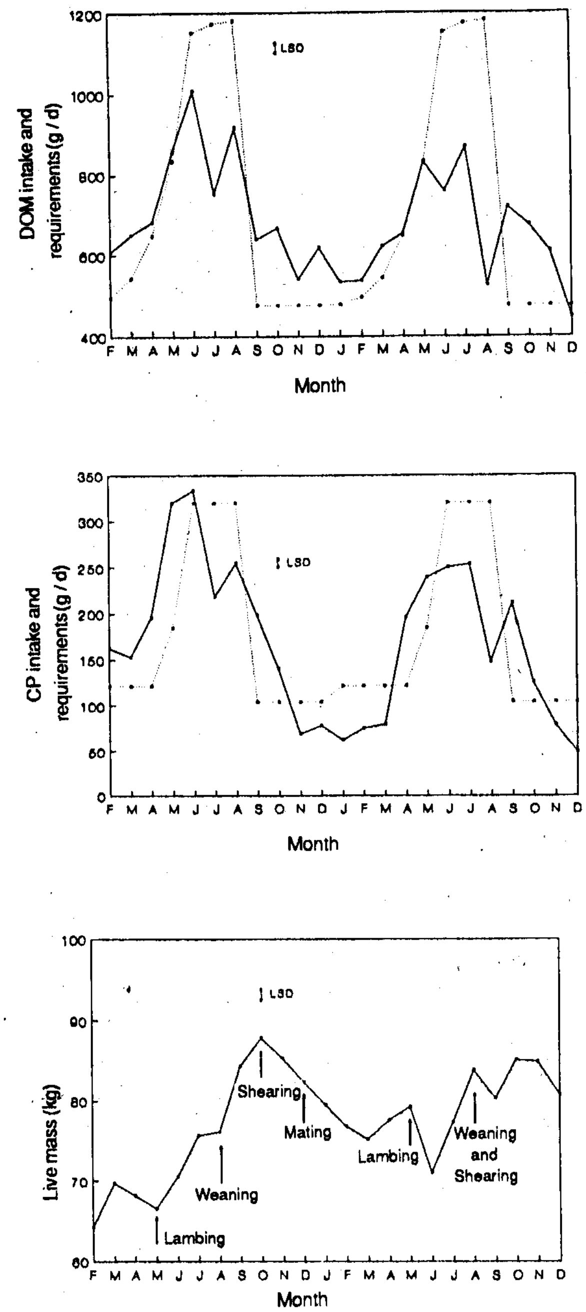

Figure 4 Digestible organic matter (DOM) intake (unbroken line), crude protein (CP) intake (unbroken line) and requirements (dotted line) as well as live mass change of South African Mutton Merino ewes continuously grazing medic pasture for 23 months at a stocking density of 5,2 ewes units/ha.

transitional stage from the wet season to the dry season (October and November).

The DOM and CP intake of reproducing SAMM ewes are presented in Figure 4. Significant ($P \leq 0,05$) differences occurred between months. The DOM intake varied between 445 ± 67 g/d (December 1982) and 1008 ± 284 g/d (June 1981). The DOM requirements (ARC, 1980) for a 60 kg ewe with a 6 kg single lamb for maintenance (474 g/d), 30 days of pregnancy (475 g/d), 60 days of pregnancy (495 g/d), 90 days of pregnancy (542 g/d), 120 days of pregnancy (648 g/d), 148 days of pregnancy (833 g/d), 30 days of lactation (1115 g/d), 60 days of lactation (1173 g/d), and 90 days of lactation (1181 g/d) were calculated and superimposed on the obtained intake values (Figure 4). In general, DOM intake exceeded requirements of ewes during the dry period and pregnancy, while DOM intake was insufficient during lactation.

The CP intake varied between 48 ± 7 g/d (December 1982) and 333 ± 94 g/d (June 1981). The CP requirements (NRC, 1985) for maintenance (104 g/d), first 15 weeks of pregnancy (121 g/d), last six weeks of pregnancy (148 g/d) and lactation (319 g/d) were calculated and superimposed on CP intake. The same pattern associated with DOM intake was observed for CP intake. CP was also deficient during the dry season (December, January and February), as well as in November (both 1981 and 1982) and March (1982 only).

When intake data of the ewes were averaged within season (Figure 5), DOM intake was 546 ± 130 g/d in the dry season (December, January and February), 716 ± 187 g/d in the transitional stage from the dry season to the wet season (March, April and May), 809 ± 252 g/d in the wet season (June, July and August) and 641 ± 128 g/d in the transitional stage from the wet season to the dry season (September, October and November). The averaged requirements for DOM in the corresponding periods were 481, 674, 1168 and 474 g/d respectively. It is clear from Figure 5 that DOM intake exceeded the requirements in all seasons, except in the wet season, when the ewes were lactating and requirements were extremely high. The CP intakes were 83 ± 44 g/d (summer), 197 ± 90 g/d (autumn), 244 ± 82 g/d (winter) and 137 ± 60 g/d (spring), while the corresponding requirements were 115, 142, 319 and 104 g/d. The CP intake was insufficient in the dry season (summer) as well as in the wet season (winter) when ewes were lactating.

Variations in CP intake of Merino wethers recorded in this study agreed with the trend of seasonal variation in CP intake from medic pasture found by De Villiers (T.T. De Villiers, 1982; personal communication), although our values were lower. De Villiers (1982), who also used Merino wethers, recorded CP intakes of 130 g/d (summer), 207 g/d (autumn), 239 g/d (winter) and 191 g/d (spring). He reported DOM intake values of respectively 389 g/d (summer), 454 g/d (autumn), 579 g/d (winter) and 525 g/d (spring), which are in agreement with the seasonal trend of DOM intake of ewes found in our study, but differ from the DOM intake pattern observed with the wethers in our study. This may be ascribed to the unexpectedly low DOM intake values recorded for June 1981, September 1981, August

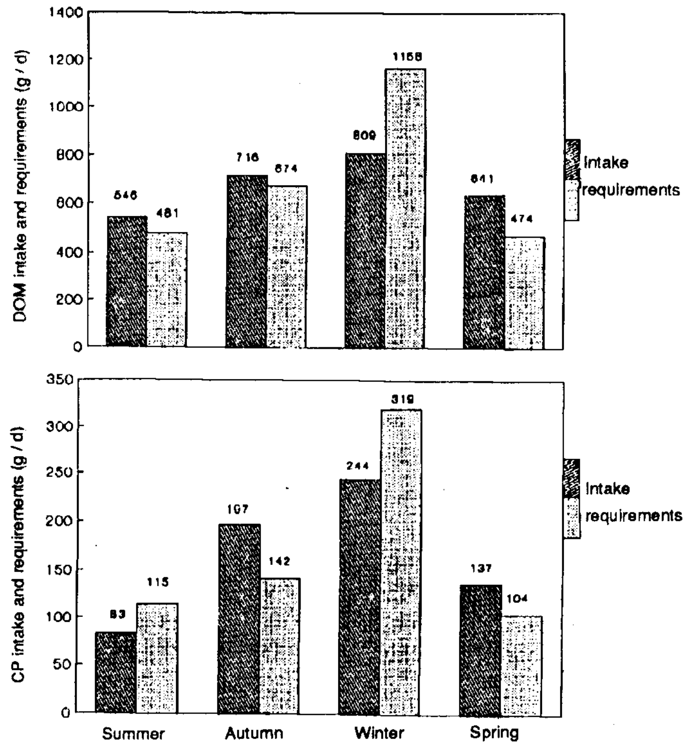

Figure 5 Seasonally digestible organic matter (DOM) and crude protein (CP) intake and requirements of the South African Mutton Merino ewes continuously grazing medic pasture for 23 months at a stocking density of 5,2 ewes/ha.

1982, and September 1982. Although our results are strictly not comparable to those of Benjamin *et al.* (1977) (they determined the intake from dry medic pasture by eight-month-old German Merino rams by the total collection of faeces technique and *in vitro* digestibility), estimated intake of DOM was somewhat lower than the calculated mean organic matter intake of 1200 g/d recorded in their study.

Production data

The average live mass of the Merino wethers and of SAMM ewes for the 23 months are presented in Figures 3 and 4 respectively. The mean live mass of the Merino wethers reached a maximum in September 1981 (84 ± 4 kg), and averaged 65 ± 8 kg for the experimental period. Significant ($P \leq 0,05$) differences in live mass of the wethers were observed between months. After being unchanged at *ca.* 60 kg during the dry summer period in 1981, the average live mass of the Merino wethers increased ($P \leq 0,05$) during the wet winter months (May – August). After being shorn in September, average live mass declined ($P \leq 0,05$) during the late spring and summer months, to reach a minimum of *ca.* 48 kg in March 1982. This was followed by an increase in average live mass during the winter of 1982, reaching a maximum of *ca.* 75 kg in September. After shearing, no definite trend was obtained for the remainder of the trial. The mean live mass of the ewes varied between 64 ± 5 kg (February 1981) and 85 ± 9 kg (October 1982). Significant ($P \leq 0,01$) differences were observed between months (Figure 4). When live mass was compared with DOM and CP intake, it suggested that the influence of intake was only realized during the following season. This might be attributed to a carry-over effect from season to season. It is clear from Figure 4 that live mass of ewes declined ($P \leqslant 0,05$) during late pregnancy in 1981 (March to May 1981), while the ewes gained mass during lactation in 1981 (May to August 1981). No definite trend was observed in the following three months up to mating. When the ewes were mated in December 1981, their masses declined during the first three months of pregnancy (January, February and March 1982), decreased during late pregnancy (March to May 1982), decreased during the first month of lactation (May 1982) and subsequently increased up to weaning (August 1982). No definite trend was observed during the following four months (September – December). Overall, the ewes tended to gain mass over the two-year period, which could be attributed to the fact that young ewes were used. Variation in monthly live masses of sheep continuously grazing medic pasture was also reported by Brownlee & Denney (1985) and Ashton *et al.* (1979).

The production data of the producing SAMM ewes in terms of wool and mutton, and of the Merino wethers in terms of wool production, are summarized in Table 1. The data represent the two-year experimental period. The wool production of the Merino wethers was considerably higher in 1981 (60,5 kg/ha) than in 1982 (39,7 kg/ha). The greasy wool production of the SAMM ewes was 23,4 kg/ha in 1981, but the data for 1982 were unfonunately lost.

Table 1 Wool production of Merino wethers (stocking rate 6,5 wethers/ha), as well as wool production, reproduction and growth data of SAMM ewes and their lambs (stocking rate 5,2 ewes/ha) continuously grazing medic pasture

Production data	Year 1981	Year 1982
Merino wethers		
Greasy wool production (kg/sheep)	9,3 ± 1,9[a]	6,1 ± 1,8[a]
Greasy wool production (kg/ha)	60,5	39,7
SAMM ewes		
Ewes joined	14	14
Ewes lambed	9	12
Lambs born	15	22
Lambs weaned	11	15
Lambs born/ewes joined (%)	107	157
Lambs weaned/ewes joined (%)	79	107
Greasy wool production (kg/sheep)	4,5 ± 1,2[a]	–[b]
Greasy wool production (kg/ha)	23,4	–[b]
Lambs		
Weaning mass, 100 days (kg)	31,8 ± 6,5[a]	33,8 ± 6,2[a]
Average daily gain (g/d)	263 ± 40[a]	294 ± 63[a]
Meat production (kg/ha)[c]	62,4	90,4

[a] Standard deviations.

[b] Data for 1982 were lost.

[c] $\frac{\text{Weaning mass (kg)} \times \text{Number of lambs weaned} \times \text{Dressing \% (48\%)} \times \text{Stocking rate}}{\text{Number of ewes}}$

Mutton production, expressed in terms of kg meat/ha, was 62,4 kg (1981) and 90,4 kg (1982). The lower production obtained in 1981 was caused by a lower lambing rate which may be ascribed to the fact that first-parity ewes were used. Lambs were weaned (*ca.* 100 days) at 31,8 ± 6,5 kg (1981) and 33,8 ± 6,2 kg (1982) and maintained average daily gains of 263 ± 40 and 294 ± 63 g/d in the respective years.

Data obtained in our study compare well with the data obtained by De Villiers (T.T. De Villiers, 1982; personal communication) for SAMM ewes continuously grazing medic pasture for a four-year period at a stocking rate of five ewe units/ha. He reported an average 100 day weaning mass of 34,8 kg, average daily gains for the lambs of 294 g/d, greasy wool production of 3,6 kg/ewe and a total mutton production of 98 kg/ha and greasy wool production of 18 kg/ha. He maintained a lambing rate (lambs born/ ewes joined) of 157% and a weaning rate (lambs weaned/ ewes joined) of 120% for the four-year period. The conception rate in his study averaged 93%. Van Heerden & Tainton (1987), who continuously grazed medic pasture for four years by five producing Merino ewes/ha, reported production values of 6,1 kg greasy wool/ewe unit, 31 kg greasy wool/ha, meat yields of 66 kg/ha and average daily gains of 190 g/d for lambs. The wool production data obtained in South Africa exceeded the wool production values obtained in Australia (where lower stocking rates were used) by Ashton *et al.*, (1979) (achieving 21,1 kg wool/ha by continuously grazing grass-medic pasture for 12 years by 3,7 South Australian strong wool Merinos), Robards *et al.* (1978) (17,5 kg wool/ha at a stocking rate of 3,7 Merino ewes/ha) and Brownlee (1973) (17 kg wool/ ha at a stocking rate of 3,1 Merino wethers/ha). Brownlee & Denney (1985), who continuously grazed medic pasture by four dry Merino ewes/ha for four years, reported a clean fleece production of 6,5 kg/ewe a year.

Conclusions

Grab samples taken at specific times may under- or overestimate intake. More accurate intake values may be achieved after the determination of an excretion pattern if grab samples are collected at a fixed time. When compared to the total collection of an undigestible marker, more accurate intake values were found with grab samples than by the total collection of faeces technique, which probably underestimated intake, due to losses of faeces.

When medic pasture is under continuous grazing, it seems that supplementary feed is required by reproducing ewes for certain periods during the year. The effect of supplementary feed in this shortage periods on pasture intake and production must, however, be investigated and the economic application thereof elucidated. This is particularly true if it is borne in mind that ewes may be allowed to deplete body reserves to a certain extent during late pregnancy and lactation (Russel, 1984). The levels of production maintained in the present investigation could also be regarded as satisfactory. Economic advantages may perhaps only be achieved when supplementary feeding results in a higher stocking density and an attained higher production rate per hectare. Presently there is a lack of knowledge on pasture intake and the influence of supplementary feeding on intake under local conditions. More research is required to put pasture feeding systems with strategic supplementary feeding on a sound basis in scientific and economic terms.

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