The carry-over effect of supplementation in the previous year on the production of South African Mutton Merino ewes

L. Brundyn[1,2], T.S. Brand[1#], A.V. Ferreira[2], B.B. Aucamp[1] and A. Durand[3]
[1] Elsenburg Agricultural Research Centre, Private Bag X1, Elsenburg, 7607, South Africa
[2] University of Stellenbosch, Private Bag X1, Matieland, 7602, South Africa
[3]Langgewens Experimental Farm, P.O. Box 271, Moorreesburg, 7310, South Africa

Abstract

A trial was conducted to determine the carry-over effect of supplementation in a previous year on the production of South African Mutton Merino ewes in the following year while grazing cereal stubble. Three hundred and sixteen ewes were divided into four flocks, of which two grazed oat stubble, and two grazed wheat stubble. Each of these four flocks was again subdivided into four groups, of which two subdivisions received supplementation and two received none. Four subdivisions received 200 g/d from the 6 March 1998 until the 28 May 1998, while the other four subdivisions received 200 g/d from the 5 March 1999 until the 18 April 1999. This was increased to 300 g/d from 19 April 1999 until the 25 May 1999. The ewes were weighed on a monthly basis. Due to supplementation in 1998, birth status (lambs born per ewes mated) showed a tendency to increase in 1999, while weaning status (lambs weaned per ewes mated) was not significantly affected by supplementation in the previous year. Both birth weight and weaning weight of lambs were negatively affected by supplementation in the previous year, possibly due to the tendency for the higher birth rate achieved. The initial live weight of the ewes as well as kilogram weaned lamb/ewe was unaffected by supplementary feeding in the previous year.

Keywords: Birth status, SA Mutton Merino ewes, supplementation, weaning status
Corresponding author. E-mail: tersb@elsenburg.com

Introduction

The Swartland area of the winter rainfall region of South Africa is predominantly a wheat-sheep farming area with the available forage during summer and autumn being dominated by cereal stubble.

The stubble constitute a major part of the diet of pregnant and lactating ewes during the summer and early autumn months, and due to low digestibility (Purser, 1983) and protein (Coombe, 1981), supplementation has to be provided in most cases to prevent weight loss of ewes (Weston & Hogan, 1986; Aitchison, 1988; Brand *et al*., 1992a). Inadequate provision of nutrients also causes an inadequate milk supply in ewes as well as poor pre-weaning growth in lambs. The low productivity of animals grazing cereal stubble is also associated with a low digestibility (Dann & Coombe, 1987), which results in a reduced intake (Mulholland *et al*., 1976) of the available material. Inadequate nutrient content may be aggravated by the reduced intake capacity of the late pregnant ewe (Weston & Hogan, 1986).

The main objective of supplementing the diets of ruminants, which are grazing low-quality pastures, like cereal stubble, is to correct ruminal or animal deficiencies in the diet (Dann & Coombe, 1987). However, in may cases producers did not provide supplementary feed to ewes due to economic considerations. The direct advantages of supplementary feeding to cereal stubble is described well, while the carry-over effect of the provision of supplementation to stubble lands in the previous year on the production of ewes in the following year is a field where little research has been documented. Nutrition of the female from the foetal stage until she reaches maturity may influence the reproductive performance by affecting firstly the time or age of onset of the first oestrus, secondly by affecting the fertility and fecundity at this first oestrus, or lastly by residual effects on reproductive performance during the remainder of the reproductive life (Gunn, 1983).

This study was conducted to determine the influence of supplementation in the previous (1998) year on the productive performance of South African Mutton Merino (SAMM) ewes and lambs in the following year (1999), while grazing wheat stubble lands during both years.

Materials and Methods

An experiment was conducted at the experimental farm, Langgewens, which is situated in the Swartland area of the winter rainfall region of South Africa. The area has a Mediterranean climate and receives 78% of the annual precipitation during the winter (33°17′S, 18°42′E, altitude 177 m). Three hundred and sixteen SAMM ewes were divided into four flocks (Table 1). The project was done over a two-year period. In 1998 two flocks of sheep grazing respectively oats and wheat residues were divided into four groups each. The first group grazed a 20 ha oat stubble camp at a stocking density of 5.0 ewes/ha and the second group grazed an 11.8 ha wheat stubble camp at a stocking density of 4.7 ewes/ha. Every group was subdivided into four groups of which two subdivisions received supplementation and two received none. The two groups received supplementation from the 6 March 1998 until the 28 May 1998 at a rate of 200 g/d. In 1999 two flocks of sheep similarly grazing respectively oats and wheat residues were divided into four groups each. The first group grazed a 21 ha wheat stubble camp at a stocking density of 4.8 ewes/ha and the second group grazed a 14 ha oat stubble camp at a stocking density of 4.3 ewes/ha. Each group was subdivided into four groups again of which two subdivisions received supplementation and two received none. These groups received supplementation from the 5 March 1999 until the 18 April 1999 at a rate of 200 g/d, after which it was increased to 300 g/d from 19 April until 25 May (Table 1). Supplementation was given during the last four weeks of pregnancy until the first eight weeks of lactation in the form of a lick (Table 2). During both years the four groups of sheep within each flock were rotated between the four camps to eliminate any possible camp effects.

The effect of the feeding treatment in the previous year (1998) on production in the following (1999) year was detected by Least significant difference (LSD) and analysed according to a two (supplementary feed or none in the previous year) by two (supplementary feeding or none in the current year) factorial design. The LSD test was only used when a significant F-value in the analysis of variance table was observed (Snedecor & Cochran, 1980). Ewe and lamb data were corrected for multiple births by linear model procedures where applicable.

Table 1 Details of experiments performed with SAMM ewes grazing cereal stubble

Experiment no.:	1	2	3	4
Year	1998	1998	1999	1999
Type of stubble	Oat	Wheat	Wheat	Oat
Paddock size (ha)	20	11.8	21	14
Number of ewes	100	56	100	60
Stocking density	4	4	4	4
Stubble grazing	5.0	4.7	4.8	4.3
Starting date	30 Dec.	30 Dec.	22 Jan.	22 Jan.
End date	28 May	28 May	25 May	25 May
Number of days	150	150	124	124
Supplementation				
Starting date	6 March	6 March	5 March	5 March
End date	28 May	28 May	25 May	25 May
Number of days	83	83	81	81
Amount (g/ewe/day)	200 g/d[+]	200 g/d[+]	200 g/d[++]	200 g/d[++]
			300 g/d	300 g/d
Total supplementation (kg/ewe)	16.6	16.6	19.9	19.9
Lambing date	12 Apr.	12 Apr.	12 Apr.	12 Apr.
Weaning date	10 Sep.	10 Sep.	25 Aug.	25 Aug.

[+] 200 g/d from 6 March 1998 until 28 May 1998

[++] 200 g/d from 5 March 1999 until 18 April 1999
300 g/d from 19 April 1999 until 25 May 1999

Table 2 The physical and chemical composition of the supplementary lick supplied to producing SA Mutton Merino ewes while grazing grain stubble during the dry summer period

Item	Content
Physical composition (air dry) (%)	
Barley meal	57.00
Cottonseed oil-cake meal	22.10
Urea	3.70
Feed lime	1.55
Molasses meal	1.50
Sulphur	0.15
Salt	14.00
Chemical composition (g/kg dry matter)	
Dry matter	855
Crude protein	174
Crude fibre	67
Ether extract	22
Ash	48
Total digestible nutrients	637
Metabolisable energy (MJ/kg)	80
Calcium	6
Phosphorus	4
Magnesium	3
Sulphur	3

Results and Discussion

The effect of dietary treatment in both the previous year (1998) and the following year (1999) on production parameters obtained were assessed and are presented in Table 3. The data revealed no significant interactions between years and the dietary effect of each year was presented separately. It is evident that the number of lambs born showed a tendency to improve with supplementation provided in 1998 ($P = 0.07$), but the number of lambs weaned per ewes mated was not significantly affected ($P = 0.43$) by the supplementation provided in 1998. The birth weight ($P = 0.003$) as well as weaning weight ($P = 0.005$) of the lambs whose mothers received supplementation in 1998 was lower than those that did not receive supplementation. This was probably due to the increase ($P \leq 0.07$) in the number of twin lambs in the ewes that received supplementation the previous year. The initial bodyweight ($P = 0.23$) as well as the kilogram weaned lamb/ewe ($P = 0.81$) was unaffected by supplementation in the previous year.

The number of lambs born per ewes mated ($P = 0.89$) as well as the number of lambs weaned per ewes mated ($P = 0.64$) was also not affected significantly by the treatment provided in 1999. The initial bodyweight of the ewes ($P = 0.05$) that received supplementation was significantly higher than those that did not receive supplementation, due to the fact that the supplemented ewes had to rear multiple lambs. The kilogram weaned lamb/ewe ($P = 0.63$), as well as the birth weight ($P = 0.16$) and weaning weight ($P = 0.29$) of the lambs was higher in the lambs whose mothers received supplementation in 1999, although it was not significantly affected.

The treatment in terms of supplying adequate nutrition through pasture to the ewes in the rest of their reproduction cycle (e.g. the dry period) will have an undoubted influence on the carry-over effect of supplementation on the reproductive performance of the ewe. If there is adequate pasture with a high quality, a possible carry-over effect on the production of the ewes may probably be neutralized. In a study conducted by Gibb & Baker (1988) where the performance of young steers receiving stack-treated ammoniated hay or untreated hay, were evaluated with and without supplementation, it was concluded that over the summer period at pasture, the mean daily live weight gains showed no carry-over effects of winter treatment and the final live weights still reflected the effects of treatment the previous winter ($P < 0.05$). In

the steers that received untreated hay there was an indication of compensatory growth, although the differences were not significant.

Table 3 The effect of supplementation in both the previous (1998) and present (1999) year on production of SA Mutton Merino ewes in the following year

Production (1999)	Treatment in 1998		s.e.m.	P
	No supplementation	Supplementation		
Ewes:				
Initial bodyweight, kg	68.86	70.54	1.01	0.23
Weaning lamb weight/ewe^{+++}	28.79	30.00	1.37	0.81
Lambs:				
Birthweight, kg	4.94^{a}	4.42^{b}	0.12	0.003
Weaning weight, kg	27.95^{a}	25.00^{b}	0.75	0.005
Birth status^{+}	1.09	1.37	0.10	0.07
Weaning status^{++}	0.94	1.05	0.10	0.43
Production (1999)	Treatment in 1999		s.e.m.	P
	No supplementation	Supplementation		
Ewes:				
Initial bodyweight, kg	71.03	68.36	0.98	0.05
Weaning lamb weight/ewe^{+++}	26.71	32.42	1.37	0.63
Lambs:				
Birthweight, kg	4.56	4.80	0.12	0.16
Weaning weight, kg	25.93	27.02	0.76	0.29
Birth status^{+}	1.22	1.24	0.10	0.89
Weaning status^{++}	0.96	1.02	0.09	0.64

+ Lambs born/ewes mated; ++ Lambs weaned/ewes mated; +++ Weaning weight of lambs x weaning status
Values in rows not followed by the same superscript differ ($P < 0.05$)

Hughes *et al*. (1978) studied the long-term effect of a winter supplement on (supplied at low, moderate, high and very high levels) the productivity of range cows for 10 consecutive winters. In the first four calf crops, high levels of supplement resulted in earlier ($P < 0.025$) calving dates. Increasing supplement from the low to high levels resulted in larger birth weights in calf crops from year one ($P < 0.001$), two ($P < 0.025$), three ($P < 0.025$) and nine ($P < 0.025$). There was a decline in the calving percentages of calf crops from year two and three, but all treatment groups had similar values in calf crop from year four and succeeding calf crops. In the present study, the birth weight of the lambs from unsupplemented ewes were higher than those of the supplemented ewes during treatment in 1998 due to an increase in the twinning rate of the supplemented ewes. Supplementation in 1999, however, produced heavier lambs than the unsupplemented ewes. Although the very high level cows had a high calving percentage (0.93) in calf crop one, Hughes *et al*. (1978) found that the weaning percentage for this group was only 0.66, which was significantly less than the low (0.82) and high (0.82) level groups. The low weaning percentage for the very high group was due to the fact that about 33% of the calves were stillborn, due to dystocia in the obese heifers. Even though the low level group had the same weaning percentage value as the high level group, kilograms of calf weaned per cow exposed were considerably lower, probably due to the differences in milk production of the dams. The low and moderate levels of supplementation during the first winter were apparently sufficient to support adequate conception in the first breeding season. These lower levels of supplementation, coupled with the stress of pregnancy and lactation, appeared to be inadequate to support normal oestrus and reproduction. In the present study, the kilogram weaned lamb/ewe in 1999 was not affected significantly by treatment in both years (1998 and 1999), although it was higher in the supplemented ewes in 1999.

Baker & Gibb (1995) studied the performance of Friesian steer calves when reared over winter on a silage (S) or on a silage plus concentrate (SC) diet. It was found that the dietary treatment during the winter had no significant carry-over effect on performance during the grass-feeding period and there was no

indication of compensatory growth by the steers that received silage alone. Short *et al*. (1996) conducted a four-year experiment to determine the effects of protein supplementation, age at weaning and calf sire breed on cow and calf performance during fall grazing. Some carry-over effects of treatments were observed the next spring in cow weight, condition score, and birth weight ($P < 0.01$), but there were no effects by the next fall on weaning weight or pregnancy rates.

The lack of response in the live weight of ewes in the present study could be accounted for by the fact that mature ewes were used. In a study by Allden (1979) an unrestricted level of feeding for the first eight weeks of life prior to a lengthy period of restriction was very effective in establishing a high reproductive potential, compared to restricted nutrition from birth. This emphasizes the importance of nutrition early in life. This was also indicated by Reardon & Lambourne (1966), who indicated that there may be a critical development period which is very sensitive to nutrition and which will greatly affect the genetic potential achieved by the ewes later in their life.

Conclusion

In conclusion, it is evident that supplying supplementary feed in the previous year did not have a significant carry-over effect on production in the following year. Although there was a tendency for ewes to produce more lambs when receiving supplementation the previous year, the number of lambs weaned did not improve significantly, rendering it economically unjustifiable to provide supplementation in order to obtain a significant carry-over effect. A probable carry-over effect on the production of the ewes will also be smaller if adequate pasture is supplied in the dry period. The animals used in the study were mature, while young growing animals may probably be more exposed to a possible carry-over effect.

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