S.-Afr.Tydskr.Veek. 1990, 20(2)

Response of SA Mutton Merino ewes and their lambs to supplementation with enriched oat, barley or triticale grain on wheat stubble grazing

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Received 13 March 1989; accepted 27 November 1989

Oat, barley or triticale grain, enriched by addition of nitrogen, minerals, and an ionophore, was fed for 90 days as supplement at a level of 500 g per head per day to SA Mutton Merino ewes during late pregnancy and lactation. Data from 125 pregnant ewes were used to investigate live mass change during late pregnancy and lactation, while wool production (derived from 10×10 cm midrib squares tattooed on the right side of the ewes) was studied with 57 of these ewes. Data from 130 lambs, alive on the ewes at weaning, were used to determine the influence of supplementation on birth mass, weaning mass and preweaning growth rate. The ewes receiving supplement succeeded in maintaining a higher ($P \leqslant 0{,}05$) average live mass during lactation than the unsupplemented control group. Ewes receiving enriched barley tended to have smaller losses of live mass than those supplemented with enriched triticale. Supplementation tended to increase greasy and clean wool production per unit skin area, but no significant deviations from the control group were found. The birth mass of lambs born from ewes fed the supplement, tended to be higher than in the control group. Lambs reared by ewes supplemented with enriched oats and triticale were heavier ($P \leqslant 0{,}05$) at weaning, with faster ($P \leqslant 0{,}05$) growth rates than control group lambs. A similar tendency was observed in lambs reared by ewes receiving enriched barley as supplement.

Hawer-, gars- of triticalegraan is met die byvoeging van stikstof, minerale en 'n ionofoor verryk, en vir 90 dae teen 500 g per ooi per dag aan SA Vleismerino-ooie tydens laatdragtigheid en laktasie as aanvulling gevoer. Data van 125 dragtige ooie is gebruik om liggaamsmassaverandering gedurende laatdragtigheid en laktasie te ondersoek, terwyl wolproduksie (verkry van 10 × 10 cm-midribvierkante op die regtersy van ooie getatoeëer) met 57 ooie bestudeer is. Data van 130 lammers, lewend by die ooie by speen, is gebruik om die invloed van aanvulling op geboortemassa, speenmassa en voorspeense groeitoename te ondersoek. Ooie waaraan aanvulling voorsien is, het 'n hoër ($P \leq 0{,}05$) liggaamsmassa tydens laktasie gehandhaaf as die onaangevulde kontrolegroep, terwyl die groep wat verrykte gars ontvang het, geneig het om kleiner liggaamsmassaverliese te toon as die groep waaraan verrykte triticale voorsien is. Aanvulling het geneig om rou- en skoonwolproduksie per eenheid velopppervlakte te verbeter, maar geen betekenisvolle afwykings van die kontrolegroep is verkry nie. Die geboortemassa van lammers van ooie wat aangevul is, het geneig om hoër te wees as by lammers van die kontrolegroep. Lammers wat deur ooie wat verrykte hawer- en triticale-aanvullings gekry het grootgemaak is, was swaarder ($P \leq 0{,}05$) by speen as kontrolegroeplammers, en het vinniger ($P \leq 0{,}05$) voorspeense groeitoenames gehandhaaf. 'n Ooreenstemmende neiging is by lammers van die groep waaraan verrykte gars voorsien is, ondervind.

Keywords: Enriched small grains, lamb growth, stubble grazing, supplementation.

Sheep farming in the cropping areas of the Swartland depends mainly on wheat stubble and other crop residues for summer grazing. The nutritive value of these pastures deteriorates rapidly towards autumn, before the first winter rains. Ewes from this area are generally mated to lamb from the middle of autumn to early winter, often resulting in periods of higher nutrient requirement (owing to late pregnancy and lactation) coinciding with periods of nutritional deprivation. To counter the problems of ketosis and poor milk yield in ewes, as well as low viability and poor preweaning gain in lambs, the diets of ewes are often supplemented during this period. The response of ewes and their lambs to supplementation with small grains that had been enriched by addition of nitrogen, minerals and an ionophore, was therefore investigated.

The experiment was conducted during 1988 with a flock of 149 SA Mutton Merino ewes on the experimental farm, Langgewens, near Moorreesburg. The ewes were mated from 15 November 1987 for six weeks, and subsequently maintained on wheat stubble at a stocking density of 2 ewes/ha in a single flock. Supplementation commenced by the end of March, when the average live mass of a group of tracer ewes, weighed weekly for this purpose, began to decline. At this stage, the ewes were stratified according to age and live mass and randomly allocated to four experimental groups, representing an unsupplemented control and three groups supplemented with enriched oat, barley or triticale grain. The alkali-ionophore enrichment formula consisted of urea (1,5%) and minerals (*ca* 1,1%) absorbed into the grain, with calcium hydroxide (2,1%) and salinomycin (320 g/t grain) bound to it with molasses (applied at a level of 32 l/t grain). Although ewes were kept as a single flock on the same pasture for the entire supplementation period, the groups were separated daily between 15h00 and 16h00 to feed supplement to the experimental groups. The level of supplementation was kept constant at 500 g/head/d, for a period of 90 days – from 30 March to 28 June. At this stage, a total precipitation of 146 mm was recorded, with 73,6 mm in June alone. Hereafter, sufficient green pasture was available and supplementation discontinued. The dry matter, crude protein (AOAC, 1970), cell wall constituents (Van Soest & Wine, 1967) and *in vitro* organic matter digestibility (Engels & Van der Merwe, 1967) of the enriched small grains were determined.

At the beginning of supplementation, squares of 10 × 10 cm were clipped as close as possible (Oster clippers, no. 40 head) and tattooed on the right sides of a random sample of 15 ewes from each group, to study total wool yield/100 cm^2 during the supplementation period (Du Plessis, 1974). On the last day of supplementation, these squares were clipped again and the wool was quantitatively recovered for further analyses.

All ewes were weighed weekly, except during the 6-week lambing period. Mass change from the initial mass at the beginning of supplementation was then calculated. The wool recovered from the ewes was used to determine total greasy and clean wool production in mg/cm^2 skin area, clean yield and fibre diameter (by projection microscopy). Information regarding sex, birth type, birth mass, weaning mass (at 100 days) and daily gain to weaning was recorded for lambs. These data were analysed by least-squares procedures (Harvey, 1977) to correct for uneven subclasses. The fixed model for the analysis on the live mass change and wool data of the ewes included the effects of treatment, number of lambs born (single or multiple) and the two-factor interaction. Only data from 125 ewes that lambed were retained in the analysis on live mass change. The data used to compare wool growth (mg/cm^2) similarly included only 57 pregnant ewes. The fixed model for the analysis of the lamb data included the effects of treatment, birth type (single or multiple), sex (male or female) and all the applicable two-factor interactions. Only data from 130 lambs weaned on the ewes were considered. The Bonferoni method was used to test differences between least-squares means for significance (Van Ark, 1981).

The chemical composition of the supplements is presented in Table 1. The *in vitro* digestibility of enriched barley and triticale was higher than that of enriched oats, with the concentration of cell walls of enriched oats being the highest.

Table 1 Chemical composition of enriched oat, barley and triticale grain (DM basis)

	Grain		
Component	Oats	Barley	Triticale
Crude protein	13,1	14,7	17,4
Cell wall constituents	39,8	23,8	23,3
In vitro organic matter digestibility	69,0	87,1	89,8

Preliminary analysis suggested that twin-bearing ewes were 6—7 kg heavier ($P \leq 0{,}01$) than those bearing singles. This observation agrees with that of Russel (1984), and generally limits the use of live mass change in late pregnancy as a means of assessing adequacy of nutrition during that period. Prior to lambing, no differences in live mass change were obtained between the respective treatments. Live mass loss of ewes receiving supplement over the entire lactation period was less ($P \leq 0{,}05$) than that of ewes in the control group (see Figure 1). There was also a tendency for ewes receiving enriched barley supplement to maintain a higher live mass than those supplemented with enriched oats or triticale, with some differences between the former group and the enriched triticale group being significant ($P \leq 0{,}05$). The ability of ewes receiving supplement to maintain an average live mass higher than that of a control group, is consistent with results of Kenney & Roberts (1984) who found similar advantages in supplementing poor quality hay (considered representative of available pasture) with 270 g oats, wheat or lupins/head/d. Young, Newton & Orr (1980) similarly reported that ewes fed with 400—650 g barley-based supplement/d succeeded in maintaining a higher live mass than unsupplemented control ewes on a perennial ryegrass pasture.

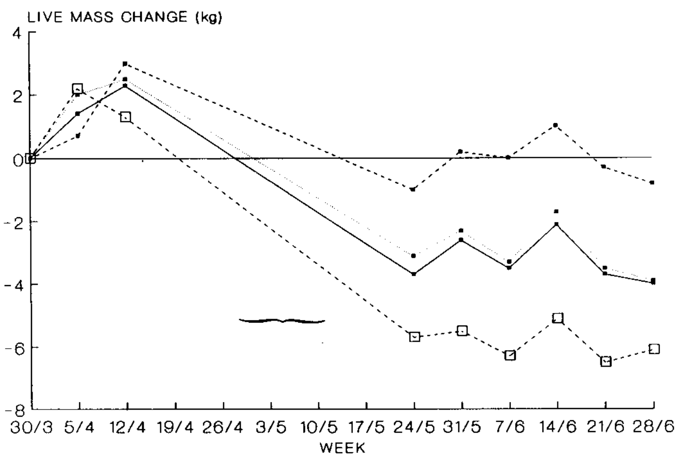

Figure 1 Live mass change as deviations from initial live mass at the beginning of supplementation in ewes receiving enriched oats (■ . . . . ■), barley (■ - - - - ■), or triticale (■ —— ■) as supplements, or in the control group (□ - - - - □).

The supplemented ewes tended ($P = 0{,}15$) to produce more greasy wool/unit skin area (mg/cm^2) than the control group (Table 2). Yield and fibre diameter were similar for all four groups. Clean wool production (mg/cm^2) also tended to be higher in the supplemented ewes, without reaching significance ($P = 0{,}24$). In this regard, Kenney & Roberts (1984) reported significant ($P \leq 0{,}05$) improvements in fleece mass after supplementing poor quality hay with oats and lupins.

Supplementation tended to improve average lamb birth mass ($P = 0{,}15$; Table 3), although no large effect was expected, since the feeding program was only implemented 14 days before lambing commenced. The overall lamb survival was low (68,1%) and largely independent of supplementation, although lambs borne by ewes receiving enriched oats tended to have a higher probability of survival (74,4%). Feeding enriched oats and triticale supplements to ewes improved ($P \leq 0{,}05$) the average mass at weaning and preweaning growth rate of their lambs, while a similar tendency was observed in lambs born from ewes fed enriched barley. Kenney & Roberts (1984) reported similar higher growth rates in lambs that were reared by ewes fed poor quality hay, supplemented with oats, wheat and lupins. Holst (1987) also reported an increase in the live mass of lambs reared by ewes fed an oat grain supplement when compared to

Table 3 Birth mass, weaning mass and preweaning growth rate of lambs reared by control ewes and ewes that were receiving enriched oat, barley or triticale grain supplements

Treatment	Number of lambs	Birth mass (kg)	Weaning mass (kg)	ADG to weaning (g/d)
Control	33	3,86	26,4[a]	225[a]
Oats	32	4,18	30,5[b]	265[b]
Barley	32	4,20	28,8[a,b]	247[a,b]
Triticale	33	4,22	29,6[b]	255[b]
SD[1]		0,70	3,90	37,6

[a,b] Significant differences ($P \leq 0{,}05$) in columns.
[1] Standard deviation for the analysis.

Table 2 Greasy and clean wool production (mg/cm^2), clean yield and fibre diameter of untreated control ewes, and ewes that were receiving enriched oat, barley or triticale supplements

Treatment	Number of ewes	Greasy wool production (mg/cm^2)	Clean yield (%)	Clean wool production (mg/cm^2)	Fibre diameter (μ)
Control	14	73,7	47,9	35,2	22,9
Oats	15	86,0	49,7	42,7	24,0
Barley	14	87,6	49,2	43,1	23,1
Triticale	14	88,8	48,4	42,9	23,3
SD[a]		14,4	5,8	8,9	2,6

[a] Standard deviation for the analysis.

an untreated control group. In the present results, the fact that no significant improvement in lamb growth rate could be obtained by feeding ewes on enriched barley supplement – although these ewes maintained the highest average live-mass of all groups – is anomalous. These results on the supplementation of enriched barley accord with 8indings of Young *et al.* (1980) on ewes, grazing perennial ryegrass pastures, and receiving a barley-based supplement during lactation.

The most probable explanation for this anomaly is that ewes fed barley may have partitioned more nutrients to form body tissue, and less nutrients towards lamb growth. Ionophores may affect milk yield in ruminants by increasing propionate production at the cost of acetate and buterate (Mackie & Kistner, 1985), possibly contributing to this observation. It should, however, be stated that progeny of ewes receiving enriched oat grain grew as well as lambs suckling ewes on an untreated oat grain supplement in a pilot trial (A.A. Brand, 1988; unpublished results). The possibility that this finding was related to the ionophore included in the enrichment formula thus appears unlikely, particularly since lambs suckling ewes that were receiving enriched barley were the only ewes apparently affected. Similar conclusions were reached in other experiments, involving grain supplements without ionophores. In this respect, Jordan & Hanke (1977) reported marked improvements in ewe body mass gain during lactation when the shelled-corn supplement was increased from 0,23 to 0,91 kg/ewe/d, while a relatively small improvement in lamb growth was observed. Beetson (1984) obtained similar results, with twin and triplet lambs responding less than singles when the amount of supplement (80% cereal grain + 20% lupins) fed to their dams was doubled from 0,5 to 1 kg/head/d. In the present study, the expected digestible organic matter intake of the enriched barley supplement was 26% higher compared to enriched oats. The digestible organic matter intake of enriched barley was, however, similar to that of triticale. Since these tendencies are based on relatively few data, the observed results may well be coincidental, and would thus need verification.

From these results, it is evident that supplementation with enriched small grains resulted in some biological gain. In general, ewes receiving a supplement maintained a higher live mass during lactation and also tended to produce more wool/cm^2 than control ewes. Lambs reared by ewes fed oat and triticale supplements, grew better than control lambs. Economic benefit of supplementation cannot readily be assumed, as ewes may be allowed to deplete body reserves to a certain extent during late pregnancy and lactation (Russel, 1984). The assessment of the economic merit of supplementation may furthermore be complicated by an interaction with stocking rate, as was implied by Young *et al.* (1980). However, there appears to be merit in the assessment of the adequacy of nutrition on an objective basis, possibly using metabolites such as plasma β-hydroxybuterate (Foot, Cummings, Spiker & Flinn, 1984), in order to place the decision of whether or not to supplement cereal stubble pastures on a sound economic basis.

Acknowledgements

The authors thank Mr A. Durand and his staff for the maintenance of the experimental flock and the practical execution of the experiment, Messrs F. Franck, M. Goldmann and A. Austin for technical assistance, and Prof P.J. de Wet and Mr W.J. Burger of the Department of Sheep and Wool Science, University of Stellenbosch, for projection microscope facilities for fibre diameter determination.

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