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PRE- AND POST-WEANING PERFORMANCE OF ARTIFICIALLY REARED LAMBS

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OPSOMMING: VOOR- EN NASPEENPRESTASIE VAN KUNSMATIG GROOTGEMAAKTE LAMMERS

Vier-en-twintig Suid-Afrikaanse Vleismerino ooilammers is kunsmatig in 'n 2^2-faktoriale proefontwerp grootgemaak op of 5 of 10 kg melksurrogaat tot 'n speenouderdom van òf 25 òf 30 dae. Vanaf speen tot 'n minimum ouderdom van 100 dae en 'n minimum liggaamsgewig van 32 kg, is die lammers individueel en *ad lib.* gevoer met 'n meelmengsel wat 16% RP, 72% TVV en 9% ruvesel bevat het. Gedurende die periode van voer van melksurrogaat was die gemiddelde daaglikse toename (GDT) en voeromsetting (VO) betekenisvol groter in die geval van lammers wat 10 kg melksurrogaat ontvang het (335 g en 1,08 *vs* 228 g en 0,81 respektiewelik; $P < 0,01$), en lammers wat op 25 dae gespeen was, het 'n betekenisvol hoër GDT gehad (297 *vs* 265 g; $P < 0,05$). Om 32 kg liggaamsgewig te bereik, het die lammers wat op 10 kg melksurrogaat grootgemaak was 92,0 dae geneem en 65,9 kg meel ingeneem met 'n totale koste van R7,23, terwyl dié op 5 kg melksurrogaat 106,4 dae (gespeen op 25 dae) of 111,0 dae (gespeen op 30 dae) geneem het en 85,4 kg meel ingeneem, wat R6,29 beloop het. Gewigstoename tot 100 dae was betekenisvol deur die inname van melksurrogaat beïnvloed ($P < 0,01$), maar speenouderdom het geen betekenisvolle invloed hierop gehad nie. VO (40–100 dae) is nie betekenisvol deur behandelings beïnvloed nie.

SUMMARY

Twenty-four South African Mutton Merino ewe lambs were artificially reared in a 2^2-factorial experiment on 5 or 10 kg milk substitute to weaning at 25 or 30 days. From weaning until a minimum of 100 days of age and a minimum of 32 kg live weight, the lambs were individually fed *ad lib.* a meal mixture containing 16% crude protein, 72% total digestible nutrients and 9% crude fibre. During the milk substitute feeding period, both average daily gain (ADG) and food conversion ratio (FCR) were significantly greater in lambs fed 10 kg milk substitute (335 g and 1,08 *vs.* 228 g and 0,81 respectively; $P < 0,01$), and ADG was significantly greater in lambs weaned at 25 days (297 *vs.* 265 g; $P < 0,05$). To reach 32 kg live weight, the lambs reared on 10 kg milk substitute took a mean of 92,0 days, consumed 65,9 kg meal and cost R7,23, while those reared on 5 kg took 106,4 days (when weaned at 25 days) or 111,0 days (when weaned at 30 days), consumed 85,4 kg meal and cost R6,29. Growth to 100 days of age was significantly affected by intake of milk substitute ($P < 0,01$), but not by weaning age; FCR (40–100 days) was not affected by treatments.

Experience in South Africa and particularly in the United Kingdom (M.L.C., 1970) has shown that although there are no insurmountable practical difficulties in the artificial rearing of lambs, at present natural rearing is usually the cheaper method. Nevertheless, there may be circumstances when artificial rearing may be justified. Firstly, for example, the efficiency of lamb production can be improved by increasing litter sizes and/or the frequency of lambing and thus the number of lambs born per ewe per year. The artificial rearing of lambs in excess of twins (or even of singles, depending on the milking ability of the ewes and the available feed supply), or the removal of all lambs within one or two days of birth to facilitate the early rebreeding of ewes, may be means of promoting maximum efficiency of lamb production. Secondly, for fat lamb production, breeding stock needs to be selected *inter alia* for post-weaning growth rate or final weight, and for efficiency of feed utilization or food conversion ratio (Owen, 1971), and artificial rearing may improve the effectiveness of such selection by reducing variation due to the pre-weaning performance of the lambs. Where lambs are reared naturally, their growth to 100 days of age or to slaughter weight is greatly influenced by the milk yield of the mother. By rearing lambs artificially, using a milk powder or milk substitute at a known concentration and at a uniform rate for all lambs, it is possible to rear lambs to predetermined weaning weights at a given age and to standardize the effect of pre-weaning treatment on the post-weaning performance of the lambs.

The objects of this experiment were to determine the cost of artificially rearing lambs to slaughter weight, using different levels of milk substitute, and to compare the post-weaning performance of the lambs.

Procedure

Twenty-four twin-born South African Mutton Merino ewe lambs were removed from their mothers about 1 day after birth (day 1) when their mean weight was 4,52 ± 0,9 kg and randomly allotted to four treatment groups in a 2^2-factorial experiment. The factors investigated were (1) the total amount of milk substitute allowed per lamb, viz. 5 kg (fed at 125 g per l) or 10 kg (fed at 250 g per l), and (2) the period of feeding the milk substitute, viz. 25

Table 1

Mean total intake of dry milk substitute for 5 day periods, and initial and weaning weights (six lambs per group, kg)

Concentration of milk substitute	125 g per litre		250 g per litre	
Weaning after:	25 days	30 days	25 days	30 days
Days				
1 – 5	0,600	0,601	1,170	1,166
6 – 10	0,800	0,651	1,608	1,290
11 – 15	1,000	0,723	1,944	1,456
16 – 20	1,202	0,823	2,381	1,669
21 – 25	1,381	1,002	2,721	1,976
26 – 30	–	1,193	–	2,337
Total intake	4,983	4,993	9,824	9,894
Cost of milk substitute consumed	R2,00	R2,00	R3,93	R3,96
Initial weight	4,5	4,5	4,6	4,5
Weaning weight	10,5	10,9	13,4	14,0

or 30 days. The milk substitute ("Wessalam", Wessanen Royal Mills, Wormerveer, Netherlands, the cost of which in South Africa is 40c per kg) was mixed daily using boiled water. The milk substitute was fed warm to each lamb individually, by means of a bottle and teat for the first few days and thereafter by means of a small suspended bucket with a teat attached. Feeding took place four times a day initially; this was reduced to three times daily between 6 and 10 days of age, intake being progressively increased in each five-day period as shown in Table 1. Lucerne hay was available to each lamb from day 10 until the last day but one of milk substitute feeding, from which time the following meal mixture (no additional roughage) was supplied *ad lib.*: maize meal 60%, lucerne meal 15%, fish meal 5%, wheaten bran 5%, peanut oilcake meal 10%, molasses meal 5%, plus an additional 1% dicalcium phosphate and 1% salt. The estimated crude protein, total digestible nutrient and crude fibre contents were 16%, 72% and 9% respectively and the cost of the ration was 5c per kg. Water was supplied only after weaning, which was abrupt. The lambs remained in individual pens throughout the experiment, except for a daily period after weaning (weather permitting), when they were released into an open communal run for 2–3 hr. A single intramuscular injection of 100 000 i.u vitamin A (Roche) was given to each lamb at about 40 days of age. Lambs were weighed regularly and the meal consumed by individual lambs was recorded daily until each had reached at least day 100 and a weight of at least 32kg.

Discussion of Results

Some scouring occurred during the first 5 days of rearing, but affected lambs responded quickly to the addition of terramycin and kaolin to the milk substitute. No other problems were encountered until weaning. One lamb, reared on 5 kg milk substitute in 25 days, was reluctant to eat the meal ration until about 70 days of age, and another, reared on 10 kg in 30 days, broke a leg on day 82. The data from these two animals were discarded from all post-weaning results.

Pre-weaning performance

The mean weights of milk substitute consumed and weaning weights are shown in Table 1 for each treatment group. In Table 2, the average daily gain (ADG) and gross food conversion ratios (FCR – i.e. intake of milk substitute powder per unit live weight gain) are given. Both

Table 2

Mean average daily gain (ADG) and gross food conversion ratios (FCR) during feeding of milk substitute (six lambs per group)

Weaning age		Total milk substitute intake		
		5 kg	10 kg	Mean
25 days	ADG (g)	242	353	297
	FCR	0,83	1,12	0.98
30 days	ADG (g)	213	317	265
	FCR	0.79	1,04	0,91
Mean	ADG (g)	228	335	281
	FCR	0,81	1,08	0,95

ADG and FCR were significantly greater in lambs fed 10 kg milk substitute ($P < 0,01$), while differences in age at weaning significantly influenced ADG ($P < 0,05$), but not FCR.

Performance to 32 kg live weight

This is summarized in Table 3. Considering the number of days taken to reach 32 kg, the interaction between quantity of milk substitute fed and weaning age was statistically significant ($P < 0,01$). Thus, rearing lambs on 10 kg milk substitute in 25 or 30 days did not significantly influence the total time taken by the lambs to reach 32 kg. On the other hand, using only 5 kg milk substitute, weaning at 25 days instead of at 30 days significantly shortened the feeding period, although the mean difference (4,6 days) was small and the average meal consumption and total feed costs in these groups did not differ significantly. The lambs reared on 10 kg milk substitute consumed less meal between weaning and reaching 32 kg, but this difference was not sufficient to compensate entirely for the higher pre-weaning feed costs in these groups. For purposes of production, however, it is clearly

Table 3

Mean performance of lambs to 32 kg live weight
(Total feed costs exclude very small quantities of lucerne hay consumed before weaning)

Weaning age		Total milk substitute intake		Mean
		5 kg	10 kg	
25 days	No. of lambs	5	6	11
	ADG (g)	259	298	280
	Time taken (days)	106,4	92,5	98,8
	Meal consumed (kg)	86,0	66,4	75,1
	Total feed costs	R6,30	R7,25	R6,78
30 days	No. of lambs	6	5	11
	ADG (g)	249	301	273
	Time taken (days)	111,0	91,4	102,1
	Meal consumed (kg)	85,3	65,3	76,2
	Total feed costs	R6,27	R7,21	R6,74
Mean	No. of lambs	11	11	22
	ADG (g)	253	299	276
	Time taken (days)	108,9	92,0	100,5
	Meal consumed (kg)	85,4	65,9	75,7
	Total feed costs	R6,29	R7,23	R6,76

more economical to use the smaller quantity of milk substitute and quite possible to wean the lambs as early as 25 days.

Owen & Davies (1970) have apparently repeatedly shown that the overall ADG of lambs to 17,5 kg live weight was not affected by feeding 5 kg or 9 kg of milk powder before weaning, the difference in weaning weight being compensated by post-weaning concentrate consumption. In the present experiment, on the other hand, in spite of consuming 20 kg more concentrates per head than those reared on 10 kg milk substitute, the lambs reared on 5 kg milk substitute had a lower overall ADG to 32 kg. Moreover, Frederiksen, Price & Bell (1971) found inconsistent evidence of compensatory growth in two trials with artificially reared lambs weaned at 12,3 or 14,5 kg. With rather older lambs under grazing conditions, Kirton (1970) reported that groups of lambs differing by 5,8 kg at weaning at 14 weeks did not differ in their post-weaning growth rates. It seems, therefore, that in practice the post-weaning growth rate of lambs that are lighter at weaning does not always compensate for the lower growth rate before weaning.

Performance test to 100 days of age

The performance of the lambs to 100 days of age was also significantly affected by the intake of milk substitute, but not by weaning age. The data are summarized in Table 4. Weight at 100 days and ADG (birth to 100 days) were adjusted in analyses of covariance for weight of the lamb at 40 days. The analyses showed that the differences between the adjusted treatment means were in both cases not significant. Thus the differences both in 100 day weight as well as in ADG (birth to 100 days) can be explained by differences in 40 day weight, the respective regression coefficients being 0,64 kg and 6,55 g per kg of weight at 40 days of age (Snededor, 1946). Thus it is clear that the pre-weaning nutritional level of the lambs had an important influence on their performance to 100 days of age and it is suggested that in a performance test of this nature, provision should be made for adjusting the data for differences in milk substitute intake. On the other hand, in selecting for efficiency of feed utilization following weaning at about 6 weeks of age, it appears from these results to be unnecessary to adjust the FCR values for differences in pre-weaning feeding levels.

Table 4

Mean performance test data to 100 days of age

	Total milk substitute intake		Significance of difference
	5 kg	10 kg	
No. of lambs	11	11	–
40 day weight (kg)	12,0	14,5	$P < 0,01$
100 day weight (kg)	30,1	34,9	$P < 0,01$
ADG, 40–100 days	302	340	$P < 0,01$
FCR, 40–100 days	3,74	3,71	N.S.
ADG, birth – 100 days	256	304	$P < 0,01$

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