FEEDING STRATEGIES FOR OPTIMISING THE POST-WEANING GROWTH OF KIDS FROM CASHMERE GOATS

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SUMMARY

Sixty Australian cashmere suckling kids (6 weeks old) were used in a factorial experiment which evaluated the effects of feeding concentrates (77% sorghum grain, 20% cottonseed meal, 3% limestone) in varying sequences (nil (A), 6 to 8 and 10 to 16 weeks (B), 8 to 16 weeks (C), 10 to 16 weeks (D), 6 to 16 weeks of age (E)) to groups of twin and single male, female and castrate kids. Concentrates were offered from creep feeders (kids) and troughs (kids and does) until weaning (10 weeks), after which the kids were held in separate paddocks until 16 weeks of age. Experience of concentrates prior to weaning facilitated higher feed consumptions at weaning, but these effects were not apparent at later times. At all ages, single kids were significantly ($P<0.05$) heavier than twins, and males and castrates were significantly ($P<0.05$) heavier than females. At 6 weeks of age there were no significant differences in the liveweights of kids in the different feeding groups. At 14 weeks, kids fed concentrates continuously (group E) were significantly ($P<0.05$) heavier (14.5 kg) than those fed intermittently (groups B (13.0 kg), C (12.7 kg) and D (11.8 kg)), which were significantly ($P<0.05$) heavier than those not fed at all (group A 10.3 kg). It was concluded that high kid growth rates could be maintained over the weaning period from at least 6 weeks of age by a continuous creep feeding system.

Keywords: concentrates, pre-weaning, post-weaning, growth, goats

INTRODUCTION

Australia has a feral goat population of unknown size which is opportunistically harvested for domestication as breeding stock and for export as meat. Although goat meat represents only a small proportion of total meat exported, Australia is the world's largest exporter of goat meat (10582 tonnes in 1991, Anon. 1991). The current market value for live and carcass export is in excess of $23 million, and real opportunities exist for the expansion of this industry (Australian Agriculture 1995). Mature goats of feral origin represent the major proportion of carcasses exported. Domestic and export markets for high quality goat meat have been identified, but the realisation of these opportunities is limited by variable supply and quality. Young goats of uniform weights (18-20 kg liveweight) and age (less than 6 months old) are required for this prime kid market, and the future development of a domestic goat meat industry will depend on a continuous supply of goats of this type.

A major problem facing the development of this industry is high variability (8-18 kg) of kid liveweights at weaning (10-12 weeks). This variability is associated with the high proportion of small twins and females, with restrictions in growth related to limited doe milk supply and with the normal check in growth associated with development of a functional rumen (Yan *et al.* 1993). There is also usually a further period of growth stasis or weight loss following weaning (Ash 1986) which extends the time needed to achieve the necessary liveweight for marketing as prime kid. In countries where goat meat is valued highly, early weaning and intensive kid raising systems have been developed (Morand-Fehr *et al.* 1991). Where kids are raised at pasture with their dams, management systems need to be developed which permit the maintenance of high kid growth rates during the transition from pre-ruminant to ruminant and after weaning. The following study was designed to develop such a system by using various strategies of concentrate supplementation to maximise the growth of kids between 6 and 14 weeks of age, when weaned at 10 weeks of age.

MATERIALS AND METHODS

Location, animals and management

The experiment was conducted at the University of Queenland's research farm at Mt Cotton in south-east Queensland (27°53'S,153° E). Mt Cotton has a subtropical climate with a dominant summer rainfall (average 1490 mm/year) and mean summer maximum and mean winter minimum temperatures of 27 and 9°C respectively. Kids were born to domesticated Australian cashmere does maintained on irrigated pangola grass (*Digitaria eriantha* spp. *pentzii*) pastures in early September 1994. At 4 weeks of age, all kids were weighed, vaccinated against clostridial diseases (5 in 1, ICI-Tasman Ltd, New Zealand), treated for intestinal

parasites (Ivomec - Merck, Sharp and Dohme, Australia), castrated (elastrator ring) as required, and allocated to treatment groups.

The experiment commenced 2 weeks later when kids were weighed again and grouped with their does in paddocks (1 ha) equipped with troughs for concentrate feeding. The concentrate (77% kibbled sorghum grain, 20% cottonseed meal, 3% limestone, 13 MJ ME/kg dry matter, 18% crude protein, Ca:P = 2: 1) was offered *ad libitum* in covered troughs which allowed access by both does and kids, and in separate creep feeder troughs accessible only to the kids. It was anticipated that kids would learn from their mothers more quickly in this system. The concentrate ration was offered thrice weekly and feed refusals removed and weighed at the end of each week. All kids and does were weighed at fortnightly intervals. Kids were weaned at 10 weeks of age by removing their mothers from the treatment paddocks. At this time kids were treated again for intestinal parasites (Ivomec). The trial ended when kids were 16 weeks old.

Experimental design

Each group consisted of 9 does (6 bearing singles, 3 bearing twins) and 12 kids (2 twin and 2 single entire males, females and castrates). Kids from twin-bearing does were pairs of male:castrate, male:female, castrate:female). Five feeding treatments were used. Group A (nil) - no concentrate provided. Group B (6-8,10-16) - kids offered concentrate for 6 to 8 weeks, and then from 10 to 16 weeks. Group C (8-16) - kids offered concentrate from 8 to 16 weeks. Group D (10-16) - kids offered concentrate from 10 (weaning) to 16 weeks. Group E (6-l 6) - kids offered continuous access to concentrates from 6 to 16 weeks. These treatments may be represented as a factorial design consisting of 5 treatments (feeding strategies) x 2 birth types (single and twin) x 3 'sexes' (male, castrate, female) x 2 replicates.

Statistical Analysis

Analysis of variance for a factorial design was used to detect the significance of differences between treatments, birth type and sex (QUASP 1990).

RESULTS AND DISCUSSION

Feeding system and concentrate intake

Prior to weaning, kids had access to concentrates from troughs shared by does and kids and from troughs available only to kids. Since it was not possible to distinguish doe from kid consumption from the shared troughs, only average consumption from the creep feeders (kids only) is reported in Table 1. Although statistical comparisons cannot be made from these data, kid consumption of concentrates increased with time, and although the intakes of kids introduced to concentrates for the first time at weaning were lower than that of groups with previous exposure, adaptation to concentrate consumption was rapid. The increase observed in feed intake following weaning may only be apparent, since the intake of concentrates by kids from the troughs shared with does prior to weaning was not measured.

Table 1. Mean values for the intake of concentrate consumed from creep feeders by Australian cashmere kids during different feeding regimes

Weeks when concentrates were offered	Group	Concentrate consumption per kid	Period of feeding				
			6-8	8-10	10-12	12-14	14-16
6 - 16	E	g/day	128	191	271	313	375
		$g/kg^{0.75}$.day	24.1	30.6	39.3	43.1	50.2
6-8, 10-16	B	g/day	90	-	227	307	313
		$g/kg^{0.75}$.day	18.2		37.0	47.3	44.9
8 - 16	C	g/day	-	164	236	290	340
		$g/kg^{0.75}$.day		29.4	39.1	44.7	48.9
10 - 16	D	g/day	-	-	182	297	327
		$g/kg^{0.75}$.day			31.1	48.4	50.0

Feeding system and liveweight change

Although kid growth rates were measured until 16 weeks of age, kids from the group fed concentrate continuously from 6 weeks suffered a check in growth rate between 14 and 16 weeks associated with rain contamination of their feed. Consequently only the observations made to 14 weeks are presented. Table 2 shows mean values for the liveweight changes of kids offered the different concentrate treatments during growth from birth to 6, 6 to 10 (weaning) and 10 to 14 weeks of age. There were no significant differences between treatments for the mean growth rates (g/day and $g/kg^{0.75}$.day) of kids between birth and 6 weeks of age. Kids offered concentrates continuously between 6 and 10 weeks of age grew significantly ($P<0.05$) faster than unsupplemented kids and kids given concentrates between 6 and 8 or 8 and 10 weeks of age. After weaning (10 weeks), all supplemented kids grew significantly ($P<0.05$) faster than unsupplemented kids. As a consequence, at 14 weeks of age, kids offered concentrates prior to weaning were heavier than unsupplemented kids, and kids offered concentrates only after weaning. However, even the best kid growth rates after weaning (male singles 70 g/day) were lower than those found for similar intensively fed goats (Ash and Norton 1987) given concentrates (21% crude protein) *ad Zibitum* (males 149 g/day, females 77 g/day). This comparison suggests that considerable improvement in growth rates could be made by removing the kids from pasture to pens for intensive feeding in this period.

The interaction between feeding system, sex and birth type

At 6 weeks of age, entire males (8.3 kg) were significantly ($P<0.05$) heavier than females (6.8 kg), and the liveweight of castrates was intermediate (7.8 kg) and not significantly different from either males or females. At 16 weeks of age, entire males and castrates (14.7 and 12.9 kg) were again heavier than females (11.6 kg). There were no significant interactions between sex and treatment, which indicates that all "sexes" responded similarly to supplementation. At 6 weeks of age, single kids were significantly ($P<0.05$) heavier (8.3 kg) than twins (6.9 kg), and these differences were also significant ($P<0.05$) at 16 weeks (singles 14.3 kg, twins 11.9 kg). Again there was no significant interaction between treatment and birth type, and therefore *ad Zibitum* concentrate feeding did not promote better growth in twins relative to singles. Norton and Banda (1992) have also reported similar results for the growth rates of twin and single Australian cashmere kids offered *ad Zibitum* intakes of artificial milk between birth and 11 weeks of age.

It may be concluded that goat kids at 6 weeks of age readily accepted concentrate feeds when offered in the presence of their dams, and that high growth rates were maintained over the weaning period. It may be predicted from observed growth rates in these studies that single male, castrate and females kids and possibly male twin would reach liveweights of 18 - 20 kg by about 30 weeks of age. Twin females and castrates would take much longer to achieve a marketable weight, and the castration of twin males is not recommended as a practice.

Table 2. Mean values (n = 12) ± standard error of mean (SEM) for the liveweight (kg) and liveweight changes of Australian cashmere kids offered concentrate supplements between 6 and 14 weeks of age. A = no concentrate, B = concentrate offered weeks 6-8 and 10-16, C = concentrate offered weeks 8-16, D = concentrate offered weeks 10-16, E = concentrate offered weeks 6-16. Mean values within a row with different superscripts differ significantly (P<0.05)

Growth period	Feeding treatment					SEM
	A	B	C	D	E	
Birth to 6 wks						
Birth wt	2.6	2.4	2.6	2.6	2.6	0.17
g/day	109	120	120	113	137	15.4
$g/kg^{0.75}$.day	33.3	36.1	35.1	34.1	38.6	8.12
6 to 10 wks						
Liveweight (6 wks)	7.2	7.5	7.7	7.3	8.3	0.67
g/day	104^{a}	113^{a}	101^{a}	107^{a}	157^{b}	21.8
$g/kg^{0.75}$ day	20.6	21.7	19.3	20.9	27.0	7.21
10 to 14 wks						
Liveweight (10 wks)	10.1^{a}	10.6^{a}	10.5^{a}	10.3^{a}	12.8^{b}	0.97
g/day	6^{a}	83^{b}	79^{b}	54^{c}	64^{bc}	11.2
$g/kg^{0.75}$.day	1.0^{a}	13.1^{b}	12.5^{b}	8.8^{c}	9.0^{c}	1.59
Liveweight (14 wks)	10.3^{a}	13.0^{bc}	12.7^{bc}	11.8ab	14.5^{c}	1.12

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