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Artificial insemination using the buck effect to partially synchronise cashmere does

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ABSTRACT

Following the introduction of bucks on day 0 to isolated does there are peaks of oestrus on day 3 and day 7. While the day 3 peak is associated with low conception rates the day 7 peak is useful for partial synchrony for artificial insemination (AI).

In this trial near Te Kuiti oestrous does were drafted off twice daily, starting day 5, following buck introduction. Those drafted in the evening were artificial inseminated laparoscopically with frozen-thawed semen the next morning and those drafted in the morning were artificial inseminated in the afternoon. On two farms the proportion of 207 and 123 mature does artificial inseminated on day 7-8 (day 0=April 11) were 55% and 74% respectively, on day 6-10 inclusive 87% and 94% were artificial inseminated. On farm 1 on day 7-8 and day 6-10 only 25% and 28% of 205 two toothed does were artificial inseminated, in contrast on farm 2 74% and 84% of 70 two toothed does were artificial inseminated. The farm 1 two toothed does were 3.6 kg lighter than those on farm 2.

CIDR-PMSG synchronised does from farm 1 (48 mature and 33 two tooth) were AIed on-time on days 6 and 10. There was no significant difference between the pregnancy rates of the CIDR synchronised (60%) and the buck induced does (56%).

There were additive effects of type of oestrus induction and live weight on the % multiple pregnant. At 20 kg live weight the predictions of the % multiple pregnant were buck effect 11%, CIDR-PMSG 26%, and at 30 kg live weight 51% and 75% respectively.

Keywords Cashmere does, artificial insemination, frozen semen, laparoscopic, oestrus, buck effect, CIDR, PMSG.

INTRODUCTION

The buck effect depends on the introduction of bucks to does that have been isolated from males for at least 4 weeks. The introduction is followed by peaks of ovarian activity 3 and 7 days later (Chemineau, 1983; Restall, 1983). A high percentage of the *corpora lutea* at 3 days are not accompanied by behavioural oestrus and do not persist, therefore these are not useful for artificially inseminated purposes. In contrast the day 7 peak is associated with a high percentage (>80%) of does with ovulations accompanied by a fertile oestrus. The buck effect can be used throughout the goat breeding season, however when the does are already ovulating spontaneously the peaks of oestrus occur 1 day earlier (Chemineau, 1983; Restall, 1983).

In this trial the success of laparoscopic artificial insemination (AI) of frozen-thawed goat semen was compared at 2 types of oestrus induction, the CIDR-PMSG (CIDR, Carter Holt Harvey, Hamilton New Zealand) synchronised oestrus versus the buck induced oestrus. The latter type of oestrus avoids the use of hormones but does not allow the on time insemination

of the does on one day. The number of days necessary to artificially inseminate a given proportion of the does was assessed, and the percentage of does pregnant to the 2 types of oestrus was compared.

MATERIALS AND METHODS

The trial was carried out on 2 farms with 493 and 193 Cashmere does respectively. All the AI was performed in Farm 1 shearing shed. The oestrous does on Farm 2 were trucked to Farm 1 immediately after drafting and were returned to their home farm the day after their AI. The remaining procedures on the 2 farms were the same.

Five vasectomised Cashmere bucks per 100 does present were introduced to all the buck effect treatment does on 11 April (day 0), the bucks were harnessed with crayons on day 5 at 8 am. This was followed by sequential drafting off of the marked does in the evening (5 pm) and morning (8 am). Does drafted at 5 pm were AIed 16-19 hours later and those drafted at 8 am were AIed 5-9 hours later. The last draft (draft 9) was in the evening of day 9.

TABLE 1 Validation of scanning, Whatawhata 1988. Correct scanning classes are shown in bold printing.

Age of foetus	Scanning classes		Kidding classes		
	No. of foetuses	Did not kid	1 Kid born 30/8-11/9(AI)	≥2 Kids born 30/8-11/9(AI)	≥1 Kid born after 16/9 (not AI)
-	0	64	0	0	0
Old (AI)	1	4	32	3	0
Old (AI)	≥2	1	1	43	0
Young (not AI)	1	7	0	0	32
Young (not AI)	≥2	2	0	0	11

There were 2 groups of CIDR-PMSG treatment does from farm 1 only. One group was AIed starting at 8 am on day 6 and the other starting at 8 am on day 10, both about 40 hours after CIDR removal and injection with 200 iu of PMSG. CIDRs had been inserted for a period of 17 days.

Frozen semen from 2 sires was bought from one semen processing centre, and the semen from the remaining 6 sires was purchased from another processing centre, all 8 sires were used on farm 1 and 7 of these on farm 2. Three of the 8 sires were used for the CIDR-PMSG treatment. All straws contained a total of 40 million sperm. Following thawing half of each straw was injected into each uterine horn with the aid of a laparoscope.

The does were scanned ultrasonically on 21 June. The number of foetuses was counted (0, 1 or 2 or more) and their ages estimated from their crown-rump length. The older foetuses resulting from AI were thus distinguished from the foetuses resulting from the subsequent natural mating. This method of assessing AI pregnancy and multiple pregnancy rates has been validated using the same operator by comparing the number of correct scanning classes with the incorrect scanning classes using data from a 1988 trial at Whatawhata Research Centre (Table 1). A correct scanning class means the scan and kidding result agreed for an individual doe.

Percentage responses were statistically analysed as binomial data using the generalised linear model

procedures in the Genstat statistical programme, giving due regard to the unbalanced nature of the design. Estimates reported are adjusted for all other statistically significant effects.

RESULTS

Distribution of AI around the Day 7 Peak of Oestrus

The results from a similar buck introduction trial (Moore *et al.*, 1989) carried out at Whatawhata Research Centre are included for comparison with the present trial (Table 2). With the exception of the two toots on farm 1 the data are consistent in that: (1.) >25% of the does were artificial inseminated on both days 7 and 8; (2.) >80% of the does were artificial inseminated on days 6-10 inclusive. In contrast only 13% and 12% of the farm 1 two toots were AIed on days 7 and 8 respectively and only 28% on days 6-10 inclusive. The two toots from farm 1 were 3.6 kg lighter than those from farm 2.

Effects of AI on % Pregnant and % Multiple Pregnant to AI

There were highly significant effects of liveweight in the % pregnant and % multiple pregnant. There were also large differences between the 8 sires in % pregnant (ranged from 19% to 87%) but not in the % multiple pregnant.

There was no significant difference between the

TABLE 2 Distribution of AI around the day 7 oestrus peak.

Farm	Age	Does Present	% AIed on days indicated							June livewgt (kg)
			d6	d7	d8	d9	d10	d6-10	d7-8	
1	Two Tooth	205	0	13	12	3	0	28	25	22.2
1	Four Tooth and Older	207	13	29	26	16	3	87	55	28.1
2	Two Tooth	70	3	37	37	7	0	84	74	25.8
2	Four Tooth and Older	123	6	31	43	11	3	94	74	27.4
WRC	Four Tooth and Older	200	3	26	26	17	10	82	52	-

TABLE 3 Effects of farm, age and oestrus induction on % pregnant and % multiple pregnant (values expressed as least squares mean).

Main Effect		% does pregnant/ does AIed and scanned		% does multiple pregnant/ does pregnant	
		Lwt Unadjusted	Lwt Adjusted	Lwt Unadjusted	Lwt Adjusted
Farm	1	54	53	40	41
	2	65	66	45	41
	SED	5.5	5.8	6.6	8.5
Age	Two tooth	59	66	26	42
	Four Tooth and older	56	55	49	41
	SED	5.0	6.0	7.3	9.1
Oestrus induction	Buck	56	58	35	37
	CIDR	60	59	72	62
	SED	6.9	7.4	15.0	11.1

pregnancy rates of the CIDR synchronised and the buck induced does (Table 3). The observed pregnancy rates were mature CIDR synchronised does 48%, mature buck effect does 60%, two-tooth CIDR 58% and two-tooth buck effect 51%. There was a significant difference between farms in % pregnant which was not removed by live weight (Table 3). When the data were adjusted

for live weight the two tooth were nearly significantly different from the older does ($P < 0.1$). At a live weight of 20 kg the predictions of % pregnant were two tooth 53%, four tooth and older 41%, and at 30 kg 72% and 61% respectively.

There was a significant effect of age of doe on the % multiple pregnant which was removed by the live

weight (Table 3). There was also an effect of type of oestrus induction which was not removed by live weight. The effects of live weight and type of oestrus were additive, at 20 kg live weight the predictions of % multiple pregnant were buck effect 11%, CIDR-PMSG 26%, and at 30 kg live weight 51% and 75% respectively.

DISCUSSION

Previous preliminary work with small numbers of does (H.R. Tervit, *pers. comm.*) has suggested that higher conception rates could be obtained at a natural rather than a synchronised oestrus with fresh diluted or frozen semen deposited cervically or into the uterus by means of a laparoscope. These comparisons were supported by observations from other experiments. Moore *et al.* (1989) found that 70% of does artificial inseminated laparoscopically at a buck induced oestrus kidded, in contrast 50% kidded to a synchronised oestrus (Moore *et al.*, 1988). The corresponding figures with cervical AI were 36% and 25%. However in the present trial with laparoscopic insemination there was no advantage to the buck induced oestrus in terms of conception rate.

The only advantage to the buck induced oestrus was in terms of cost, the elimination of CIDRs and PMSG. The cost of these hormones was partially offset by the increase in multiple kidding rate produced by the PMSG.

However this trial has shown that the buck effect does produce oestrus at predictable times and in

predictable proportions of mature does or well grown two toothed under farm conditions (>50% days 7-8, >80% days 6-10). This partially synchronised oestrus may be more useful for a low cost do-it-yourself AI system using fresh semen cervically, rather than for laparoscopic AI with frozen semen, which generally requires a veterinarian and expensive equipment, making on-time AI on one day desirable.

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