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The use of fine and coarse bucks and G4 does for breeding for cashgora production

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ABSTRACT

Two hundred and six mixed age Angora x Feral (G4) does with a mean fibre diameter of 20.4 microns were randomly mated to three bucks with mean fibre diameter of 18.8 microns (Group 1) and three bucks with mean fibre diameter of 22.2 microns (Group 2) in June 1987. The progeny were shorn at 10 months (August 1988), 16 months (March 1989) and 22 months (August 1989) of age. The fleeces were measured for fleece weight, mean fibre diameter, yield by weight of down, and colour. Down weight was then calculated. The fibre was visually classed according to Mohair-Cashmere Warehouse fibre lines and an economic value put on the fibre.

Group 1 progeny were heavier and had finer fleeces and lower down weights than group 2 progeny at all three shearing dates. Group 1 fleeces were 0.6, 0.9 and 1.0 micron finer and 71, 86 and 109 grams lighter than Group 2 at the three shearing dates respectively. Fibre diameter increased during the experiment to a greater extent in Group 2 (3.8±0.1 microns) than group 1 (3.4±0.1 microns). Group 1 had a lower yield percentage of down (12%, 10% and 6% lower) than Group 2 at all three shearings.

At the first shearing fleeces from Group 1 were classed predominantly into the cashmere lines, however at the last shearing fleeces were classed predominantly into the cashgora lines. Group 2 fleeces at the first shearing were classed equally into cashmere and cashgora lines but by the last shearing fleeces were classed into cashgora and mohair lines. Group 2 returned an additional fibre return of $4.80 at the first shearing but thereafter the fleece returns were similar in the two groups.

Keywords Goats, cashgora, cashmere, fibre diameter, yield, fleece weight, down weight, fibre classing.

INTRODUCTION

Cashgora is the fibre produced from a goat that has both feral and angora ancestry, with a mean fibre diameter which is less than 22 microns and low to medium lustre. The production of a fibre that remains under 22 microns in fibre diameter as an animal ages will be a major challenge to animal breeding. There are many different breeding policies that are being used with the objective of breeding towards cashgora production. The successful implementation of such programmes will require information on the implication of differing crosses of angora and feral goats in terms of fibre production and the basic relationships that exist between fibre diameter and age and fibre diameter and sex. The objective of this trial reported in this paper was to evaluate the implications of using fine or coarse micron bucks over angora x feral (G4) does for cashgora production.

MATERIALS AND METHODS

Two hundred and six mixed age G4 does were purchased from six sources. Does were fibre sampled in June 1987 by taking an 8 cm strip from the neck across the midside to the rump. This raw sample was tested for fibre diameter using the Fineness Fibre Distributor Analyser (FFDA).

The does were randomly allocated to mating groups on mean fibre diameter, liveweight and age. Bucks used were 3 years of age or older; 3 feral type bucks (Group 1) and 3 cashgora type bucks (Group 2).

Kidding commenced on 24 November 1987 and progeny were weaned on 1 February at a mean age of 7.5 weeks. All animals were weighed at birth, weaning and in August 1988 and March 1989. Males only were weighed in November 1989. The males and females were grazed on pasture separately after weaning and were supplemented with crushed maize and hay over the winter and the does were mated in April 1989. All animals were shorn at 10 months (August 1988), and at 16 months (March 1989). At 22 months (August 1989) of age males were shorn while does were midside sampled. Fleece and fibre samples were tested for mean

TABLE 1 Number of progeny and lsmeans and standard errors of liveweights at birth and weaning for sire and sex groupings. Means with the same superscript do not differ significantly at the 5% level

		Number of progeny	Liveweight (kg) Birth Weight	Liveweight (kg) Weaning Weight
Group 1	Female	43	2.84 ± 0.07^{bc}	11.6 ± 0.4^{bc}
	Male	44	3.08 ± 0.07^{a}	12.9 ± 0.4^{ab}
Group 2	Female	42	2.71 ± 0.07^{c}	10.9 ± 0.4^{c}
	Male	57	2.96 ± 0.06^{ab}	12.2 ± 0.3^{a}
Significance	Sex		***	***
	Group		ns	ns

fibre diameter of down, fibre diameter distribution, yield by weight of down and colour at Whatawhata Fibre Testing Centre. Down weight was then calculated.

The fleeces were classed by a registered classer into the Mohair-Cashmere warehouse fibre lines and an economic value determined using pool 7, 1989 prices.

The data was analyzed using generalized least squares. The dam age, dam mean fibre diameter, hogget age at shearing, hogget liveweight, breed, sire within breed, sex and the sex by breed interaction were fitted in the models. Colour of fibre was analyzed using Chi square test.

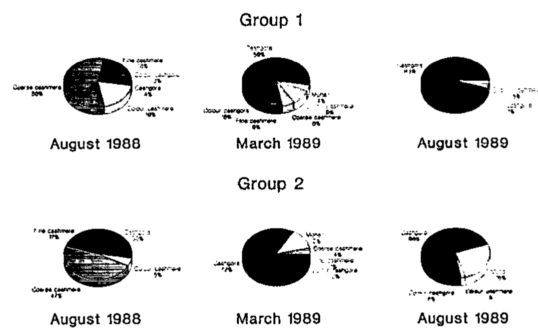

FIG 1 Fibre grades for Groups 1 and 2 at shearing.

RESULTS

Breed Effects

There were no differences between sire groups in liveweight up to weaning, thereafter Group 1 males were heavier than Group 2 males, 1.6 kg heavier (P<0.05) in August 1988, 2.6 kg heavier (P<0.001) in March 1989 and 4.0 kg heavier (P<0.01) (male progeny only) in November 1989 (Table 1 and 2). Group 1 progeny had finer fleeces and lower fleece weights, yields and fleece weights than Group 2 at all three shearing dates (Table 3). Group 1 fleeces were 0.7, 0.9 and 1.1 microns finer and 71, 86 and 109 grams of down lighter than Group 2 at the three shearing dates respectively (P<0.001). The yield of down for Group 1 was 12, 10 and 6% lower than Group 2 at the three shearings respectively (P<0.001).

Mean fibre diameter increase from the first to the third shearing and was greater in Group 2 than Group 1, 3.8±0.1 compared to 3.4±0.1 (P<0.03). The standard deviation of mean fibre diameter in Group 1 progeny was 0.27, 0.35 and 0.32 microns lower (P<0.001) than Group 2 progeny at all shearings (Table 3). However the coefficient of variation of fibre diameter was only lower in Group 1 fleeces at the March 1989 shearing (P<0.01). Seventy-eight percent of Group 1 progeny produced white down compared with ninety four percent of Group 2 progeny (P<0.01).

At the first shearing fleeces from Group 1 were classed predominantly in to the cashmere lines, however at the last shearing fleeces were predominantly classed in to the cashgora lines. Group 2 fleeces at the first shearing were classed equally in to cashmere and

TABLE 2 Least squares means and standard errors of liveweights on August 1988, March 1989 and November 1989 (male only) for sex and breed groupings. Means with the same superscript do not differ significantly at the 5% level.

Breed Group	Sex Group	Liveweight (kg) August 1988	March 1989	November 1989
Group 1	Female	16.2±0.7[c]	26±1[c]	
	Male	19.8±0.6[a]	35.3±0.9[a]	47±1[a]
Group 2	Female	14.7±0.7[c]	24.4±0.9[c]	
	Male	18.1±0.5[b]	32.1±0.7[b]	42±1[b]
Significance	Sex	***	***	
	Group	*	***	**

cashgora lines but by the last shearing fleeces were classed into cashgora and mohair lines. At the first shearing Group 2 progeny produced $4.80 more than Group 1 progeny (P<0.001) but thereafter there was no difference in the groups in fleece value for individual shearings (Table 4). Total fleece returns from the does over two shearings had $9 advantage to Group 2 while in the males a $4 advantage existed for the three shearings (P<0.01).

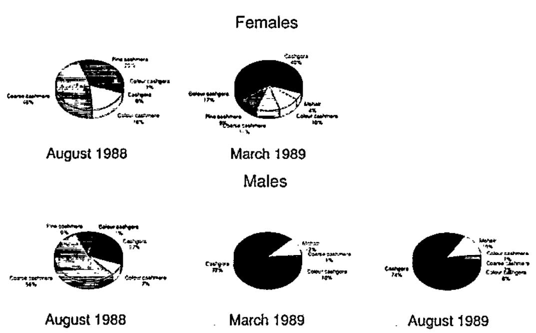

FIG 2 Fibre grades for females and males at shearing.

Sex Effects

Females compared with males were 0.25 kg (P<0.001) lighter at birth, 1.3 kg lighter at weaning (P<0.001), 3.5 kg lighter (P<0.001) in August 1988 and 8.3 kg lighter (P<0.001) in March 1989 (Table 1 and 2). Females produced finer fleeces with lower fleece and down weights (Table 3). Female fleeces were 0.8, 2.3 and 0.8 microns finer and 65 and 156 grams of down lighter than male fleeces at the shearing dates respectively (P<0.001). Fibre diameter standard deviation was 0.13, 0.35 and 0.65 micron higher in males than females at three shearing dates respectively but coefficient of variation of fibre diameter was only significantly different in the August 1989 shearing (P<0.001).

Male fleeces were classed into the coarser and hence lower value cashgora and mohair lines (Figure 2). However male progeny still returned $3.60 (P<0.001) and $2.40 (P<0.01) more at the first two shearing dates than the female progeny (Table 4).

Sire and Dam Effects

The mean fibre diameter of the dams was 20.4 micron. Dam fibre diameter, dam age, hogget age at shearing and hogget liveweight did not affect liveweight and fleece production of the progeny.

The fine bucks had a mean fibre diameter of 19.0, 19.0 and 18.5 micron for Sire 1, 2 and 3 respectively while the fibre diameter of the coarser bucks was 23.1, 22,2 and 21.4 micron for Sire 1, 2 and 3 respectively. Individual sires had a significant effect on fleece production (Table 5) but not on liveweight of progeny. Sire number 2 in Group 2 (Table 5) produced progeny which had the highest fibre diameter, fibre diameter standard deviation, yield percentage of down and highest down weight at each of the three shearings. Despite Sire number 1 in Group 1's own high down production (587 compared with 109 and 119 grams for Sire 1, 2 and 3

TABLE 3 Least squares means and standard errors of fibre diameter, standard deviation of fibre diameter, fleece weights, percentage weight of down, and down weight for sire and sex groupings for fleeces shorn on August 1988, March 1989 and August 1989. Means with the same superscript do not differ significantly at the 5% level.

Fibre Trait	Sex	August 1988	March 1989	August 1989
Mean Fibre Diameter (microns)				
Group 1	Female	16.6±0.2[c]	19.0±0.2[d]	20.0±0.3[c]
	Male	17.2±0.2[b]	21.1±0.2[b]	20.6±0.2[bc]
Group 2	Female	17.0±0.2[ab]	19.8±0.2[c]	20.8±0.2[b]
	Male	18.0±0.1[a]	22.2±0.2[a]	21.9±0.2[a]
Significance	Sex	***	***	***
	Group	***	***	***
Standard Deviation of Mean Fibre Diameter (microns)				
Group 1	Female	3.79±0.08[b]	3.46±0.08[c]	3.73±0.08[d]
	Male	3.84±0.07[b]	3.98±0.07[b]	4.45±0.08[b]
Group 2	Female	3.97±0.07[b]	3.82±0.07[b]	4.13±0.08[c]
	Male	4.19±0.06[a]	4.35±0.06[a]	4.70±0.07[a]
Significance	Sex	*	***	***
	Group	***	***	***
Fleece Weights (grams)				
Group 1	Female	232±16[c]	299±21[b]	
	Male	322±14[b]	528±19[b]	245±17[b]
Group 2	Female	299±15[b]	345±20[b]	
	Male	382±12[a]	640±16[a]	401±14[a]
Significance	Sex	***	***	
	Group	***	***	***
Down Yield (%)				
Group 1	Female	42±2[d]	38±2[c]	54±2[c]
	Male	49±2[c]	46±2[b]	58±2[b]
Group 2	Female	55±2[b]	49±2[b]	61±2[ab]
	Male	61±1[a]	56±2[a]	63±1[a]
Significance	Sex	***	***	*
	Group	***	***	***
Down Weight (grams)				
Group 1	Female	103±11[c]	127±18[d]	
	Male	161±10[b]	252±16[b]	148±13[b]
Group 2	Female	167±11[b]	181±17[c]	
	Male	238±9[a]	369±13[a]	257±11[a]
Significance	Sex	***	***	
	Group	***	***	***

TABLE 4 Fibre returns from fleeces shorn on August 1988, March 1989 and August 1989 for sex and breed groupings. Means with the same superscript do not differ significantly at the 5% level.

Breed Group	Sex	Fleece Returns ($ per head) August 1988	March 1989	August 1989
Group 1	Female	14 ± 1^{b}	8.2 ± 0.9^{c}	
	Male	21 ± 1^{a}	10.8 ± 0.8^{ab}	6.4 ± 0.7^{a}
Group 2	Female	22 ± 1^{a}	9.3 ± 0.8^{bc}	
	Male	23 ± 1^{a}	11.5 ± 0.7^{a}	7.6 ± 0.5^{a}
Significance	Sex	***	**	
	Group	***	ns	ns

respectively), it had a similar down production to the sires in that group except for the March 1989 fleece which was 142 grams heavier than either of the other sires. The down production of the Group 1 sires was 383, 375 and 555 grams for sire 1,2, and 3 respectively.

DISCUSSION

At the first shearing progeny of the coarse bucks in this experiment were 2.6 kg lighter, but produced an additional 79 grams of down which was 0.7 micron coarser than the finer Group 1 bucks. The trends found in this experiment are supported by a study comparing feral x feral progeny with feral x G4 progeny (Gretton and Bigham, 1988) where the progeny of the G4 bucks goats were 0.6 kg lighter and produced an additional 39 grams of down which was 0.5 micron coarser. The Feral x G4 treatment of Gretton and Bigham (1988) and the Group 1 treatment in this experiment are similar. Both produced first fleeces of 16.9 micron however the down weight of the Group 1 progeny was 55% higher. This difference may simply reflect the differences in genetic potential for down production of the goats used in these two experiments or it may reflect the selection of G4 sires considered appropriate for crossing with cashmere does for cashmere production carried out by Gretton and Bigham (1988).

As Angora goats age the fibre diameter of their fleece can increase from 8 to 11 microns (Ariturk *et al.*, 1979; Shelton, 1981; Gifford *et al.*, 1990) while lifetime increases in fibre diameter of cashmere fleeces are only 2 micron (Pattie and Restall, 1988; Gifford, 1989). This aging effect is of particular importance in cashgora production because once the fleeces exceeds the 22 micron it is classed into the poor quality mohair lines which have little value. Goats in this experiment had an increase in fibre diameter from the first to second fleeces in excess of three microns, with animals in Group 2 approaching four microns resulting in 25% of the fleeces being classed into the low value mohair lines at two years of age. It is clear that the inclusion of Angora genes into cashmere goats greatly increases the fibre diameter increase with age.

Animals in group 2 produced fleeces which were on average 10% higher yielding than these in Group 1. This is a commonly reported trait of fleeces from goats with an increasing level of Angora influence (Couchman, 1987; Gretton and Bigham, 1988). An increasing proportion of white goats as found in this experiment is also a trait associated with cross breeding with angora goats. Differentiation in fibre diameter between the guard hair and down is important for the efficient separation of down from guard hair during processing of 'down' fleeces (Couchman, 1987; Smith, 1987). Standard deviation of down fibre diameter is a commonly used indicator of fibre type differentiation. In this experiment and that of Gretton and Bigham (1988) the standard deviation of fibre diameter was 0.3 units higher in treatment groups with a greater proportion of Angora genes. This effect can be largely explained by the higher mean fibre diameter of these groups, however even when the variation in fibre diameter was corrected for mean fibre diameter significant differences remained between the two groups at one shearing date.

TABLE 5 Least squares means and standard errors of fibre diameter and down weight for August 1988, March 1989 and August 1989.

Breed Group	Sire Number	August 1988	March 1989	August 1989
Mean Fibre Diameter (microns)				
1	1	17.1±0.2^{bc}	20.1±0.2^{c}	20.9±0.3^{b}
	2	16.7±0.3^{c}	20.2±0.4^{bc}	20.1±0.4^{b}
	3	16.9±0.2^{bc}	19.9±0.2^{c}	20.3±0.3^{b}
2	1	17.3±0.2^{b}	20.8±0.2^{b}	20.6±0.3^{b}
	2	18.1±0.2^{a}	22.1±0.3^{a}	22.6±0.3^{a}
	3	17.2±0.2^{bc}	20.1±0.2^{c}	20.9±0.3^{b}
Significance	Sire	**	***	***
Down Weight (grams)				
1	1	118±11^{c}	144±17^{cd}	105±17^{d}
	2	154±18^{bc}	286±28^{b}	195±28^{bc}
	3	124±12^{c}	138±18^{d}	144±21^{cd}
2	1	177±11^{b}	251±18^{b}	197±17^{b}
	2	258±13^{a}	384±20^{a}	335±20^{a}
	3	175±11^{b}	190±18^{c}	239±19^{b}
Significance	Sire	**	***	***

Means with the same superscript do not differ significantly at the 5% level

It is very difficult to obtain true estimates of differences between sexes in fibre traits as male and females are commonly grazed separately. This was the case both in this experiment and others quoted below. Cashmere males are reported to be heavier and produce fleeces which are heavier but lower yielding, with similar down weights and fibre diameter to females (Restall and Pattie, 1989; Gifford *et al.*, 1989). There is some conflict in the literature regarding the effect of sex on production traits in Angora goats with some authors claiming that males are heavier, produce heavier fleeces of higher fibre diameter (Ariturk *et al.*, 1979; Nicoll *et al.*, 1989) while others claim the reverse (Gifford *et al.*, 1990). In this experiment a small liveweight advantage existed for males at weaning following common grazing so it is likely that a real sex difference existed in these animals. However the large 8 kg difference observed in March 1989 is likely to be largely of management origin.

It is clear that large variation exists between sires within breed groups. This is particularly apparent in Group 2 where one particular sire had progeny which were consistently coarser and higher producing without exhibiting this trait in his own fleece production.

The particular breeding option selected by a cashgora breeder will be largely determined by the farmers objectives. Group 2 animals in this experiment possessed a financial advantage in the first two years largely due to increased down weights and a greater proportion of white fleeces. However if the age trends seen in the first two years persist with Group 2 animals continuing to coarsen then it is likely that Group 1 animals will produce the higher value fleeces in the long term.

CONCLUSIONS

When mated to G4 does, 'down' bucks ranging in fibre diameter between 21 and 23 micron produced progeny which were lighter, produced fleeces of higher down weights but coarser in fibre diameter than bucks ranging in fibre diameter between 18 and 19 micron. The fleeces from the bucks higher in fibre diameter were worth an additional $5 over two years.

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