
THE PROCEEDINGS OF THE
NEW ZEALAND SOCIETY
OF
ANIMAL PRODUCTION
VOLUME 62 2002

Liveweight and fleece production from New Zealand, South African and first cross Angora goats

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ABSTRACT

The release of the South African Angora from quarantine will be the single factor with the greatest impact on the New Zealand mohair industry over the next few years. In order to provide information on production under New Zealand farming conditions,trial was carried out comparing the liveweight and fleece production of South African, New Zealand and first cross South African x New Zealand (Crossbred) Angora goats from birth to two years of age. Crossbred and South African goats were significantly heavier than New Zealand Angoras at most ages. South African Angoras were heavier than Crossbreds for the first 8 months only. Fleeces from South African goats were heaviest, New Zealand Angora fleeces were lightest, while Crossbred fleece weights were intermediate between the parental breeds at all shearing times. Fibre diameter of fleeces from New Zealand goats was finer at 12 months of age (24.8±0.4, 27.0±0.4, 27.6±0.3 µm for New Zealand, Crossbred and South African respectively) but there were no differences at 18 and 24 months of age. Medullation and kemp levels were higher in New Zealand than South African fleeces at all sampling times. Medullation and kemp levels in the Crossbred fleeces were higher than the mean of the parent levels, indicating heterosis effects. Medullation levels did not differ in Crossbred and New Zealand fleeces at 18 and 24 months of age. Advantages of the South African Angora over the New Zealand Angora goat were confirmed in this study, however anticipated improvements in fleece quality were not achieved in the first cross.

Keywords: Fibre characteristics; fibre growth; goats; liveweight; mohair.

INTRODUCTION

Angora goats of South African origin were imported into New Zealand in 1988 and released from quarantine in April 1993. It is frequently stated that South African goats produce fibre that is of better quality than mohair from New Zealand Angoras and that, although coarser in fibre diameter, South African mohair is kemp-free and has very low levels of medullation. However production levels quoted for these goats generally refer to South African results (van der Westhuysen *et al.*, 1988) where the feed, climate and management differ from New Zealand.

The initial impact of the South African goats is likely to be through crossbreeding. Purchase of a South African buck or semen to cross over New Zealand Angora does will be the commonest route used by farmers to introduce the South African genes into their flocks. The aim of this trial was to obtain information on fleece production, especially fibre diameter, fleece weight, kemp and medullation levels, of South African and crossbred compared to New Zealand Angora goats to evaluate the impact that the release of the South African genetics would have on the goat farming industry in New Zealand.

MATERIALS AND METHODS

The trial was carried out at Flock House Agricultural Centre (latitude 40°14'S, longitude 175°16'E), near Bulls, on an area of sand country, which was typically summer dry, and had poor quality pastures in which the dominant species were Browntop and Subterranean clover. Crossbred goats were generated by crossing South African bucks over New Zealand Angora does. South African goats were produced from an embryo transfer programme which included recipient does from a range of breeds. South African and Crossbred goats were run in quarantine, however New Zealand goats were run separately as they were unable to enter quarantine as initially intended. New Zealand goats were grazed adjacent to the quarantine area on the same pasture type, with management and feed levels kept as similar as possible.

Liveweight and fleece data was recorded on 39 New Zealand, 37 New Zealand x South African (Crossbred) and 81 South African Angora goats, from birth in September 1990. All kids were tagged at birth and birth date, birth rank, birth weight, dam and sire recorded. At weaning, 31 December 1990, rearing rank and weaning weight were recorded. Sexes were grazed separately from weaning.

Liveweights were recorded monthly for the first 6 months, then quarterly. Goats were shorn approximately every six months in February - March and August - September. At shearing, fleece weights were recorded and a midside sample taken from each fleece. Samples were sent to Whatawhata Fibre Testing Centre where measurements were made of mean fibre diameter, standard deviation and coefficient of variation of fibre diameter, and kemp and medullation levels. Fleece tests were not carried out at the first shearing at six months of age. An extra fleece sample was taken in December 1991, as fibre diameter, length growth and kemp are highest in spring and early summer (Bown *et al.*, 1992). Because shearing intervals varied, fleece weights were adjusted to a six month basis to enable annual production to be determined.

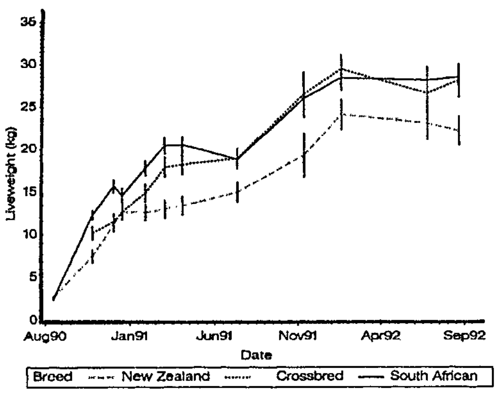
The effects of breed, sex, rearing rank, date of birth and all first order interactions on liveweight and fleece traits were examined by least squares analysis with the GLM procedure in SAS (SAS Institute Inc., USA). Date of birth was included as a linear covariate. Most of the interactions were not significant and were excluded from the final models. The final model for liveweight traits included rearing rank, breed, sex and date of birth. The model for fleece weight also included the breed x sex interaction. The final model for fleece characteristics contained breed, sex and the breed x sex interaction. Rearing rank and date of birth effects were not significant for any fleece characteristics.

RESULTS

The least squares means for liveweight and fleece characteristics of the three breed groups are presented in Figure 1 and Table 1 respectively.

Birth weight was not available on the Crossbred kids, however there was no significant difference between the birth weight of New Zealand and South African kids. The only differences were due to birth rank, with twins 0.2 kg and triplets 0.9 kg lighter than single born kids. Males were heavier than females at all weighing times after birth, with the exception of January 1991 when the difference was not significant. The difference increased from 3 kg at weaning to 5 kg by 2 years of age. Crossbred and South African goats were heavier than New Zealand goats at most ages (Figure 1). South African kids were heavier than Crossbreds for the first 8 months, but from August 1991 at 11 months of age there were no significant differences between the liveweight of the Crossbred and South African kids.

FIGURE 1: Mean liveweights of South African, New Zealand and Crossbred Angora goats.



Fleece weight of the males was significantly heavier than for the females, except for the shearing at 12 months of age. Breed x sex interactions were significant at 24 months of age with South African and Crossbred males having heavier fleece weights than the females while there was no significant difference between the sexes in fleece weight for New Zealand goats. Age had a significant effect on fleece weigh at shearings at 6 and 12 months, with older kids having 4 - 9 g/day heavier fleeces. By 18 months effects of age on fleece weight were no longer significant. Fleeces from South African goats were heaviest and New Zealand fleeces were lightest (Table 1). Crossbred fleece weights were intermediate between those of the parental breeds, similar to the means of the two parental fleece weights at shearing at 12 and 18 months of age and 15 -20 % above the parental means at 6 and 24 months of age.

TABLE 1: Least squares means and standard errors for fleece characteristics of Angora breed groups.

Fleece trait	Breed group New Zealand	Crossbred	South African
Greasy fwt^{z} (kg)			
6 mnth 02-91	0.55 ± 0.03 a	0.68 ± 0.03 b	1.00 ± 0.02 c
12 mnth 08-91	0.97 ± 0.06 a	1.33 ± 0.06 b	1.68 ± 0.04 c
18 mnth 03-92	1.14 ± 0.14 a	1.66 ± 0.13 b	2.05 ± 0.11 c
24 mnth 09-92	0.98 ± 0.09 a	1.68 ± 0.08 b	1.83 ± 0.06 c
MFD (µm)			
08-91	24.8 ± 0.4 a	27.0 ± 0.4 b	27.6 ± 0.3 b
12-91	27.6 ± 0.5 a	29.8 ± 0.5 b	30.2 ± 0.4 b
03-92	29.4 ± 0.5	29.8 ± 0.5	30.3 ± 0.3
09-92	29.6 ± 0.6	30.8 ± 0.5	29.9 ± 0.4
SD MFD (µm)			
08-91	7.49 ± 0.12	7.46 ± 0.12	7.25 ± 0.08
12-91	8.64 ± 0.15 a	7.92 ± 0.15 b	7.40 ± 0.11 b
03-92	9.69 ± 0.25 a	8.58 ± 0.24 b	8.59 ± 0.16 b
09-92	9.43 ± 0.25 a	8.88 ± 0.21 ab	8.52 ± 0.17 b
Medullation (%)			
08-91	5.75 ± 0.45 a	3.56 ± 0.47 b	1.18 ± 0.33 c
12-91	3.90 ± 0.42 a	3.08 ± 0.41 a	1.09 ± 0.29 b
03-92	7.32 ± 0.94 a	5.44 ± 0.92 a	2.00 ± 0.62 b
09-92	3.31 ± 0.65 a	2.76 ± 0.54 a	0.25 ± 0.43 b
Kemp (%)			
08-91	4.58 ± 0.30 a	3.57 ± 0.31 b	0.39 ± 0.22 c
12-91	4.77 ± 0.25 a	1.86 ± 0.25 b	0.26 ± 0.18 c
03-92	2.81 ± 0.40 a	2.62 ± 0.39 a	0.37 ± 0.27 b
09-92	1.79 ± 0.22 a	0.65 ± 0.18 b	0.07 ± 0.15 c

where a,b,c denote significant differences between means $P<0.05$
^{z}greasy fleece weights adjusted to 6 months growth

Fibre diameter of fleeces from New Zealand goats was significantly finer than Crossbred and South African fleeces at 12 months of age but there were no differences at 18 and 24 months of age. Variability of fibre diameter, as shown by the standard deviation, did not differ between breeds at 12 months of age. At 18 months of age variability in New Zealand fleeces was significantly higher than in Crossbred or South African fleeces, while at 24 months of age the standard deviation of New Zealand fleeces was significantly greater than in South African fleeces, with Crossbred variability at an intermediate level.

Medullation levels were significantly higher in New Zealand fleeces than in South African fleeces at all sampling times. Medullation levels in Crossbred fleeces were close to the parental mean at 12 months of age but were 14 and 55 % higher than the parental means at 18 and 24 months respectively and were not significantly different from medullation levels in New Zealand fleeces. Kemp levels were significantly different between the breed groups, except at the 18 month shearing where there was no difference in kemp levels between the New Zealand and Crossbred fleeces. Crossbred kemp levels were 43 and 65 % greater than the parental means at 12 and 18 months of age respectively but 30 % lower at 24 months of age. Average kemp levels in South African fleeces were very low, less than 0.4 %.

DISCUSSION

Comparison of weaning weights between studies were difficult due to differences in age, nutrition and other factors. A mean weaning weight of 13.4 kg was found by Thomson and Power (1993) for animals from the same base flock of New Zealand Angoras. The mean weaning weight of New Zealand Angoras in a study by Nicoll *et al.* (1989) was 14.3 kg, compared with 16.2 kg in an earlier study (Nicoll, 1985). Maternal effects also influence kid weaning weight and in this study the Crossbreds were only generated with New Zealand dams and not reciprocal crosses. South African goats were generated from an embryo transfer programme which involved recipient does from a range of New Zealand breeds rather than kids being raised naturally on South African dams.

Liveweight at 12 months was lower for animals in this study than in other studies. Liveweight of New Zealand Angoras at 12 month shearing was 25.7 and 30.8 kg at two sites in a Central Performance Test (Bigham *et al.*, 1988) and 22.4 kg in a study by Nicoll *et al.* (1989). Fifteen month liveweights reported by Bigham *et al.* (1988) averaged 37.8 and 39.6 kg at two sites, twice as heavy as New Zealand goats in this study. Adverse seasonal and management conditions during this trial are reflected by the low liveweights, however mohair growth is reported to be insensitive to level of nutrition (Shahjalal *et al.*, 1992). This was confirmed in the study by Thomson and Power (1993), involving goats from the same population of New Zealand Angoras used in this study, where does and kids at the high stocking rate were significantly lighter than the lower stocked treatments, but no effect on the individual mohair production for either does or kids was apparent.

Fleece weights recorded for New Zealand Angoras in this study are similar to the 0.52 - 0.56 kg kid fleece weights measured by Thomson and Power (1993), and to those of Nicoll (1985) who found fleece weights of 0.60 and 0.94 kg at 6 and 12 months of age respectively in one study and 0.57 and 0.99 kg respectively in another study (Nicoll *et al.*, 1989). Bigham *et al.* (1988) reported higher fleece weights in the Central Performance Test, 0.78 and 1.37 kg at 6 and 12 months respectively.

In a report on South African Angoras in New Zealand (Neill, 1992), fleece weights at 18 months of age were 3.0 kg for males and 2.2 kg for females. However these represented 207 days growth, almost 7 months, and only selected male progeny had been recorded. On a 6 month basis, the above fleece weights would equate to about 2.7 kg for males and 2.0 kg for females, which are comparable to South African fleece weights in this study where unselected males averaged 2.2 kg and females 1.9 kg at 18 months of age.

Mohair has a similar seasonal growth curve to that of wool production (Winklmaier, 1983). Fleece weight is lower in spring than autumn because fleece growth rates are lower in winter than summer. This is shown with the fleece weights when shorn at 24 months of age being lower than the fleece weights when shorn at 18 months of age in this study. Stapleton (1978) noted that autumn fleeces averaged 0.24 kg heavier than spring fleeces over the first 4 years in Australian Angoras.

Fibre diameter of New Zealand Angoras at 12 months of age in this study, 24.8 µm, were similar to those in other studies of New Zealand Angoras (25.7,28.1 µm Bigham *et al.*, 1988; 27.2 µm Nicoll *et al.*, 1989). Fibre diameter on South African fleeces at 18 months reported by Neill (1992) averaged 29.7 µm for bucks and 30.5 µm for does, the same as for the fibre diameter of South African fleeces at 18 months of age in this study. The lack of difference in fibre diameter between the breed groups at 18 and 24 months of age was surprising as it was anticipated that the fibre from the South Africans would be considerably coarser than that from the New Zealand Angoras.

Fibre diameter increased in this study from the second to the fourth shearing, by 4.8 µ in New Zealand Angoras and by 2.3 µm in South African Angoras. The increase in fibre diameter in Crossbreds, 3.8 µm, was close to the mean for coarsening in the parental breeds. Stapleton (1978) found fibre diameter increased from 24.4 µm at the first shearing to 34.7 µm at 4.5 years of age and then declined, closely following changes in fleece weight. Gifford *et al.* (1990) noted the greatest increases in fibre diameter were between 12 to 18 months of age (5.5 µm) and 24 to 36 months of age (2.4 µ) in Australian Angoras. In a South African report (Department of Agriculture, South Africa, 1983) fibre diameter increased from about 24 µm at 6 months of age to about 42 µm at 48 months of age.

The medullation and kemp levels in the crossbred fleeces were higher than the parental mean, indicating the presence of heterosis effects not previously anticipated (Bigham *et al.*, 1990). Scarth and May (1992) noted a rapid drop in the proportion of fleeces classed as non-kempy when crossing Texan over Australian Angoras, with half and three-quarter Texan fleeces falling on the parental mean values, but Stapleton (1991) noted the lack of an accurate objective kemp test in this study was of considerable concern. As the New Zealand Angoras were not run with the other goats some nutritional differences may have resulted. Bown *et al.* (1992) have shown that high pasture allowances resulted in increased fibre growth and fibre diameter, as well as increased levels of medullated fibres, but no increase in percentage kemp fibres.

Parry *et al.* (1993) examined the rate of post-natal follicle maturity and follicle densities in South African Angoras and their crosses to determine the contribution of these factors to the high fibre producing potential of these goats. Breed differences were apparent early in life but were not persistent to 6 months of age. Parry *et al.* (1993) concluded that follicle density and S/P ratio do not explain differences in fibre and kemp production of the South African compared to the Crossbred.

CONCLUSIONS

Advantages of the South African Angora over the New Zealand Angora goat were confirmed in this study, with South African Angoras having higher liveweights, heavier fleece weights and improved fleece quality in terms of lower medullation and kemp levels. Fibre diameter in the South African fleeces in this trial were not significantly coarser than New Zealand fleeces from 18 months of age, a result that requires confirmation in future studies.

Crossbreeding with South African bucks over New Zealand does will produce progeny with heavier liveweights and fleece weights than New Zealand Angora goats. However anticipated improvements in fleece quality in medullation and kemp levels over New Zealand Angoras were not achieved in the first cross and further work is required to determine the effect on medullation and kemp levels in back crosses to South African goats.

ACKNOWLEDGEMENTS

Thanks to Diamond Fibre Limited for access to the South African Angora goats and to Chris Miller for management of animals in quarantine.

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