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An evaluation of Angora sires through progeny testing - A progress report

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Abstract

Genetic improvement is a key to future increases in productivity in the Australian Mohair industry. Accurate identification of superior sires is part of this process. A progeny test was established to evaluate some prominent sires in use within the Australian Mohair industry. Angora does (n = 511) were mated to 11 Angora sires using artificial insemination in April, 2002. A total of 270 progeny was evaluated at their first shearing at 6 months of age and 246 were evaluated at the second shearing at 12 months of age. The project site experienced a severe drought for the 2002 season resulting in lower than expected kidding performance, average clean fleece weights (0.70 and 0.95 kg) and fibre diameters (20.3 and 21.2 µm) at first and second shearings respectively. Progeny sex and birth type had effects on greasy fleece weight and clean fleece weight at both shearings, on mean fibre diameter at the first shearing, birth weight and live weight at 3, 5, 11 and 15 months of age. The effect of the age of dam was evident for greasy fleece weight, clean fleece weight and medullation at the first shearing; clean fleece weight and yield at the second shearing; birth weight and live weight at 3, 5, 11 and 15 months of age. Differences between sires were small but apparent for the majority of fibre quality traits as well as live weight at 15 months of age. The third shearing, and a genetic analysis utilising dam pedigree, will expand results further and is likely to reveal larger differences between sires.

Keywords: Genetics, mohair, birth type, fibre diameter, fleece weight
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Introduction

The Mohair industry has existed in Australia for over 100 years and is worth A$3 million annually, but the industry is yet to realise the full potential of superior genetics imported from Africa and North America during the last 15 years. There is the potential to increase the productivity of the Angora goats in Australia through increasing or maintaining fleece weight while reducing the mean fibre diameter and medullation, increasing staple length, and improving reproductive traits (Stapleton, 1997). There is currently very little objective information on which sire selection can be based, and it is impossible to identify the genetically superior animals that exist within the national flock. A performance recording system known as MOPLAN was established in 1992 (Lollback & Stapleton, 1995). However, this system was not adopted by industry. A central progeny test site was established in 2002 to determine the genetic variation that existed between prominent sires in use in the industry and to demonstrate the usefulness of modern genetic techniques in identifying elite individuals. The project was designed to evaluate the progeny of the selected sires at their first three shearings. This paper reports on preliminary data from the first two shearings.

Materials and Methods

The project site was established near Horsham (36º43'00"S, 142º14'30"E), in the north-west of Victoria, Australia. The selected group of 11 sires included South African, Texan and interbred sires and was representative of the genetics available in Australia. A group of mixed age Angora does (n = 511) were mated using artificial insemination with frozen semen over four days in April 2002. The does were separated into age groups and randomly assigned to each sire within the age group. The average kidding date was 11th September 2002. A total of 345 progeny was born with large numbers of multiple births. At birth all progeny were tagged and their dam, birth weight and birth type (single, twin, triplet or quad) were recorded. All male progeny were castrated at 3 months of age and all progeny were weaned at 5 months of age. Animals were weighed at 3 months (LW3), 5 months (LW5), 11 months (LW11) and 15 months (LW15) of age. Animals were shorn at six months of age and again at 12 months of age. Prior to each shearing, a midside sample was removed from all animals. A randomly selected staple from the midside

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staple was manually measured for length (SL). The midside samples were measured for mean fibre diameter (MFD), standard deviation of fibre diameter (SD), coefficient of variation of fibre diameter (CVD), fibre curvature (FC) and percentage of medullated fibres (MED). The testing was carried out utilising an Optical Fibre Diameter Analyser 100 (OFDA100) using a mohair calibration developed from mohair top supplied by the CSIR, Port Elizabeth, South Africa, and following standards IWTO-47-98 and IWTO-57-98. The samples were then tested for clean washing yield (YLD). At shearing, greasy fleece weight (GFW) was recorded, and this was later multiplied by YLD to determine clean fleece weight (CFW).

Birth type was converted to include only single or multiple births (i.e. twins, triplets and quads were bulked into one category). A REML variance components analysis was completed, the fixed model included birth type, dam age, sex and sire. There was no random model specified. Dam age was included in the analysis to account for both maternal environment and genetic differences. All traits were analysed separately and all interactions were included in the initial analysis. For all traits there were no interactions (P > 0.05). The analysis was undertaken using GenStat 5.42 (GenStat Committee, 2000).

Results and Discussion

Angora goat growth and fibre production traits are closely linked to animal nutrition (McGregor 1998). The site experienced a severe drought for the 2002 season, and despite considerable supplementary feeding there was a reduction in doe kidding performance and in progeny growth and fibre production. The predicted means for fleece traits (Table 1) and live weight traits (Table 2) are lower than expected.

Table 1 Means (± s.e.) of fleece traits at the first and second shearings for mean fibre diameter (MFD), standard deviation of fibre diameter (SD), coefficient of variation of fibre diameter (CVD), fibre curvature (FC), percentage of fibres displaying medullation (MED), clean washing yield (YLD), greasy fleece weight (GFW), clean fleece weight (CFW) and mid-side staple length (SL)

		MFD µm	SD µm	CVD %	FC °/mm	MED %	YLD %	GFW kg	CFW kg	SL cm
First Shearing	Mean	20.3	6.3	31.0	19.2	1.3	80.5	0.87	0.70	14.1
(n = 270)	s.e.	0.3	0.1	0.5	0.4	0.1	0.7	0.03	0.02	0.3
Second Shearing	Mean	21.2	5.4	25.3	18.5	0.6	81.6	1.17	0.95	11.6
(n = 246)	s.e.	0.3	0.1	0.5	0.5	0.1	0.7	0.03	0.03	0.3

Table 2 Means (± s.e.) and the predicted means of birth type effects (single=1 and multiple=2) including the standard error of difference (s.e.d.) and predicted mean of sex effects including the s.e.d. of birthweight (BWT) and live weight at 3 (LW3), 5 (LW5), 11 (LW11) and 15 (LW15) months of age, greasy fleece weight at first (GFW1) and second (GFW2) shearings, clean fleece weight at first (CFW1) and second shearings (CFW2) and mean fibre diameter at the first shearing (MFD1)

Trait	Unit		Overall		Birth type category means			Sex category means		
		n	Mean	s.e.	1	2	s.e.d.	Female	Male	s.e.d.
BWT	kg	345	2.7	0.06	3.0	2.4	0.06*	2.6	2.8	0.05*
LW3	kg	281	12.4	0.44	14.3	10.4	0.39*	11.4	13.3	0.35*
LW5	kg	271	14.3	0.51	16.4	12.2	0.47*	13.3	15.3	0.41*
LW11	kg	246	15.7	0.39	16.7	14.7	0.39*	14.8	16.6	0.33*
LW15	kg	239	23.0	0.56	23.8	22.1	0.55*	21.7	24.2	0.47*
GFW1	kg	270	0.87	0.03	1.01	0.74	0.03*	0.82	0.93	0.03*
GFW2	kg	246	1.17	0.03	1.20	1.13	0.03*	1.12	1.22	0.02*
CFW1	kg	270	0.70	0.02	0.80	0.60	0.02*	0.65	0.74	0.02*
CFW2	kg	246	0.95	0.03	0.98	0.92	0.02*	0.91	0.99	0.02*
MFD1	µm	270	20.3	0.27	21.1	19.5	0.25*	-	-	

*Difference is significant at P < 0.001

There were differences (P < 0.001) between birth types and between sexes for all live weight traits and some fleece traits (Table 2). Female progeny were smaller and produced lighter fleeces than the male progeny. Single born progeny were heavier on average, producing more mohair than multiple born progeny. The effects of sex and birth type were similar to those reported by Nicoll *et al.* (1989).

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The drought conditions may have reduced the variation between sires, however, differences ($P < 0.05$) were evident for many of the fleece traits (Table 3). The only time where there was a difference ($P < 0.05$) between sires in live weight was LW15, this weight was taken following a period of rapid growth.

Table 3 Predicted sire means, standard error of differences (s.e.d.) and the significance level (Sig.) at the first (1st) and second (2nd) shearings for mean fibre diameter (MFD), coefficient of variation of fibre diameter (CVD), fibre curvature (FC), percentage of medullated fibres (MED), washing yield (YLD) clean fleece weight (CFW) and live weight at 15 months of age (LW15)

					Sire										
	Trait		Sig.	s.e.d.	1	2	3	4	5	6	7	8	9	10	11
1st	MFD	µm	P < 0.001	0.53	20.3	21.0	19.6	21.4	19.6	20.6	20.3	21.2	20.1	20.0	19.6
	CVD	%	P < 0.05	0.86	31.9	30.7	32.0	30.9	31.0	29.3	31.7	31.5	31.2	29.8	30.5
	FC	°/mm	P < 0.001	0.82	20.9	18.9	19.0	17.8	20.9	17.0	18.9	18.8	19.8	19.4	20.0
	MED	%	P < 0.01	0.16	1.3	1.4	1.4	1.2	1.1	1.4	1.6	1.5	1.1	1.5	1.1
	YLD	%	P < 0.001	1.37	79.7	76.6	82.6	82.5	80.6	83.1	79.3	79.7	80.9	80.4	80.2
	CFW	kg	ns	0.05	0.71	0.70	0.63	0.69	0.69	0.70	0.68	0.77	0.76	0.67	0.68
2nd	MFD	µm	P < 0.001	0.58	21.2	22.0	20.7	22.2	20.1	21.2	21.9	22.1	20.5	20.8	20.3
	CVD	%	P < 0.05	1.08	26.5	25.5	25.8	25.0	25.6	23.6	24.5	23.9	26.1	25.4	26.6
	FC	°/mm	P < 0.001	1.00	20.8	18.3	17.8	17.8	19.9	16.4	18.3	16.4	19.5	18.3	19.7
	MED	%	P < 0.05	0.10	0.4	0.7	0.6	0.6	0.6	0.5	0.6	0.8	0.5	0.5	0.6
	YLD	%	P < 0.001	1.43	79.3	83.1	80.2	83.5	81.6	83.8	82.1	79.1	82.8	82.6	79.2
	CFW	kg	ns	0.05	0.95	0.99	0.89	0.92	0.92	0.95	1.04	0.95	0.93	0.97	0.94
	LW15	kg	P < 0.05	1.13	22.3	23.3	23.5	23.0	23.0	20.9	24.8	23.9	21.6	23.5	22.8

MFD is the most important mohair property for processing and it is closely associated with greasy mohair price (Hunter, 1993). The maximum difference between sires for MFD was 1.8 µm at the first shearing and 2.1 µm at the second shearing. These differences in MFD are evident without an associated reduction in fleece weight ($P > 0.05$) and for some sires without a reduction in live weight, which is promising for industry genetic improvement. Due to better seasonal conditions in 2003 it is expected that the third shearing will allow the progeny to better express their genetic potential and much larger differences will be evident. Widespread industry use of the most profitable sires identified in this project will result in an increase in profitability of Australian mohair production enterprises. The evaluation of further sires, with links to the current data would substantially enhance the value of this information, and result in more efficient identification and use of superior sires in the industry.

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