PROGENY OF ANDERSON RAMS SELECTED FOR RESISTANCE TO INTERNAL PARASITES IN AUSTRALIA ARE COMPARABLE IN OTHER TRAITS TO THAT FROM TALITAS RAMS SELECTED IN URUGUAY

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SUMMARY

Gastrointestinal parasites constitute a serious problem in many sheep production systems. Two studs, Anderson Rams in Australia and Talitas Rams in Uruguay, have been selecting for resistance for about two decades with considerable success. We used semen from Anderson Rams in Uruguay and compared their progeny with that of Talitas Rams. The genetic merit of Anderson Rams for worm egg count per gram of faeces is comparable to that of the best in Talitas Rams. The same may be said about production traits and visually appraised characters. In particular, fleece rot and wool quality were feared to be a problem among the progeny of Anderson rams, but contrary to expectation, their performance was very good and comparable to that of the best Talitas rams. Because Anderson Rams and Talitas Rams have worked independently, their progeny are unrelated, thus mutually providing an opportunity to increase the effective population size without compromising genetic merit in resistance to gastrointestinal parasites, in production traits, or in visually assessed characters.

INTRODUCTION

Gastrointestinal parasites constitute a serious problem in many sheep production systems (some in Australia and most in Uruguay). Talitas Rams stud in Uruguay, has been successfully selecting for resistance to internal parasites for about two decades. Semen from Anderson Rams stud in Western Australia, which has been selecting in the same direction, has been imported to Uruguay and used in a number of flocks. Worm egg count per gram of faeces (WEC) is used as a selection criterion for resistance in sheep genetic evaluations. In the latest Uruguayan Genetic Evaluation (INIA and SUL 2018) the top ram for WEC was from Talitas. Three Anderson Rams were among the 10% best for WEC, and one of them ranked third (together with a Talitas ram). It is a remarkable performance given that the three Anderson rams have no ancestors or other relatives, except for the progeny they have produced in Uruguay. Their breeding values may be negatively biased since the model fitted in the Uruguayan evaluation does not include genetic groups (Westell *et al*. 1988). Despite the demonstrated genetic merit for resistance to internal parasites of Anderson rams, some breeders have reservations. The Australian and Uruguayan environments are different, and they are wary about the performance regarding production traits and visually assessed characters. In this paper we report the progeny performance of three Anderson rams and nine Talitas rams for wool and body traits.

MATERIALS AND METHODS

Sheep and the environment. Records were available from 326 progeny of 12 rams born in the Spring of 2017. All rams had at least 20 progeny, that were reared in two locations in northern Uruguay, a University Farm in Salto (Estación Experimental Facultad de Agronomía Salto), and at Talitas Rams stud in Artigas. Two rams had progeny at the University Farm, whereas eleven rams had progeny in Talitas. Anderson rams were coded A1 to A3 and had expected progeny deviations (EPDs) for WEC ranging -0.44 to -0.31 in the Uruguayan genetic evaluation (scale -0.5 most

resistant, 0.5 most susceptible). Talitas rams were coded T1 to T9 and had WEC EPDs ranging -0.22 to -0.04. The national average is -0.13 and the best record is for a Talitas ram born in 2009 is -0.5. The ram coded as A1 (Table 4) had progeny in both locations (33 at the University Farm and 34 at Talitas), thus providing a genetic link between both locations.

The University Farm and Talitas Ram stud are at a latitude of 31 degrees south. Average rainfall is 1320 mm. Mean maximum and minimum temperatures are 24 and 12 degrees C, respectively. During the wool growth period rainfall was greater than the average. The spring of 2017 was very rainy (500 mm), followed by a relatively dry summer (370 mm). Later, in May alone, rainfall was 360 mm, accompanied by warm temperatures. Overall, wool growth took place in conditions that were conducive to wool discoloration and fleece rot.

Traits recorded. The objectively measured (yearling) traits recorded were: greasy fleece weight (GFW), yield (YLD), clean fleece weight (CFW), fibre diameter (FD) and post shearing live weight (LWT). Prior to shearing, the subjectively assessed traits were: overall visual appraisal (VISAP, 1= top, ..., 3=cull), face cover (FC, 1=open face, ..., 6=muffled face), pigmentation in non-wool areas (PGM, 1=free of pigmentation, ..., 5=highly pigmented), wool quality (WQUAL, 1=harsh poor quality, ..., 5= the best in terms of colour, handle and wool character), fleece rot (FR, 0=complete absence of fleece rot, ..., 5=high incidence of yellow or green bands). At the University Farm lambs were not shorn, visual appraisal was conducted in August 15, 2018, whereas shearing took place on September 10. At Talitas Ram stud lambs were shorn in December 2017, and visual appraisal and shearing took place in September and October 2018, respectively.

Data analyses. PROC MIXED in SAS (SAS Institute Inc., 2011) was used to fit a linear model to the data. Location, sire, sex, type of birth, age of dam, and management group within location were fitted as fixed effects, whereas date of birth was fitted as a linear covariate within location. This enabled the calculation of 'adjusted means' (least squares means) for sires, as is usually done in sire evaluation in Australia. We also analysed the visually appraised traits using PROC GLIMMIX in SAS, assuming a multinomial distribution. The results were almost identical to those obtained using PROC MIXED, except for small differences in a few and unimportant cases. Here we present the results obtained with PROC MIXED.

RESULTS AND DISCUSSION

Table 1 shows descriptive statistics for the traits studied. Fleece rot are not presented, only a very small proportion of animals were affected, and none with scores 3 to 5.

Table 1. Number of observations (N), mean (μ), minimum, maximum and standard deviation (σ) of GFW, YLD, CFW, FD, LWT, VISAP, FC, PGM), WQUAL, FR

Variable	N	μ	Min	Max	σ
GFW (kg)	318	2.69	1.30	4.20	0.47
YLD (%)	326	74.78	59.80	86.70	5.20
CFW (kg)	318	2.01	1.05	3.21	0.34
FD (μm)	326	16.81	13.30	21.30	1.57
LWT (kg)	316	34.93	16.00	53.00	6.43
VISAP (1-3)	319	1.83	1	3	0.60
FC (1-6)	319	1.93	1	4	0.74
PGM (1-5)	319	2.27	1	5	0.82
WQUAL (1-5)	319	4.41	1	5	0.70
FR (0-5)	326	0.04	0	2	0.23

Table 2 shows the analysis of variance for objectively measured traits. We mainly focus on the sire effect, which was statistically significant in all cases, except for YLD.

Table 2. Degrees of freedom (DF) and P values from the analysis of variance of GFW, YLD, CFW, FD and LWT

Effect	DF	GFW	YLD	CFW	FD	LWT
Location	1	0.8456	0.5076	0.6263	0.6951	0.1180
Sire	11	0.0002	0.1267	<.0001	0.0218	0.0206
Sex	1	<.0001	<.0001	<.0001	0.8223	<.0001
Birth type	2	<.0001	0.4725	<.0001	0.0296	0.0906
Age of dam	8	0.3734	0.6634	0.2365	0.8513	0.4220
Management group (location)	1	0.5458	0.8685	0.5936	0.0171	0.3513
Birth date (location)	2	0.0623	0.7214	0.1162	0.1164	0.0182

Table 3 shows the analysis of variance for subjectively assessed characteristics. The effect of sire was statistically significant for FC and PGM, whereas it bordered significance for WQUAL.

Table 3. Degrees of freedom (DF) and P values from the analysis of variance of VISAP, FC, PGM and WQUAL

Effect	DF	VISAP	FC	PGM	WQUAL
Location	1	0.8130	0.9576	0.6464	0.0419
Sire	11	0.2393	0.0220	0.0012	0.0955
Sex	1	0.3685	0.3528	0.1557	0.5220
Birth type	2	0.0016	0.6771	0.9721	0.0132
Age of dam	8	0.0401	0.5613	0.2983	0.9723
Management group (location)	1	0.2174	0.9151	0.6396	0.5161
Birth date (location)	2	0.3091	0.7025	0.7724	0.1225

Table 4 shows the least squares means for sires.

Table 4. Least squares means for GFW, YLD, CFW, FD, LWT, VISAP, FC, PGM and WQUAL. The three 'best' sires for each trait are indicated in bold type

Sire[1]	GFW	YLD	CFW	FD	LWT	VISAP	FC	PGM	WQUAL
A1	**2.51**	74.72	**1.88**	17.74	**35.84**	1.95	1.94	2.32	4.25
A2	2.08	74.51	1.55	**17.04**	34.18	2.16	2.05	2.22	**4.44**
A3	**2.47**	75.84	**1.86**	17.98	**37.73**	**1.68**	**1.57**	1.72	**4.45**
T1	2.31	72.28	1.65	**16.78**	33.90	2.18	2.19	1.99	4.07
T2	2.31	**76.01**	1.73	17.69	35.83	1.87	**1.61**	2.53	**4.32**
T3	2.32	73.86	1.70	17.37	**37.12**	**1.75**	**1.71**	2.02	4.22
T4	2.31	73.18	1.67	**17.10**	35.57	1.87	2.12	**1.43**	4.19
T5	2.36	**75.87**	1.78	17.87	33.22	1.96	1.90	**1.51**	3.99
T6	2.21	**75.98**	1.65	17.34	33.39	1.90	2.29	1.83	4.11
T7	**2.40**	75.32	**1.81**	17.61	33.50	**1.85**	1.73	1.61	4.21
T8	2.29	73.67	1.67	17.49	32.75	2.04	2.04	**1.34**	3.63
T9	2.09	74.90	1.55	17.42	34.21	2.07	2.11	1.62	3.81
SE	0.10-0.15	1.23-1.84	0.07-0.12	0.33-0.49	1.14-1.72	0.16-0.23	0.20-0.30	0.21-0.32	0.18-0.28

1- A: Anderson sires; T: Talitas sires; SE is the range in standard errors of least squares means

Talitas Rams is an Australian Merino stud of excellent reputation in Uruguay, selling 180 to 220 rams per year to a well-established clientele. It has been using objective measurement for decades

and its sires always rank well in the Uruguayan genetic evaluation. It provides a valuable reference for the Anderson sires being introduced.

Anderson sires have expressed high genetic merit for resistance to internal parasites in the Uruguayan environment. The results presented in this paper should help allay concerns about the performance of their progeny with regards to production traits and visually assessed characters. Table 4 shows that for all traits considered, the progeny of Anderson rams compared well with that of Talitas. In the case of GFW and CFW, two of the heaviest cutting progeny were by Anderson rams. YLD was generally greater for the progeny of Talitas rams, but the difference was not large, and the lower yield could be advantageous if it conferred greater fibre protection. Fibre diameter among all progeny ranged between 17 and 18 microns. Progeny from one of the Anderson rams was the second finest, whereas for another one it was the strongest. However, all were within the range of the progeny of Talitas rams. Concerns about Anderson rams undoing the results of many years of selection for reduced fibre diameter seem unjustified. Anderson rams produced two of the heaviest progeny groups, one of them having the greatest LWT. Regarding VISAP, Anderson rams had the best scoring progeny, as well as one of the worst. However, the values were comparable to those of Talitas, and indicated that a high proportion of all progeny were deemed visually acceptable. FC scores of all progeny were low; the greatest value was 2.3, which still corresponds to an open face sheep. Pigmentation scores were low (greatest value 2.5 out of a maximum possible individual score of 5.0). Initial apprehension about the adequacy of fleeces bred in Western Australia for the Uruguayan environment is in principle justified. The environments notably differ in rainfall. We did not analyse the FR data because of its extremely low incidence. Coupled with the WQUAL results, this should put at rest fears about wool colour and quality generally. The two best scoring progeny groups were from Anderson rams. The results for FR and WQUAL suggest that in this regard, the Anderson rams performed as well as, if not better, than Talitas rams.

CONCLUSIONS

Although the progeny number produced to date is limited, the results from the Uruguayan genetic evaluation suggest that the genetic merit for resistance to internal parasites expressed in Australia by Anderson rams, is also expressed in Uruguay. Furthermore, the genetic merit of Anderson Rams for WEC is comparable to that of the best in Talitas Rams. The number of studs that have selected for resistance to gastrointestinal parasites is limited, so both, Anderson Rams and Talitas Rams face the problem of few or no alternative sources of stock to ensure long term continuity to their breeding programs. Because Anderson Rams and Talitas Rams have worked independently, their animals are unrelated, thus mutually providing an opportunity to increase the effective population size without compromising genetic merit in resistance to gastrointestinal parasites, in production traits, or in visually assessed characters. In the immediate future, the flow of genes from Anderson Rams to Uruguay will most likely continue, whereas in the more distant future, we should not rule out the possibility of a flow in both directions.

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REFERENCES

INIA, SUL (2018) Evaluaciones Genéticas Ovinas. Uruguay. Accessed 3 September 2019. www.geneticaovina.com.uy.

SAS Institute Inc. (2011) SAS/STAT® 9.3 User's Guide, SAS Inst. Inc. Cary NC, USA.

Westell R.A., Quaas R.L. and Van Vleck L.D. (1988) *J. Dairy Sci*. **71**: 1310.