BREEDING WORM RESISTANT SHEEP AT BILLANDRI

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SUMMARY

Breeding sheep for increased resistance to worms can be incorporated into breeding objectives including other economically important production traits such as fibre diameter and clean fleece weight. This paper reports on the first year's results from Billandri Poll Merino stud comparing individual ram hoggets ranked using 4 different selection indices. Stud replacement sires were selected based on the Worm 50 Index.

Keywords: Selection, wool sheep, resistance to parasites.

INTRODUCTION

The threat of resistance to the macrocyclic lactone group of drenches in addition to the high prevalence of resistance to the levimisole and benzimadizole anthelmintic drench groups is a significant problem for the wool industry. There is also increasing pressure from processors and consumers of wool to reduce the use of chemical pesticides. This has prompted serious consideration of breeding for worm resistance. Results from the Rylington Merino project indicated that selection for low faecal worm egg count (FWEC) was effective (Karlsson et al. 1995). Billandri has collaborated with Agriculture WA and the Nemesis project to demonstrate that resistance to worms can be incorporated into a commercial ram breeding program. The effect of including resistance to parasites in a selection index on the other production traits is examined.

METHOD

From the 1994 drop ram lambs 720 out of a total of 1288 born were retained entire and fleece measured in June 1995 at 12-13 months of age with 9 months wool growth. Greasy fleece weight was recorded and mid-side samples collected and tested for fibre diameter (FD), yield, coefficient of variation of fibre diameter (CVFD) and percentage of fibres greater than 30 microns (%>30). Ram numbers were reduced to 464 based on a combination of production figures in an index and subjective features. The remaining rams were sampled for FWEC. All rams were drenched with ivermectin on 17th March 1995. The break of season rain was 10 mm on 12th May followed by 8.5 mm on 22nd May. One month after the opening rains the FWEC of young rams were monitored regularly by rounding up the ram mob against a fence for 5-10 minutes and collecting 15-20 random samples of dung pellets. These were taken to Agriculture WA laboratory in Albany for FWEC and larvae differentiation analysis. From an average FWEC of 6 eggs/gram (epg) on the 13th of June the count progressively rose to 150 epg by the 25 July and the number of zero counts fell from 15/17 to 2/20. At this point it was decided to sample the whole mob when heritability of FWEC is highest (Greeff et al. 1995). Sires retained need to be selected by early August to fit in with the annual selection and sale calendar. Faecal sampling was performed on a Harrington Vbelt machine. Faecal consistency was scored on a scale of 1 (firm) to 5 (sloppy). Dag score was scored on a scale of 0 (no dags) to 4 (very daggy). 455 rams were sampled.

RESULTS AND DISCUSSION

The average FWEC on the 3rd August when the whole mob was sampled was 209 (range 0-1650), with Trichostrongylus 151 (range 0-1050) and Nematodirus 57 (range 0-500). The proportion of rams with zero counts was 68/455. Average FWEC was below the recommended minimum average of 300 (preferably 500) for WA.

When considering selection of sires, production data was incorporated into several indices to assess the impact that adding resistance to worms to the selection programme would have on rates of response in other measured characteristics.

Table 1. Predicted genetic change after ten years of selection for the various indices

	-1.0 Micron + SS Index	Worm 30	Worm 50	Worm 70
Fibre Diameter (μ)	-1.0	-1.0	-0.9	-0.7
Clean Fleece Wt. (gms)	+350	+300	+270	+230
Body Weight (kg)	maintained	maintained	maintained	maintained
Staple Strength (N/Ktex)	+2.0	not included	not included	not included

The indices were calculated by Agriculture WA (Greeff, personal communication. 1995)

The change in ranking of individual rams under the different indices is examined in Table 2. FWECs are given to show how they affect ranking under Worm indices. The effect on rams with above average FWEC is illustrated by ram 261 with the highest FWEC of 1650 which was ranked 1st under -1.0 micron plus staple strength index, 47th under Worm30 index and 337th under Worm70. Ram 122 also with above average FWEC of 450 ranks 5th under -1.0 micron index, 17th under Worm30 and 32nd under Worm 70. An example of a resistant ram is ram 144. Ram 144 with 0 FWEC sired by a ram whose progeny had a low average FWEC (average 75) ranked 22nd in -1.0micron plus staple strength index ranked higher relative to ram 44 also with 0 FWEC but sired by a ram whose progeny had above average FWEC (average 236) as more emphasis is placed on resistance. Ram 33 with FWEC 300 ranks lower when compared with ram 44 (same sire) with FWEC 0 when more emphasis is placed on resistance.

Table 2. Ranking of the top 20 rams under various indices

	-1.0 Micron Index		Worm 30	Worm 50	Worm 70
Rank	TAG NO.	FWEC	TAG NO.	TAG NO.	TAG NO.
1	261	1650	87	87*	87
2	87	100	6	6	6
3	188	250	178	178*	196
4	178	200	188	188	178
5	122	450	77	77*	77
6	6	100	196	196*	188
7	77	200	193	53	53
8	124	300	53	193*	90
9	53	150	33	90*	144
10	44	0	124	144	193
11	193	200	90	124	26
12	33	300	144	33	34
13	202	250	202	26	44
14	90	0	26	202*	202
15	26	0	44	44	472
16	97	150	34	34*	127
17	127	100	122	472*	124
18	196	0	97	127	33
19	472	50	472	97	83
20	228	400	127	83	126

*Retained as sires.

The average performance of the top 20 ranking rams in each of five indices is given in Table 3. The top twenty ranking rams deserve attention because most of the sire replacements will come from this group. The table also demonstrates the effect on other production characteristics when resistance to worms is included as a selection criterion. In other words the degree to which selection for other characteristics has to be relaxed to include varying degrees of reduction of FWECs.

Table 3. Average of top 20 rams using different indices

INDEX	FD	CFW	CV of FD	FIBRE >30	BODY WT	FWEC AUG. 3	FAECAL CONSISTENCY	DAG SCORE
WoolplanOpt1	18.8	137%	21.1%	1.5%	79.2	252.5	3.5	0.2
-1.0 micron+SS	19.4	142%	20.5%	1.8%	79.2	242.5	3.4	0.1
WORM30	19.3	139%	20.9%	1.9%	78.5	140.0	3.5	0.1
WORM50	19.3	137%	21.0%	1.9%	77.7	122.5	3.5	0.1
WORM70	19.3	137%	21.0%	1.9%	78.3	115.0	3.5	0.1

More emphasis on FWEC led to a reduction of a Faecal Worm Egg Count from 242.5 under the 1 micron finer plus improved staple strength index to a FWEC of 122.5 under the Worm 50 index at a cost of 5% clean fleece weight, 0.5% increase in CV of FD and a slightly lower live weight (1.5 kgs.) Other characteristics including fibre diameter, yield, percentage of fibres over 30 micron, wrinkle score, scrotal circumference, and dag score have not been affected.

The timing of testing was suitable in that after fleece measurement the number of rams to be tested had been reduced. The period of eight weeks after the break of season does not interfere with other major management procedures. An artificial worm challenge could be considered if a late break of season makes the sampling date less convenient although higher estimates for heritability have been obtained from natural challenge (Karlsson personal communication). The use of faecal antigens, a possible refinement to more accurately measure the worm burden, would not alter the procedure. Including a staple strength component based on the coefficient of variation of fibre diameter is desirable.

Apart from the cost of egg counts the main limitations to the method used would be the sampling error involved in the egg count (half sib data is an important component to firm up estimates) and the possibility of low faecal worm egg counts being correlated with hyper-sensitivity and scouring in later life. In New Zealand there is some evidence to suggest there is a small genetic antagonism between FEC and wool production in NZ breeds which would slow genetic progress in these traits (McEwan et al. 1995). Genetic correlation estimates from the Rylington Merinos are more favourable and not antagonistic (Greeff personal communication). This work in a Mediterranean environment is very important in assisting breeders to decide what degree of emphasis should be placed on resistance to worms.

CONCLUSION

Using Faecal Egg Counts to breed sheep resistant to worms and reduce pasture contamination can be incorporated into a ram breeding programme without great inconvenience and deserves consideration by at least ram breeders with clients in the over 500 mm rainfall areas.

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REFERENCES

McEwan, J.C., Dodds, K.G., Watson, ., T.G., Greer, G.J., Hosking, B.C and Douch, P.G.C. (1995) *Proc. Aust. Assoc. Anim. Breed. Genet.* **11**:70.

Greeff, J.C., Karlsson, L.J.E., and Harris, J.F. (1995) *Proc. Aust. Assoc. Anim. Breed. Genet.* **11**:117

Karlsson, L.J.E., Greeff, J.C., and.Harris, J.F (1995) *Proc. Aust. Assoc. Anim. Breed. Genet.* **11**:122.