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Heritability of resistance to flystrike in New Zealand Perendale sheep

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INTRODUCTION

The cost of flystrike to sheep farmers is considerable. Apart from animal deaths, other costs include: labour and chemicals for control, reduced wool value and poorer animal performance. Also, there is a cost in animal suffering and potential for chemical contamination of wool. Furthermore, fly resistance to currently available forms of chemical control is increasing. A complementary approach to controlling flystrike is to enhance the animal's genetic resistance via selection. There appear to be no heritability estimates for resistance/susceptibility available from New Zealand sources, however values estimated from Australian Merino data range from 0.25 to 0.54 (Atkins & McGuirk, 1979; Gilmour & Raadsma, 1986; Raadsma, 1991). The objectives of this study were two-fold. First, to examine sources of non-genetic variation in susceptibility to flystrike and second, to assess the level of genetic variation in susceptibility to flystrike.

MATERIALS AND METHODS

Performance and pedigree records for Perendale sheep had been collected by two farmers (one of whom maintained 2 flocks). One farm was located on the west side and the other (with two flocks) on the east side of the North Island of New Zealand. Data were collected from 1987 to 1991, 1988 to 1991 and 1990 to 1991, for the 3 flocks. Records were maintained on Animalplan and included dam, sire, sex, birthdate, weaning weight, live-weight (8 or 10 months) and fleece weight. Flystrike events were recorded for lambs during summer. Lambs were not treated with any chemical preventives before or during the periods of observation. After editing, there were 4845 records available for analysis, representing 67 sires. To adjust for age, weaning and later weights were transformed into growth rates.

Estimation of the heritability requires the estimation of variance components. In brief, the principles used by REG (Gilmour, 1985) require that the dependent variable be transformed and analysed by weighted least squares. The regression coefficients are used to calculate predicted values, which in turn are used to form a modified dependent variable on the transformed scale and new weights. The cycle is repeated until the deviance is minus twice the difference of the log likelihoods between the current model and a full model. An analysis of deviance table is constructed from differences in deviance for various sub-models. The heritability can then be derived as four times the intra-class correlation and the standard error calculated (Gilmour, 1985).

RESULTS AND DISCUSSION

A total of 171 cases of flystrike occurred out of 4845 records giving a mean incidence of 3.5 % (range 0.5% to 7.3 for 11 flock by year combinations). Ewe Lambs (4.1%) were affected to a greater extent than rams (2.9%) ($P<0.05$). Following maximum likelihood analyses of flystrike, a model including flock-year, sex and growth rate to weaning was chosen to best represent the data. The heritability (± SE) estimate obtained from this model was 0.18 ± 0.04. This value is at the lower end of the range found in Australian Merinos and is probably a reflection of a lower overall incidence of flystrike in the Perendale sheep used in this study.

The combination of low incidence of flystrike and low heritability suggests that only slow genetic progress can be made towards an objective of reduced incidence. An alternative approach is to use an indirect predictor of flystrike such as fleece-rot or immune responsiveness (Raadsma, 1991; Raadsma, 1992; Blackwell and Blair, 1997). However, the low incidence of fleece-rot in New Zealand crossbred sheep may reduce its potential usefulness.

When attempting to genetically modify any trait, the genetic associations with other economically important characters should also be considered. There were insufficient data in the current study to estimate genetic correlations between flystrike and growth and wool production traits. However, the phenotypic associations between these traits were examined using a G-test. The only significant ($P<0.05$) association was between flystrike and fleece-weight. Sheep with lower (<-1 std. dev.) fleece-weights had a lesser chance of being flystruck than sheep with higher (>+1 std. dev.) fleece-weights (1.4% vs 3.3%). Further data are required to enable the underlying genetic basis of this undesirable association to be explored.

Before including flystrike into a breeding programme, an economic value for resistance to flystrike is required. As with any disease, this is not a simple task and further work is required to fully account for the costs and benefits of selecting for increased resistance to flystrike.

CONCLUSIONS

Susceptibility to flystrike shows only a low level of genetic variation in young Perendale sheep. As a consequence of this and the low level of incidence, only a slow rate of genetic change will be achievable by directly selecting against flystrike. However, only three flocks of one breed were included in this trial and further analyses are warranted to include a larger number of flocks and for other sheep breeds found in New Zealand. Additional work is also needed to investigate genetic correlations between flystrike and other economically important traits and to derive an economic value for resistance to flystrike.

REFERENCES

Atkins & McGuirk (1979) *Wool Techology and Sheep Breeding* **27:**15-19.

Becker (1967) Manual of proceedings in quantifying genetics, 2nd ed.

Blackwell & Blair (1997) *Proceedings of the Animal Society Production* **58:** 37-40.

Gilmour (1985) Reg, a generalised linear model programme.

Gilmour & Raadsma (1986) *Proceeding of the 3rd World Congress Gen. Appl. Live. Prod.* **12:**490-493.

Raadsma (1991) *Australian Journal of Agricultural Research* **42:** 279-293.

Raadsma (1992) *Proceedings of the Australian Association of Animal Breeding. Genetics* **10:**143-146.