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Selection for resistance to parasites in sheep

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ABSTRACT

The Wairunga flock was established in 1956. It has since been selected for production traits and, recently, also for 'disease' traits (resistance to footrot, dags and internal parasites). Records of weaning weight, autumn weight, winter weight, faecal egg count (FEC) and fleece weight have been collected on ewe and ram lambs from the 1987-born crop onwards, in a management programme which involved withholding anthelmintic drench for a monitored period in autumn. Dag scores have also been taken at the time of faecal sampling from the 1988-born crop onwards. Experiences already show that there is keen interest from ram buyer clients in 2-tooth rams that have grown without a drench. Results show significant potential savings in numbers of drenches on weaned lambs, and large differences among sire groups in the parasite susceptibility of progeny groups. Because of the need to withhold drenches, a major change in the whole concept of ram breeding and performance testing will be required by ram breeders and their clients before much progress can be made in breeding for resistance to internal parasites.

Keywords Sheep, internal parasites, resistance, breeding, dags.

INTRODUCTION

For nearly 40 years the main objective in the Wairunga flock has been to breed high performing sheep in a normal commercial environment, with the ability to breed and survive in a rigorous climate with no assistance from people. Further to this, the objective in more recent years has been to breed sheep with natural resistance to sheep diseases such as footrot, internal parasites, dagginess and facial eczema. The annual economic losses from the last three diseases are quoted as: internal parasites $270 million, dags $40 million and facial eczema $20 million (New Zealand Wool Board, 1990).

From 1956-1966 the Wairunga Romney flock pioneered the concept of computerised performance recording. By 1967 the concept was recognised with the introduction by the Ministry of Agriculture and Fisheries of the National Flock Recording Scheme, later to become Sheeplan and more recently Animalplan.

In 1967 Wairunga became the Central Flock of New Zealand's first sheep group breeding scheme. The annual screening of a large number of ewes (approximately 100,000) for the highest producers resulted in greatly improved fertility and survival rate. Major emphasis was put on structural soundness, and intensive selection was carried out for fleece weight and growth rate during this period.

In 1979, in conjunction with Wallaceville Animal Research Centre, trials were set up at Wairunga to select sheep resistant to footrot. In 1985 a programme to select sheep resistant to facial eczema was set up, and in the same year measurements of fat depth commenced to give a lean growth index on rams (Dodd *et al.*, 1985).

Erosion of profits in New Zealand sheep flocks due to the resistance of internal parasites to the currently available drenches led to the decision to include selection for this trait into the programme. Naturally no progress in this area could be made while regular drenching was taking place. It was thus decided to withhold drenching from the young stock during the critical autumn months, probably something that has not often been done in a ram breeding flock.

Following the eight years of working with Wallaceville on a successful footrot resistance programme, we again approached them and a joint venture was set up under the direction of Dr's Stewart Bisset and Alex Vlassoff.

MATERIALS AND METHODS

The Programme

The campaign to breed Romney sheep with natural resistance to internal parasites is being waged at Wairunga on two fronts:

1. All ewe lambs are involved in a programme to give a progeny test on sires.

2. A proportion of the ram lambs are assessed to find individuals which themselves show resistance.

Ewe Measurement for the Sire Progeny Test Programme

In the 1987-, 1988- and 1989-born lamb crops, all ewe lambs were drenched at weaning. The purpose of this drench was to minimise dam effects on progeny so that the results would give the best indication of sire effects. Lambs were then put on the no drench programme.

Spot checks on faecal egg count (FEC) were taken during February and March and, when the average count reached approximately 1500 eggs/g, the Wallaceville team came to Wairunga to take faecal samples from all of the approximately 1000 ewe hoggets. The hoggets had been weighed at weaning and weights were recorded again at the time of the faecal sampling. A dag score was also taken at this time for the 1988 and 1989 crops. Following the faecal sampling and dag scoring the ewe hoggets were put on to a normal dosing regime.

Individual Evaluation of Ram Hoggets

In the 1989 and 1990 seasons (1988 and 1989 lamb crops), 200 twin-born ram hoggets, selected for productive background, were put on the no drenching regime from weaning until April/May in the same way as the ewe hoggets, and individual FECs, dag scores and weight gains were recorded. In the 1990 season 36 ram hoggets, which still appeared to be doing well at the end of this period, were identified and kept on the no dosing regime; 28 of these were carried through to the two-tooth ram selling stage with no further drenching. They looked well and were keenly sought by ram clients.

In the current season (1991), 600 1990-born ram lambs were withheld from drench at weaning and at today's date (February 13) they have still not been drenched. These ram hoggets will be carefully monitored and those which have a very high FEC, or appear to need drenching, will be drenched and identified accordingly, and taken out of the no drench programme. It will be interesting to see how many we end up with at the end of the year. A good demand is predicted from clients for the resistant rams.

Dagginess

Another problem concerning farmers is dagginess, which very often leads to fly strike. It was thus decided to include this trait in the selection process. Some people thought that sheep resistant to internal parasites would also tend to have fewer dags, but the research team at Wallaceville had found no correlation between the two. There is in fact some evidence to suggest that the correlation between FEC and dag score (0 to 4 scale, 0 being dag-free) is negative (Watson *et al.*, 1986). It was therefore decided to select for dag-free sheep independently of the other traits.

RESULTS

Selective Mating

In 1989 we selectively mated the 1987-born 2-tooth ewes which had the lowest FEC and dag score and the highest weight gain, to the best three ram hoggets on the same characters. The results of this mating are shown in Figure 1. Progeny of the selected matings had lower FECs and dag scores and higher weight gains than the mean of all other progeny.

Effect of Withholding Drench

Weight gain

In the 1990 season we ended up with three groups of rams which had been given different levels of drenching. The relationship with weight gain for these groups is given in Figure 2. Some Wairunga ewes were lambed early on a separate property; figures are given separately for progeny of the two groups. Although those drenched

only at weaning (mob 3) were a selected sample, their growth until May was superior. The weight gain of mob 3 had dropped relative to the other two groups by July, but this drop did not seem to be significant and was no greater than the difference between the early and late lambing mobs.

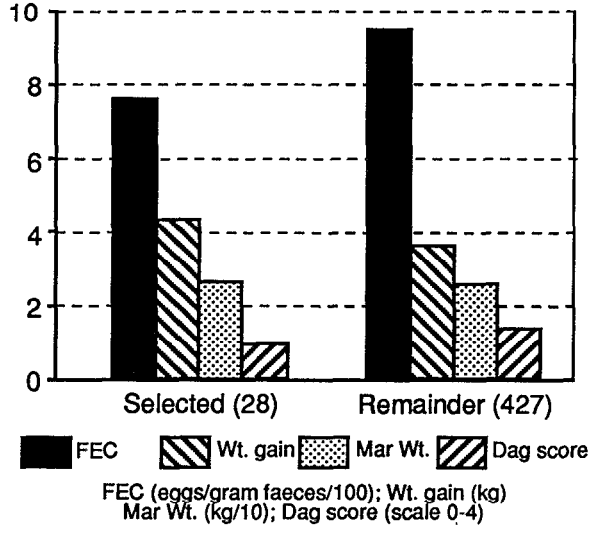

FIG 1 Wairunga faecal egg count (FEC) trials (1989-born progeny): results of selective mating.

Faecal egg count

The relationship between FEC and drench frequency is given in Figure 3. The figures show that the FEC for mob 3 increased to 4000 eggs/g during May, but were down by July to a level close to the other two groups.

Sire Progeny Test

Table 1 shows the progeny records (n=250) of one outstanding sire, Wairunga 780/87, which not only had progeny with low FECs and low dag score, but had good progeny results on 8 out of 9 traits recorded.

TABLE 1 Progeny test results from an outstanding sire, Wairunga 780/87, expressed as deviations from the flock mean.

Criterion	Prog.performance from Progeny of Sire 780/87	Best sire	Worst sire
Sire Weaning weight, kg	1.27	1.69	-2.14
Live weight at 8 mo, kg	2.58	2.58	-2.75
Fleece weight at 12 mo, kg	-0.02	0.33	-0.36
Survival, individual	0.06	0.07	-0.11
Daily post-wng gain to 8 mo, g/d	8.00	8.00	-8.48
Fat depth (GR) at 8 mo, mm	-0.52	-1.43	2.94
Faecal egg count at 8 mo, eggs/g	-684	-819	907
Facial eczema resistance	high	high	low

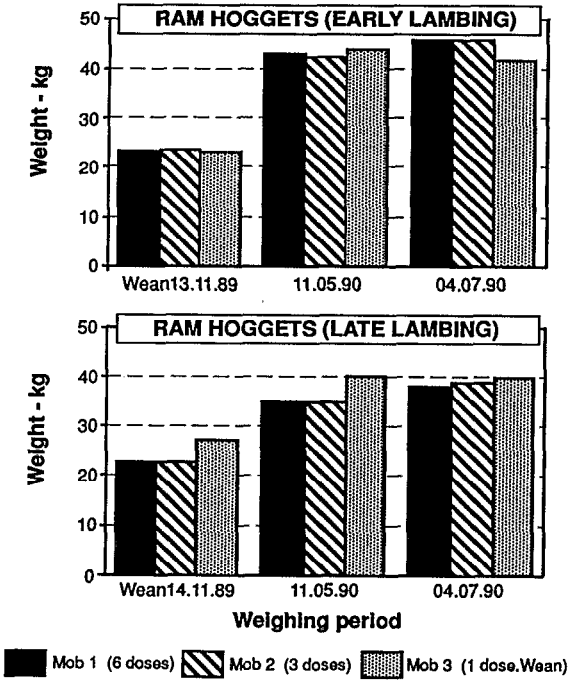

FIG 2 Relationship between weaning or autumn/winter live weights (kg) and numbers of drenches received (1989-born ram progeny).

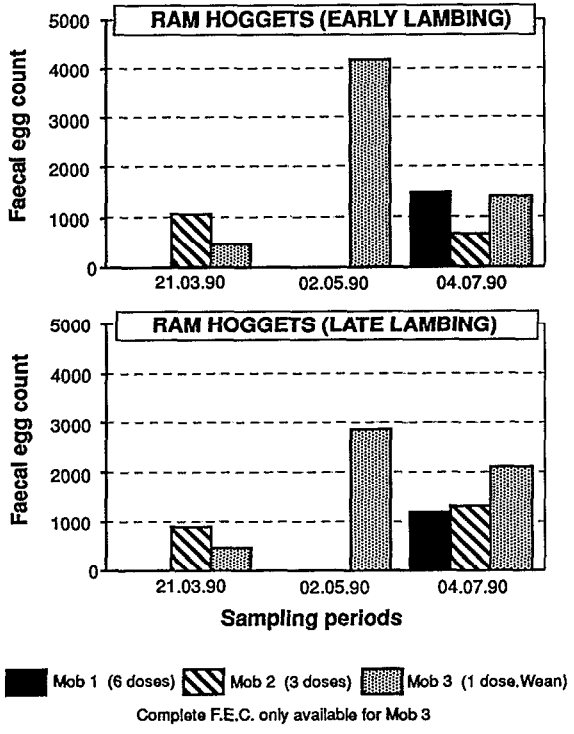

FIG 3 Relationship between faecal egg count and numbers of drenches received (1989-born ram progeny).

Animal Plan

The data on FECs and dag scores in the Wairunga flock are being processed on Animalplan along with the normal production records. When the two-tooth ram selection list for the 1990-born animals is produced it will include a breeding value for worm and dag resistance based on the records of young rams and close relatives, through the use of BLUP technology. This will be a valuable tool in the selection process.

DISCUSSION

The prospects for developing strains of sheep with natural resistance to internal parasites look good, and are probably the only way to solve some of the current problems of resistance to drenches by worms. A major change in the whole concept of ram breeding will, however, be required by ram buyers, before ram breeders will be prepared to submit their breeding flocks to the challenge of being withheld from drenching. Traditionally, most rams are bred in the wrong environment for the greatest genetic progress to be made, i.e. bred on a high plane of nutrition with high rates of dosing and other care. Rams should be bred on the same or even harsher conditions than those of the commercial properties on which they will be used. Ram breeders and the ram buyers are equally responsible for the present situation. Those people who wonder why improvement in the performance of our national flocks and herds has been slow and sometimes non-existent should look hard at this aspect of the industry.

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