GROWTH, WOOL AND HOST RESISTANCE ATTRIBUTES OF EAST FRIESIAN X COOPWORTHS RELATIVE TO PURE-BRED COOPWORTHS

N. B. Jopson[1], K. G. Dodds[1], K. J. Knowler[2] and J. C. McEwan[1]

[1]AgResearch Invermay, Private Bag 50034, Mosgiel, New Zealand
[2]Woodlands Research Station, RD1, Invercargill, New Zealand

SUMMARY

The East Friesian (EF) breed was imported into New Zealand and released to the industry in 1996. Few reports exist on the performance of EF crosses in New Zealand. This paper reports on results from EF sires mated to Coopworth ewes in the APEX Coopworth sire referencing scheme. A total of 30 EF sires were used in nine flocks of the 17 APEX member flocks to produce 3,478 EF x Coopworth progeny in the 1996 and 1997 birth years. These animals were compared with about 26,000 of their pure Coopworth contemporaries. Estimated breeding values (EBV's) from a multi-trait animal model BLUP were used to compare weaning weight, live weight at eight months, fleece weight at 12 months, and four measures of host resistance to internal parasites. The EF sires had significantly higher EBV's for weaning weight (+1.94 kg; $P<0.001$), live weight at eight months (+2.48 kg; $P<0.001$) and significantly lower fleece weight at 12 months (-0.44 kg; $P<0.001$) than their Coopworth contemporaries. There were no significant differences between sire breeds in any of the host resistance traits ($P>0.05$). There was significant overlap in the range of EBV's between the two sire breeds for all traits examined suggesting that selection decisions should be based on individual sire benefits rather than breed of origin.

Keywords: East Friesian, Coopworth, sheep, breed, growth

INTRODUCTION

In last 30 years, a number of exotic sheep breeds were imported into New Zealand in order to improve the fertility, milk production and lamb growth rates of the mainly Romney-based industry. One such breed is the East Friesian (EF), which was imported on the basis of its prolificacy and milk production (Meyer *et al.* 1977). The original importation of EF sheep into New Zealand occurred in 1972, when five ewes and one ram were imported by the Ministry of Agriculture and Fisheries, along with the Finnish Landrace, Oxford Down and German Whiteheaded Mutton. When these exotics were crossed with the Romney, the progeny performed well, equaling or bettering the best of local crosses for lamb survival, weaning weight and reproductive performance (Meyer *et al.* 1977). The exotic breeds from this importation were never released to the industry as scrapie was suspected in quarantine, and all imported sheep and their progeny were destroyed.

A second importation of EFs occurred in 1992, when 11 pregnant ewes and four rams were imported from Sweden (Allison 1995). These were taken through a quarantine programme and released to the industry in 1996. Only one study on the performance of this importation has been published. Carcass dissections indicated that EF x Romney carcasses had lower GRs, greater eye muscle areas and a greater percentage of dissectable lean in the hind leg when compared to Border Leicester (BL) carcasses at the same carcass weight (Allison 1995), although the error estimates were not provided. Ovulation rate was also reported to be greater in EF crosses than in BL crosses.

There has been significant industry use of EF sires for crossbreeding since their release and comparisons of crossbred performance relative to local pure-breds can now be undertaken. This paper reports the results of one such industry comparison made by the APEX Coopworth sire referencing group in terms of growth, wool and host resistance to internal parasites.

MATERIALS AND METHODS

The APEX Coopworth sire referencing group is comprised of 17 breeders whose properties range from Canterbury to Southland in the South Island of New Zealand. The group was formed in 1987. There are around 10,000 breeding ewes across all the member flocks, and in each flock a minimum of two reference sires must be selected from a pool of sires and used each year to link the flocks. A total of 30 pure EF sires were used to produce 3,485 EF x Coopworth progeny surviving until weaning in nine of the 17 flocks in the 1996 and 1997 birth years. There were 27,320 pure Coopworth contemporaries from 273 sires. Sire and dam were recorded at birth for all individuals, along with birth date and birth and rearing rank.

Growth traits included live weight at weaning (WWT; approximately ten weeks of age) and at eight months of age (LWT8). Hogget fleece weight at 12 months of age (FW12) was the only wool trait recorded. Progeny from several flocks were subjected to a test for resistance to internal parasites. The test involved two field exposures to parasites beginning at weaning, with the second challenge following immediately after the first as described by McEwan *et a.* (1997). Briefly, both challenges were terminated when faecal egg count (FEC) of a randomly selected subset of each flock had reached an average of 800 eggs per gram. Individual faecal samples were then collected, and an anthelmintic drench administered. The amount of strongyle (FEC1, FEC2) and *Nematodirus* (NEM1, NEM2) eggs were measured for challenges one and two, respectively.

Multi-trait across flock animal model BLUP breeding values were estimated. Fixed effects included contemporary group (flock, sex, birth year, grazing group), age of dam, birth and rearing rank, and birth day. Age of dam and rearing rank effects were excluded for host resistance traits, which were log transformed before analysis and the EBV back-transformed and expressed as the percentage difference from the average flock EBV. All other traits were scaled using the contemporary group means before analysis. Genetic parameter estimates used in the BLUP were derived from a subset of the same data. EBV's were scaled to a base of the mean of the progeny born in the 1995 year. Hybrid vigour effects were ignored in the estimation procedure. The analysis included 151,478 recorded individuals, 135,383 of which were born between 1989 and 1997.

RESULTS

The mean EBV's for growth, wool and host resistance to internal parasites, and their range, for EF or pure Coopworth sires are presented in Tables 1 and 2, respectively. The summaries only include those sires with progeny recorded for the trait. The large reduction in EF progeny numbers between weaning weight and the later traits was primarily due to progeny of two extensively used sires being transferred to another flock. EF sires had significantly higher EBV's for WWT (1.94 kg; $P<0.001$)

and LWT8 (2.48 kg; P<0.001) than their pure Coopworth contemporaries. For both traits, there is significant overlap in the range between the EF and Coopworth sires. In contrast, FW12 EBV's for EF sires were significantly lower than for Coopworth sires (-0.44 kg; P<0.001). There were no significant differences (P>0.05) found between EF and Coopworth sires in the four host resistance traits, although there were only data available for 4 – 5 EF sires for the comparisons.

Table 1. Mean and range of estimated breeding values for East Friesian sires for growth, wool and host parasite resistance traits

Trait	*n* progeny	*n* sires	Mean EBV	Range
Growth				
WWT (kg)	3427	30	2.22	-1.03 – 5.25
LWT8 (kg)	1023	28	2.95	-1.82 – 6.89
Wool				
FW12 (kg)	692	26	-0.40	-1.36 – 0.14
Parasite				
FEC1 (%)	85	4	-16.3	-23.7 – -9.2
FEC2 (%)	116	5	-13.3	-51.2 – 7.5
NEM1 (%)	85	4	-11.7	-27.0 – -0.6
NEM2 (%)	116	5	-2.5	-11.3 – 8.4

Table 2. Mean and range of estimated breeding values for Coopworth sires for growth, wool and host parasite resistance traits

Trait	*n* progeny	*n* sires	Mean EBV	Range
Growth				
WWT (kg)	26,275	266	0.29	-2.62 – 3.82
LWT8 (kg)	18,375	270	0.47	-3.20 – 4.48
Wool				
FW12 (kg)	13,454	273	0.04	-0.63 – 0.81
Parasite				
FEC1 (%)	1,882	41	-5.6	-53.7 – 79.2
FEC2 (%)	3,779	100	3.4	-68.0 – 90.4
NEM1 (%)	1,882	41	-9.3	-42.1 – 50.5
NEM2 (%)	3,780	100	-1.0	-37.9 – 70.3

DISCUSSION

Heterosis effects could not be derived from the data, but its likely magnitude could be predicted by using averages of published estimates over a number of across breed studies (from Clarke 1982). The expected levels of heterosis used were 2.7, 4.3 and 6.2 % for WWT, LWT8 and FW12 (this is half of the mean of published estimates as the Coopworth is a Romney x Border Leicester interbreed and would be expected to maintain 50 % of the heterosis from that cross). The heterosis for WWT, LWT8 and FW12 as a proportion of the difference between EF and Coopworth EBV's were therefore estimated at 32, 56 and 40 %, respectively. Approximately one third of this additional heterosis would be expected to remain if the crossbred animals were subsequently intercrossed. The small number of EF sires measured for the parasite traits were sufficient only to provide an indication of the host resistance of EF cross progeny. Based on the results there is little difference between these two sire breeds in their resistance to internal parasites.

The significant overlap in EBV's between EF and Coopworth sires in all traits indicates that individual sires must be evaluated on their individual genetic merit rather than on the basis of breed alone. Any comparison between sire breeds must be tempered by the fact that pre-selection had occurred in both EF and Coopworth sires used in the sire referencing scheme. To put the value of the breed improvement into an economic context, WormFEC (McEwan *et al.* 1997) economic values for LW8 and FW12 are currently worth $0.88 and $4.66 in NZ dual purpose selection programmes seeking to improve carcass weights and hogget and ewe wool weights after correction for increased feed maintenance costs, number of trait expressions, and discounting for the time of expression. Thus, the mean estimated benefit of using an average EF ram across Coopworth ewes relative to an average Coopworth ram would be 2.48 x $0.88 - 0.44 x $4.66 or a total of $0.13/ewe/year. This is a modest sum relative to the between sire variability in this index. This figure obviously ignores any potential reproductive benefits accrued through better hogget lambing, increased number of lambs born, lamb survival or increased lactation ability, which have been noted as benefits of EF cross animals by both Meyer *et al* (1977) and Allison (1995). It will be another year before a comparison of reproductive information can be made.

The EF breed offers growth advantages to producers based on the results from this evaluation. However, traditional selection techniques need to be used in order to evaluate and identify those EF sires which will introduce improved genetics into existing pure-bred Coopworth flocks.

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