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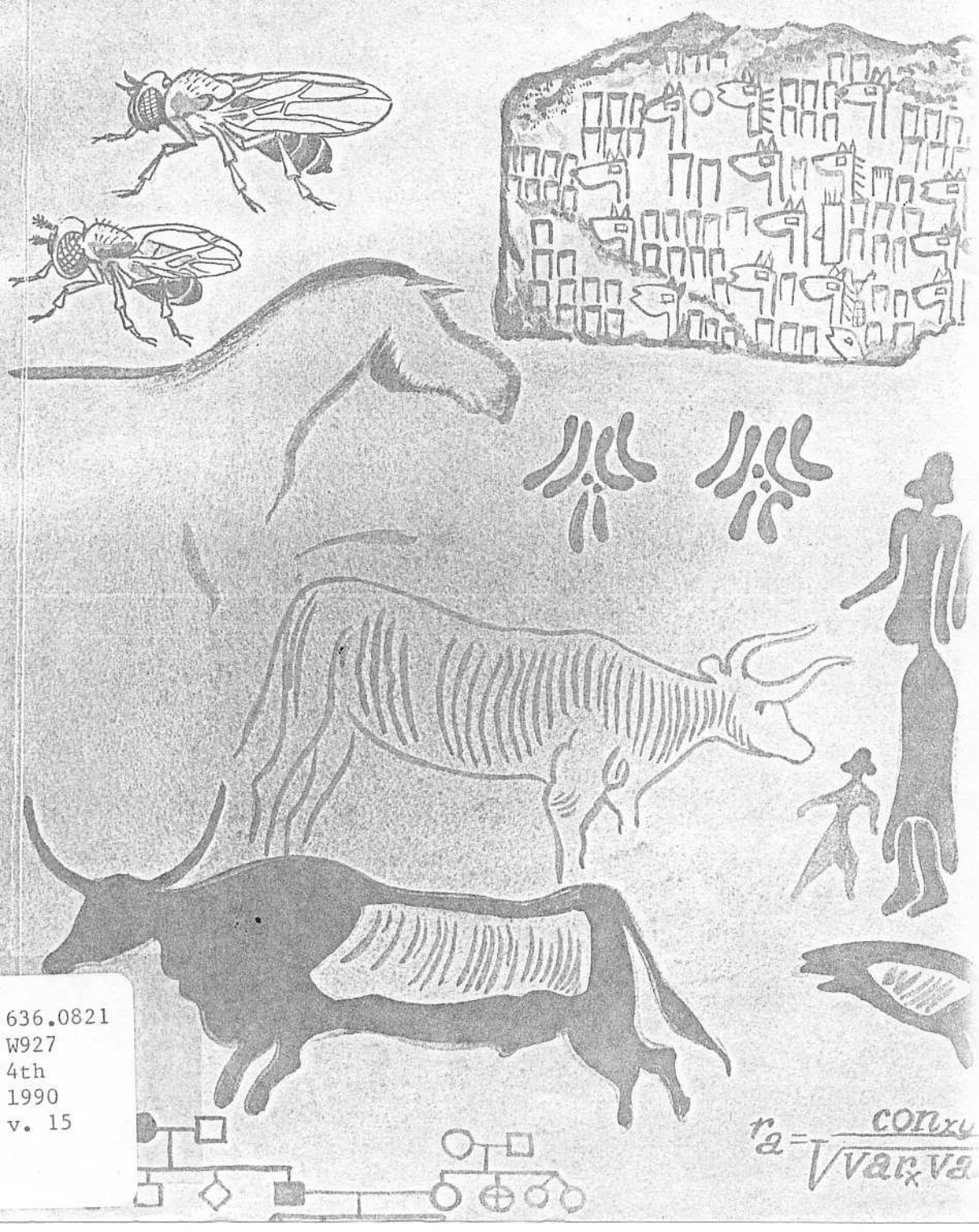

GROWTH, FERTILITY, PROLIFICACY AND FLEECE WEIGHT OF BOOROOLA, ROMANOV AND FINNSHEEP FIRST CROSS AND BACKCROSS WITH THE DLS BREED

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SUMMARY

Performance of 407 yearlings representing 7 genetic groups born in February - March and mated at 8-9 months of age was evaluated. Romanov (R) first cross (FC) and backcross (BC) ewe lambs were the heaviest at birth (3.9 and 4.1 kg) followed by Booroola (B) and Finnsheep (F) crosses, respectively. They were also the heaviest groups at 50, 100 and 365 days of age followed by F then B crosses. Fertility for R, FC (98%) and BC (94%) was significantly higher than that of F (88 and 78%) and B crosses (51 and 68%), respectively. Prolificacy was highest in R, FC. Booroola and F, FCs were similar in lamb production. The same tendency was observed in BC. Lamb survival ranged between 93 and 97% at birth and between 85 and 92% between birth and weaning. The heaviest litters at birth were those of R, FC (6.4 kg), for the other groups the weight varied between 5.2 and 5.8 kg. Litter weight at weaning ranged between 25 kg for R, FC and 19 kg for B crosses. In FC, Booroola yearlings produced 3.7 kg of wool compared to 3.2 kg for F and R. In backcross F and R clipped 3.1 kg, 0.3 kg lighter than B.

INTRODUCTION

The prominence of what is now labelled "prolific sheep" and the relative ease of procurement of such sheep, has changed drastically the methods for improving prolificacy in native sheep. Importation and crossing with prolific sheep is being practiced worldwide. There are two types of prolific sheep. Prolificacy is either a quantitative trait controlled by numerous genes and transmitted additively as in Finnsheep, Romanov, D'Man and Hu Yang or is controlled by what is believed to be one dominant gene with large effect on ovulation and is inherited according to simple Mendelian principles. Booroola, Cambridge and Javanese are breeds among this latter type of prolific sheep.

A crossbreeding program was initiated to improve prolificacy in DLS sheep, (a composite of Dorset, Leicester and Suffolk breeds selected for extended breeding season). Romanov, Finnsheep and Booroola sheep were crossed with the DLS. The objective of this paper is to report on yearling performance of crosses involving these breeds.

MATERIAL AND METHODS

The yearlings evaluated in this study were born in February and March 1987 and 1988 out of DLS ewes and DLS, Romanov (R), Finnsheep (F), Booroola (B) and first cross rams of R, F and B with DLS. Thus, seven genetic groups were represented; pure DLS, three first crosses (FC) and three backcrosses (BC) of R, F and B with DLS.

At birth, lambs were identified and weighed then nursed their dams until weaning at 50 days. From weaning to mating and during early pregnancy they were offered good quality grass silage supplemented with up to 250 g of a grain mixture. These amounts were later increased to 1 kg per ewe per day before lambing and while nursing. Management of the flock was consistent with current sheep raising technologies.

Weight of lambs was recorded periodically. In December, when the ewes were between 8 and 9 months of age, they were distributed equally into ten mating groups of similar size and exposed to rams for a 6 weeks mating period. The sires used were two each of DLS, R, F, B and Coopworth. The number of ewes exposed per genetic group per year was about 30.

The traits reported in this study are body weights at birth, 50, 100 and 365 days of age, preweaning average daily-gain, fertility (% ewes lambing or aborting of those exposed) total number of lambs born and weaned (prolificacy), survival rates, total weight of lambs born and weaned, and greasy fleece weight at about 14-15 months of age. The data were analyzed by GLM procedures (SAS, 1982). The basic statistical model included effects of year of birth, genetic group of the ewe and type of birth. Age of dam was included in the analysis of growth traits, breed of sire effect was included in analyzing for productivity traits and wool production was adjusted by covariance to a common body weight. Differences among genetic groups were tested using the PDIFF option.

RESULTS

Romanov and Booroola FC and BC lambs were significantly heavier at birth than those of Finnsheep (Table 1) while DLS ewe lambs (3.9 kg) were intermediate. The ranking observed at birth was the same up to 100 days of age. At one year of age Romanov FC ewes averaged 61 kg and were significantly the heaviest group followed by Romanov BC (56 kg). At the same age Romanov and Finnsheep crossbred ewes were significantly heavier than DLS ewes, which in turn were about 10% heavier than the Booroola crosses (Table 1).

Fertility in Romanov crosses averaged 96% and was about 13% higher than in Finnsheep crosses, which in turn were about 13% higher than in Booroola crosses (Table 2). Almost half of the Booroola FC ewes failed to conceive at 8-9 months of age compared to about 25% of the DLS and only 2.4% of the Romanov FC ewes. Prolificacy at birth was highest in Romanov crosses while the Finnsheep and Booroola crosses were comparable. All the crosses exceeded DLS in number of lambs born and weaned (Table 2). All crosses had better survival rate at birth than DLS, but the differences were small and non-significant. Survival from birth to weaning ranged between 85 and 92%, the differences being non-significant.

Litter weight at birth ranged between 5.2 and 5.5 kg for DLS and Booroola and Finnsheep crosses and between 19.4 and 21.3 kg 50 days later. Romanov FC ewes produced litters averaging 6.4 kg at birth and 25.1 kg at weaning while for Romanov BC the litters averaged 5.8 and 23.1 kg (Table 3). Greasy fleece weight was highest in Booroola crosses followed by DLS and then by Romanov and Finnsheep crosses (Table 3).

Table 1. Least square means and for body weight up to 365 days of age.

Genetic group	No of ewe lambs	Birth weight (kg) $\bar{X}$	S	50-day weight (kg) $\bar{X}$	S	Pre-weaning average daily gain (g) $\bar{X}$	S	100-day weight (kg) $\bar{X}$	S	365 day weight (kg) $\bar{X}$	S
DLS	64	3.90^{abc}	100	15.7^{c}	100	236^{c}	100	20.2^{c}	100	50.1^{c}	100
First crosses											
1/2 B	59	3.87^{bcd}	99	15.7^{c}	100	238^{c}	101	20.2^{bc}	100	43.9^{d}	88
1/2 F	71	3.69^{cd}	95	16.7^{ab}	106	260^{ab}	110	23.8^{a}	118	54.9^{b}	110
1/2 R	78	3.98^{ab}	102	16.7^{ab}	106	254^{ab}	108	24.1^{a}	119	61.0^{a}	122
Backcrosses											
1/4 B	70	4.06^{ab}	104	17.0^{ab}	108	258^{ab}	109	21.3^{bc}	105	49.6^{c}	92
1/4 F	67	3.76^{d}	96	16.2^{bc}	103	250^{bc}	106	21.6^{b}	107	51.3^{c}	102
1/4 R	62	4.12^{a}	106	17.4^{a}	111	266^{a}	113	23.6^{a}	117	56.4^{b}	113
Error M.S.		0.33		5.9		1984		14.6		39.8	

Table 2. Least square means for fertility, prolificacy and lamb survival.

Genetic group	No of ewes	Fertility (%) $\bar{X}$	S	No of lambs born total $\bar{X}$	S	No of lambs weaned $\bar{X}$	S	Survival at birth (%) $\bar{X}$	S	Survival to weaning (%) $\bar{X}$	S
DLS	61	74.5^{c}	100	1.36^{c}	100	1.06^{c}	100	88.9^{a}	100	90.8^{a}	100
First crosses											
1/2 B	54	50.7^{d}	68	1.85^{ab}	136	1.50^{ab}	142	96.5^{a}	108	91.1^{a}	100
1/2 F	65	88.2^{ab}	118	1.84^{b}	135	1.41^{ab}	133	92.9^{a}	104	85.1^{a}	94
1/2 R	64	97.6^{a}	131	2.07^{a}	152	1.71^{a}	161	93.5^{a}	105	92.4^{a}	102
Backcrosses											
1/4 B	70	67.9^{c}	91	1.49^{c}	110	1.12^{c}	106	94.1^{a}	106	88.0^{a}	97
1/4 F	63	78.1^{bc}	105	1.54^{c}	113	1.25^{bc}	118	92.7^{a}	104	92.5^{a}	102
1/4 R	58	93.7^{a}	126	1.79^{b}	132	1.53^{a}	144	96.9^{a}	109	91.5^{a}	101
Error M.S.		12.9		0.34		0.38		450		476	

Table 3. Least square means for litter and fleece weights.

Genetic group	No of ewes	Litter weight at birth, kg $\bar{X}$	S	Litter total weight at weaning, kg $\bar{X}$	S	Greasy fleece weight, kg $\bar{X}$	S
DLS	60	5.36^{b}	100	20.4^{bc}	100	3.30^{bc}	100
First crosses							
1/2 B	58	5.51^{b}	103	19.6^{c}	97	3.73^{a}	113
1/2 F	64	5.35^{b}	100	21.3^{bc}	105	3.23^{bc}	98
1/2 R	65	6.36^{a}	119	25.1^{a}	124	2.98^{d}	90
Backcrosses							
1/4 B	69	5.29^{b}	99	19.4^{c}	96	3.41^{b}	103
1/4 F	67	5.19^{b}	97	19.4^{c}	96	3.14^{cd}	95
1/4 R	59	5.76^{b}	107	23.1^{ab}	114	3.11^{cd}	94
Error M.S.		2.13		43.2		0.45	

In tables 1, 2 and 3:
a-d Means followed by different letters are significantly different ($P<0.05$).
S Superiority (> 100) or inferiority (< 100) of group means relative to DLS means.

DISCUSSION

Crossing DLS sheep with Romanov or Finnsheep had generally favourable effects on growth rate, fertility and prolificacy and unfavourable effect on wool production at first parity. Crossing with Booroola yielded favourable effects on prolificacy and wool production and unfavourable effects on preweaning growth rate and fertility at 8-9 months of age.

Romanov crosses excelled those of Booroola and Finnsheep in most of the productivity traits, with the performance of Booroola and Finnsheep crosses being very similar. Booroola crosses excelled in wool production but were markedly inferior in fertility at 8-9 months.

The productivity of backcrosses was inferior to that of first crosses. In Booroola backcrosses, half the animals were theoretically carriers of one copy of the fecundity gene while the other half were non-carriers. Similarly in Romanov and Finnsheep backcrosses, one fourth of the genes were contributed by the prolific breeds. The final results were similar in both types of inheritance and one cannot determine whether the reduction in performance of the backcrosses was due to gene segregation or loss of additive gene effect from the prolifics.

Despite the wide-spread use of prolific breeds, very little comparative studies of their performance as purebreds or crossbreds are reported. To the author's knowledge, none involved simultaneous comparisons of Booroola, Romanov and Finnsheep. The studies of Goot et al. (1979), Gabina and Valls Ortiz (1985), Vesely and Swierstra (1985) and Jakubec and Krizek (1988) comparing Romanov and Finnsheep crosses showed an advantage of Romanov crosses over Finnsheep crosses in traits associated to body weight and reproduction (prolificacy, fertility and lamb survival). Similar superiority of Romanov over Finnsheep was observed in crosses with DLS sheep in the present study.

No studies comparing Romanov and Booroola crosses have been published, while few studies have compared crosses of Booroola and Finnsheep such as those of Young and Dickerson (1988), Burditt et al. (1988) and Willingham et al. (1988). Booroola crosses were generally lighter in weight, and reached sexual maturity at an older age. On the other hand, they produced heavier fleeces than Finnsheep crosses. Prolificacy of Booroola and Finnsheep crosses was similar in all studies especially in later parities. Young and Dickerson (1988) showed a slight advantage for Finnsheep crosses at first parity. Their results generally agree with the present findings for Booroola and Finnsheep crosses.

It can be concluded that crossbreeding with either types of prolific breeds improved different aspects of performance of DLS sheep. Each, however, has revealed some disadvantages.

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