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Comparative wool production of Texel, Oxford Down, Finnish Landrace and Romney sheep

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ABSTRACT

Seasonal wool growth and objective fleece characteristics were measured for a group of Texel, Oxford Down (Oxford) and Romney ewes at Hopuhopu Quarantine and Research Station and a group of Finnish Landrace (Finn) and Romney ewes at Flock House Quarantine and Research Station. The ewes were born in 1987 and aspects of wool production measured from November 1988 to August 1990.

All breeds exhibited a seasonal pattern of wool growth with a late summer-early autumn maximum and late winter-early spring minimum. The seasonal amplitude of wool growth of the Oxford was less, the Texel similar and the Finn greater than the Romney.

Average annual clean fleece weight of the Romney (100) was heavier than the Texel, Oxford and Finn (60, 59, 44 respectively). Oxford and Texel wool was shorter (69, 59 respectively), more bulky (157, 162 respectively) and of a similar mean fibre diameter and brightness compared with Romney wool (100). Finn wool was shorter (70), slightly more bulky (115), finer (74) and similar brightness compared with Romney wool (100). Texel, Oxford and Finn wools all showed less yellow discolouration (92, 77, 70 respectively) than Romney wool (100).

Calculated net wool returns for the Texel, Oxford and Finn ewes were approximately \$7, \$7 and \$11 per ewe per year less than for the Romney.

Keywords Texel, Oxford Down, Finnish Landrace, Romney, wool growth, fleece characteristics, wool returns.

INTRODUCTION

In 1985 small groups of Texel, Oxford Down (Oxford) and Finnish Landrace (Finn) sheep were introduced into New Zealand by MAF Technology under strict quarantine conditions as fertilised embryos. The Oxford sheep were sourced from Denmark while the Texel and Finn sheep were sourced from both Denmark and Finland. Progeny derived from the imported embryos were released to sheep farmers in October 1990.

New Zealand's sheep industry is largely based on dual purpose breeds producing meat and wool. The Texel and Oxford were introduced to increase the production of a heavy weight lean carcass and the Finn to increase the fecundity of existing breeds.

To assess the likely impact of these breeds on New Zealand's wool clip, the comparative wool production of the exotic breeds was measured relative to that of our most numerous sheep breed, the Romney.

MATERIALS AND METHODS

All the purebred Texel, Oxford and Finn ewes born and reared at the Hopuhopu Quarantine and Research Station, near Hamilton, in the spring of 1987 were used in this study. The Romney control ewes were born at a similar time on a nearby research area and introduced into the quarantine area after comprehensive health testing procedures at 14 weeks of age. The number of sires and dams represented within each of the breed groups of ewes were 12, 21; 3, 5; 21, 36 and 12, 34 for the Texel, Oxford, Finn and Romney respectively. In May 1988 all the Finn lambs and a random half of the Romney lambs were transferred to Flock House Quarantine and Research Station, between Palmerston North and Wanganui. The Texel, Oxford and the other half of the Romney lambs remained at Hopuhopu. All the experimental sheep at each site were grazed together throughout. Management constraints precluded the

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TABLE 1 Breed estimates for fleece characteristics of Romney, Texel and Oxford ewes at Hopuhopu and Romney and Finn ewes at Flock House. Fleece weight and staple length data are adjusted for 12 months growth. Numbers in brackets are the standard error for comparison of the imported breeds with the Romney. Numbers in bold type are the means values expressed as a proportion of the Romney at the same site.

Location	Breed	Number of ewes	Pre-shear live weight (kg)	Greasy fleece weight (kg)	Clean fleece weight (kg)	Staple length (mm)	Fibre diameter (μm)	Staple strength (N/ktex)	Loose wool bulk (cm^3/g)	Brightness (CIE Y units)	Yellowness (CIE Y-Z units)
Hopuhopu	Romney	27	57 100	4.9 100	3.9 100	164 100	35.7 100	37 100	19.6 100	55.0 100	5.4 100
	Texel	30	53(2) 92	3.0(0.1) 61	2.3(0.1) 60	113(5) 69	35.6(0.5) 100	33(1) 90	30.8(0.7) 157	57.1(0.7) 104	4.9(0.3) 92
	Oxford	7	63(2) 109	3.2(0.2) 65	2.3(0.2) 59	97(8) 59	32.7(0.8) 92	37(3) 100	31.8(1.2) 162	56.5(0.6) 103	4.1(0.5) 77
Flock House	Romney	15	49 100	5.3 100	4.1 100	184 100	35.0 100	43 100	18.6 100	59.1 100	3.4 100
	Finn	79	45(2) 92	2.4(0.1) 46	1.8(0.1) 44	128(5) 70	25.9(0.5) 74	18(1) 43	21.4(0.8) 115	58.2(0.4) 98	2.4(0.2) 70

same experimental protocol being followed at each site.

A midside patch area was clipped on all ewes at 4 weekly intervals for 20 months from December 1988 at Hopuhopu and at 6 weekly intervals for 16 months from November 1988 at Flock House beginning when the ewes were approximately 16 months old. The patch samples were washed and weight of clean wool clipped determined.

The ewes at Hopuhopu were shorn in December 1988 as hoggets, in September 1989 when 2 years of age and in August 1990 when 3 years of age. At Flock House the ewes were shorn 4 times between 1 and 3 years of age in September 1988, July 1989, February 1990 and October 1990. Individual fasted live weight and greasy fleece weight were recorded at shearing. A midside fleece sample was taken at each shearing for the measurement of washing yield, mean fibre diameter (Lynch and Michie, 1976), staple strength (Heuer, 1979), loose wool bulk (Bigham *et al.*, 1984) and brightness and yellowness (Hammersley and Thompson, 1974). Clean fleece weight was calculated from the yield of the full length midside sample. Greasy fleece

weight, clean fleece weight and staple length were scaled to a uniform 12-month wool growth for each of the shearing times. Clean wool growth rate was estimated by partitioning actual clean fleece weight according to the relative weight of clean wool clipped from the midside patch.

The Texel and Oxford ewes at Hopuhopu, although not sustaining a pregnancy during the period of wool growth measurements, were superovulated by hormone therapy each spring and autumn and artificially inseminated with semen from rams of their own breed. The resulting embryos were removed surgically. During this time the Romney ewes were withheld from food and water for similar periods to the treated ewes. The Finn ewes at Flock House were naturally mated to rams of their own breed after oestrus synchronization.

RESULTS AND DISCUSSION

Seasonal Wool Growth

Data were analysed for a total of 158 sheep with

complete fleece information throughout the trial. The number of sheep of each breed at each site for which data were analysed are given in Table 1. The seasonal pattern of clean wool growth for the imported breeds at each site was similar to that of the Romney with a period of maximum growth during the summer and early autumn and a period of minimal growth during the late winter early spring period (Fig.1). Relative to the Romney the proportional wool growth rate of the Texel, Oxford and Finn, was 61, 50 and 55 respectively during the period of maximum wool growth and 62, 82 and 36 respectively during the period of minimum wool growth. These data indicate that the Oxford was less seasonal, the Texel similar and the Finn more seasonal in its pattern of wool growth than the Romney.

a peak wool production in January 1990. The decline in wool production during the ensuing March and April 1990 was the most marked for the Romney breed and occurred without a concomitant change in live weight, pasture on offer being an average of 1800 kg green DM/ha. It may have been associated with an outbreak of facial eczema although clinical manifestations later in the year and plasma gamma glutamyl transferase (GGT) levels (Towers and Stratton, 1978) measured on the ewes as 3-year-olds in July 1990, were lower for Romneys than for the other 2 breeds.

Mean minimum wool growth rate for the Romney at Flock House was higher than at Hopuhopu in 1989 due to the effect of feeding a high protein supplement.

Fleece Characteristics

Fleece characteristic data were analysed by analysis of variance within sites to test the effects of breed, shearing time and their interaction. Although the breed x shearing time effect was significant for some characteristics there was no change in breed ranking between shearing time for any fleece characteristics. Mean values for the fleece characteristics of each imported breed and their relative to the Romney at each site pooled over shearings are given in Table 1. Correlations between paternal half-sibs were not taken account of in the analysis due to lack of sire identification for the Romney therefore the standard errors given in Table 1 are likely to be underestimated.

Fleece weight of the imported breeds was lower than the Romney with values for the Finn being comparable to overseas reports (Baker, 1988). The higher grease content, and hence lower yield of the Oxford, relative to the Texel, changed their order of ranking for greasy and clean fleece weight. With crossbreeding to the Romney and Coopworth, fleece weight of the crossbred progeny has been intermediate between the parent breeds (Dobbie, 1990).

The comparative relationship of staple length of the Texel and Oxford with the Romney was similar to that for fleece weight whereas that for the Finn was greater highlighting a more pronounced staple tip for Finn wool relative to Romney wool.

Mean fibre diameter of the Romney, Texel and Oxford was similar and coarser than the Finn. Even though the Finn was finer the diameter effect would

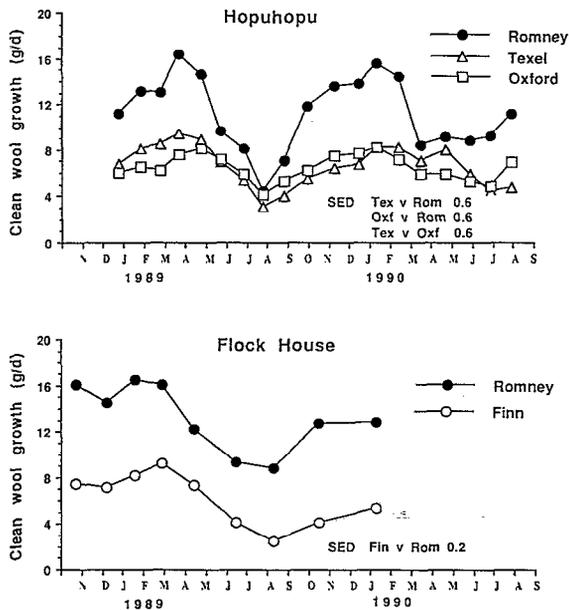


FIG 1 Seasonal wool growth profile of Romney, Texel and Oxford ewes at Hopuhopu and Romney and Finn ewes at Flock House.

A somewhat different seasonal pattern of variation in clean wool growth rate was observed in the 2 years at Hopuhopu. One-year-old ewes showed steadily increasing rates of wool growth from December 1988 to March 1989, but as 2-year-olds in 1990 showed

only be of processing significance for a limited range of end-uses. The trends in mean fibre diameter were not reflected in staple crimp frequency, traditionally an indication of fibre diameter. Mean values for crimp frequency were 1.0, 1.9, 2.0 and 1.6 crimps/cm for the Romney, Texel, Oxford and Finn respectively. Crimp frequency within each breed was weakly associated with mean fibre diameter ($r = -0.2$ to -0.5).

Finn wool was markedly weaker in tensile strength than the wools of the other breeds. Although the seasonality of the fibre diameter was not measured in this trial it would be expected to be similar to that of wool growth rate (Sumner and Wickham, 1969). This would explain the reduced staple strength of the Finn wool as tensile strength is directly related to fibre cross-sectional area. A reduction in staple strength of the magnitude observed in this trial for the Finn would be of considerable processing significance with increased fibre loss and a reduced yarn strength (Ross, 1983). Many of the Finn fleeces showed severe cotting which would require opening before processing. This would further decrease fibre length after carding, reducing yarn strength.

Both Romney and Finn wool had low loose wool bulk, while Texel and Oxford wool had a particularly high loose wool bulk desired by the wool trade for several end-uses (Sumner and Maddever, 1991). The Texel with its freedom from pigmented fibres, compared with the Oxford, is likely to have a place in increasing the loose wool bulk of New Zealand crossbred wool for a niche market.

Although Finn and Romney wools are generally considered to be semi-lustrous relative to Texel and Oxford wools, the Texel and Oxford wools in this trial were slightly brighter when measured by reflectance colourimeter. This small difference is only likely to be of significance if these wools were dyed to very light pastel shades.

Romney wool grown at Hopuhopu was more yellow than wool grown at Flock House due to the higher rainfall and associated humidity combined with different shearing times. Wool of the imported breeds was less yellow than the Romney with a ranking of Texel, Oxford and Finn. The increased whiteness of the Finn wool would be expected to be of commercial significance (Elliott, 1986).

The economic implications of the differences in

wool characteristics between the breeds in this trial shown in Table 1 were calculated. An average clean wool price of 500c/kg clean was assumed and combined with published estimates of relative economic values for crossbred wool at auction during the last 5 years (Maddever, 1991). While the wool of all 3 imported breeds could be expected to return more per kg than Romney wool on account of differences in the fibre diameter, bulk and yellowness, this may be offset by a shorter staple length and reduced staple strength. Overall however these beneficial effects were negated by a reduced fleece weight. Assuming similar harvesting and production costs for all breeds net wool returns for the Texel, Oxford and Finn were approximately \$7, \$7 and \$11 per ewe per year less than the Romney. If crossbred wool prices were to fall to 400c/kg clean the differential would fall to approximately \$5.50 for the Texel and Oxford and \$8.50 for the Finn.

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