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The effects of sheep breed on the defects pinhole and raised rib

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ABSTRACT

The effect of sheep breed and wool type on the incidence of the skin defects “pinhole” and “raised rib” was investigated. Six breeds/crosses were used – pure Romneys and SuffolkxRomney, DorsetxRomney, East FriesianxRomney, TexelxRomney and MerinoxRomney crosses. Skins were recovered at slaughter and processed to dyed crust leather, then scored numerically for the severity and extent of pinhole and graded into the “Run” (best quality), “Pinhole”, and “Thirds” grades. The presence or absence of raised rib on the skins was noted. Wool bulk and fibre diameter were measured. Skins from Romneys had the least pinhole and Merino crosses the most. Skins from Texel, Dorset and East Friesian crosses were also significantly more likely to be downgraded due to pinhole than those from Romneys. Within-breed differences in the level of pinhole were due to wool bulk differences, with a higher wool bulk correlated with more pinhole. Merino-cross skins were much more likely than the skins from pure-bred Romneys or the other crosses to have raised rib. Texel-Romney-cross skins were more likely than pure-bred Romney skins to have raised rib. There was no difference between the mean wool fibre diameter for ribby and non-ribby Romney skins, but the ribby skins had a significantly higher wool bulk.

Key words: sheep; breed; pinhole; rib; skin; leather.

INTRODUCTION

Two lamb pelt faults which at present are of particular concern to the New Zealand fellmongering and light leather industries are “pinhole” and “rib”. Pinhole consists of very small visible pits in the surface of the pelt resulting from breakdown of the walls of adjacent follicles (Figure 1), and raised rib consists of raised ridges running roughly perpendicular to the spine.

Both pinhole and rib are inherent faults – they are not affected by animal husbandry techniques, or by processing conditions. Both defects severely affect the usability and value of leather produced from the pelts. At the minimum, affected pelts are downgraded into the “Pinhole” and “Ribby” grades respectively. Severely pinholed pelts may go into the “Thirds” grade, and very heavy rib into the “Merino” grade.

Reported levels of pinhole and raised rib on pickled lamb pelts have been rising steadily (Figure 2). Over a five-year period, the reported level of rib has doubled and that of pinhole has increased by forty percent. These increases have occurred over a period when other farm-related faults such as whitespot and rash (caused by infection of the live animal with dermatophilosis) and cockle (caused by infestation with lice) have been decreasing in prevalence. The increasing level of these faults is of concern because of the reduced value of affected pelts. Pelts with pinhole are worth approximately two thirds what they would be otherwise and “Ribby” grade pelts are devalued by half, with severely ribbed “Merino” grade pelts worth about one tenth what they would be otherwise. It is also difficult to find markets for the affected pelts.

The increasing prevalence of pinhole and rib has been blamed on changing sheep breed profiles – in particular increases in the use of breeds recently introduced to New Zealand and the use of crossbreeding in order to produce finer or bulkier wool. A link between the occurrence of pinhole and high wool bulk has been found (Scobie et al., 1997). Accordingly it was decided to investigate the influence of sheep breed on the level of these two defects on lamb pelts. The investigation compared skins from pure-bred Romneys with crosses between Romneys and Suffolks, Dorsets, East Friesians, Texels, and Merinos.

Romneys were chosen as the base breed because they
are still by far the most numerous breed in New Zealand. In 1996 they made up 58% of the ewe flock and 50% of the ram flock (Statistics New Zealand Agriculture Production Surveys, 1996). They are often crossed with other breeds, so several Romney crosses were also investigated. Suffolks and Dorsets were chosen because they are the more common of the “traditional” sire breeds (Statistics New Zealand Agriculture Production Surveys, 1996). The East Friesian is one of the most popular of the so-called “exotic” breeds, and Texels are the most numerous of the “new” sire breeds. Merino-cross skins were included because there is some evidence that increasing numbers of this cross are being slaughtered. Merinos are known to produce poor-quality skins, with severe pinhole and rib, and it was suspected that cross-breeds would inherit some of these characteristics.

The objectives of this research were to compare the incidence and degree of pinhole and raised rib on the skins of the lambs of different breeds and crosses; and to determine whether there was a correlation between wool fibre diameter and bulk and the prevalence of pinhole and rib on these skins.

### MATERIALS AND METHODS

#### Skin source and processing

Skins were from lambs slaughtered at a commercially relevant age and weight at two commercial slaughter plants, one in the North Island and one in the South Island. For all except Dorset crosses, skins were sourced from more than one farm. This was done in order to prevent possible biases due to sire effects. Skins used in the study were from 200 pure-bred Romneys from six farms, 49 Dorset-Romney crosses from a single farm, 102 East Friesian-Romney crosses from three farms, 67 Merino-Romney crosses from two farms, 100 Suffolk-Romney crosses from three farms, and 123 Texel-Romney crosses from four farms. The breed of the lambs was verified by the slaughter plant stock buyers.

Prior to processing, skins were preserved by salting and were individually numbered. Before processing, a mid-side wool sample was taken from each skin. The skins were then processed to dyed crust leather using a standard process for lamb skins.

#### Skin and wool assessments

Measurements of wool fibre diameter and bulk were made using International Wool Textile Organisation (IWTO) standard methods. Mean Fibre Diameter (MFD) was measured using an Optical Fibre Diameter Analyser and wool bulk using a WRONZ Loose Wool Bulkometer. Wool measurements for one line of Merino-cross skins could not be made because the animals were newly shorn at slaughter.

Pinhole was quantified using a method developed and routinely used at LASRA for this purpose. Each crust leather skin was divided into 10 regions and each region scored for pinhole on a scale of “0” (no pinholes in the region) to “6” (many pinholes in the region). The ten individual scores were then added to give the total score for the skin.

In addition, the crust leather skins were graded on the basis of the amount of pinhole present into the “Run” (best quality), “Pinhole” (reduced in value due to pinhole) or “Thirds” (severely reduced in value due to pinhole) grades. To do this, the relationship between crust leather pinhole score and pelt grading for pinhole was established by commercially grading 90 skins for pinhole at the pickled pelt stage, then converting these skins to crust leather and scoring them for pinhole as described above. Using this relationship, crust leather skins were graded as “Run” if all regions scored “3” or less. If one or more of the ten regions was scored at “4”, but none at “5” or “6”, the skin was put in the “Pinhole” grade. A score of “5” or “6” in one or more regions placed the skin in the “Thirds” grade.

Rib was assessed on the dyed crust leathers. Each skin was scored as having “no raised rib”, or “raised rib”.

#### Statistical analysis

Figures were compared using the unpaired two-sample Student’s t-test or the Chi-squared test as appropriate. Both tests were applied at the 5% level of significance.

Correlation coefficients were considered significant at the 5% level.

### RESULTS

Table 1 shows that skins from pure-bred Romneys had the least pinhole and Merino-crosses the most. Skins from Texel-crosses, Dorset-crosses and East Friesian-crosses were also significantly more likely to be downgraded due to pinhole than those from pure-bred Romneys.
of Romneys used had the least pinhole in the study, two had pinhole of moderate severity, and one had pinhole of a severity just less than that of the Merino-crosses. These within-breed differences were found to be due to wool bulk. The correlation between average wool bulk and the average skin pinhole score for the 18 lines of skins for which wool measurements were available is shown in Figure 3. The higher the wool bulk, the higher the skin pinhole score. The correlation between average wool bulk and average skin pinhole score for the 18 lines of skins was $\rho = 0.5$ (P<0.05).

Merino-cross skins were very much more likely than the skins from either pure-bred Romneys or any of the other crosses to have raised rib (Table 2). Although the incidence was much lower than for the Merino-cross skins, the Texel-Romney cross skins also had significantly more raised rib than the pure-bred Romney skins.

The relationship between wool fibre diameter and bulk measurements and raised rib for the non Merino-cross skins is shown in Table 3. Because of their very high incidence of raised rib, Merino-cross skins were excluded.

TABLE 2: The incidence of raised rib on lamb skins from different breeds/crosses. Breeds or crosses with a letter in common were not significantly different at the 5% level (Chi-squared test).

<table>
<thead>
<tr>
<th>Breed/Cross</th>
<th>Skins without raised rib (%)</th>
<th>Skins with raised rib (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Romney</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Dorset-cross</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>East Friesian-cross</td>
<td>99</td>
<td>1</td>
</tr>
<tr>
<td>Suffolk-cross</td>
<td>99</td>
<td>1</td>
</tr>
<tr>
<td>Texel-cross</td>
<td>97</td>
<td>3</td>
</tr>
<tr>
<td>Merino-cross</td>
<td>31</td>
<td>69</td>
</tr>
</tbody>
</table>

There was no difference between the mean wool fibre diameter for the ribby and non-ribby skins, but the ribby skins had a significantly higher wool bulk (P<0.05).

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Statistics New Zealand Agriculture Production Surveys, 1996

**DISCUSSION**

With regard to the incidence of the pinhole defect, there were differences both between breeds/crosses and within breeds and crosses. Overall, skins from pure-bred Romneys were least likely to be downgraded because of this defect and skins from Merino-Romney cross lambs the most likely, with the other breed crosses falling between. Both between-breed and within-breed differences appeared to be related to wool bulk, with higher bulk being linked to higher pinhole levels. This was consistent with the findings of previous research (Scobie *et al*., 1997). Within-breed variations have also been reported by other researchers (Campbell *et al*., 1997).

The incidence of raised rib also varied between breeds/crosses, with the Merino-Romney cross skins very much more likely to have this defect than skins from the other breeds/crosses in the trial. Although affected to a much lower degree, Texel-Romney cross skins also had more raised rib than purebred Romney skins. For the non-Merino cross skins, raised rib was also associated with higher wool bulk.