THE RELATIONSHIP BETWEEN FELT BALL DIAMETER, CURVATURE AND WOOL TOP PROPERTIES

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Recent research has shown a relationship between wool felting and Hauteur (Barton and Purvis 2002; Schlink *et al*. 2002) in both fine and medium wool Merino sheep. This paper investigates the potential of including felt ball diameter (FBD) and curvature as component variables in multiple regression models to predict Hauteur.

Fifty four tops were selected for this experiment, and their synthesis was described by Oldham and Peterson (2000). Raw wool felting was determined on tops using the modified Aachen felt ball test (Schlink *et al*. 2002). The tops selected ranged in: yield from 63.0 to 72.0%; fibre diameter (FD) from 21.4 to 21.7 µm; coefficient of variation of FD in tops (CVFD) from 19.2 to 23.7%; staple length (SL) from 83 to 98 mm; staple strength (SS) from 33 to 43 N/ktex; percent mid breaks (PMB) from 24 to 85%; vegetable matter content (VM) from 0.4 to 1.5%; curvature (Curve) from 67 to 83 degrees/mm; FBD in the tops from 23.9 to 26.2 mm; Hauteur from 68.0 to 85.0 mm; coefficient of variation of Hauteur (CVH) from 30.2 to 53.6%; and Romaine from 4.8 to 6.5%. Stepwise regression was used to develop multiple regression models to explain specified parameters. Parameters were retained in the multiple regression models if significant at $P<0.05$.

Felt ball diameter was significantly correlated with Hauteur, CVH and Romaine (r=0.55, -0.59 and 0.30, respectively). TEAM predictions accounted for 36.7% of the variation in Hauteur, 73.5% of the variation in CVH and 18.1% of the variation in Romaine. Multiple regression models developed using only the TEAM parameters predicted 76.9%, 75.4% and 24.6% of the variation in Hauteur, CVH and Romaine, respectively. When the additional parameters for FBD and Curve were introduced in the models, the variance explained was increased to 81.8% for Hauteur, 89.1% for CVH and 35.0 for Romaine. The multiple regression models developed were:

Hauteur = -43.1 + 7.56*VM – 0.172*PMB + 0.606*SL + 0.513*SS + 1.94*FBD ($P<0.001$)
CVH = 134 + 0.229*PMB – 9.21*VM – 0.581*SS – 2.27*FBD – 0.792*CVFD ($P<0.01$)
Romaine = 34.6 – 0.0821*Yield + 0.024*Curve – 0.0403*SS – 1.10*FD ($P<0.001$)

Felt ball diameter was significantly correlated with Hauteur, CVH and Romaine, being more highly correlated than previously reported for fine wool Merino tops (Barton and Purvis 2002). However, this may be due to the felt ball test not being standardised between the 2 studies. Whilst the use of FBD improved the prediction of Hauteur and CVH, FBD was not a significant ($P>0.05$) component for the prediction of Romaine. It is important to note that the tops used were from a narrow range of FD, and that time of shearing has a major impact on the performance of TEAM predictions. In view of this restricted range in FD, the role of FBD in the prediction of Hauteur needs to be evaluated over a wide range of tops using an agreed, high throughput method to determine FBD. Most importantly, since FBD is a heritable trait in Merino sheep (Schlink *et al*. 2002), this information shows that breeding for reduced wool felting is likely to lead to improved Hauteur and reductions in CVH. Longer fibre lengths in the top are associated with improved efficiency of spinning.

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