DOES SELECTION FOR AN INCREASED CLEAN FLEECE WEIGHT AFFECT THE COEFFICIENT OF VARIATION OF FIBRE DIAMETER?

S.W.P. Cloete\textsuperscript{1}, J.C. Greeff\textsuperscript{2} and E. Du Toit\textsuperscript{3}

\textsuperscript{1}Elsenburg Agricultural Development Institute, Private Bag X1, Elsenburg 7607, South Africa
\textsuperscript{2}GSARI, Nyabing Road, Katanning, WA 6317
\textsuperscript{3}Tygerhoek Experimental farm, P.O. Box 25, Riviersonderend 7250, South Africa

SUMMARY
Selection for an increase in clean fleece weight while maintaining a constant fibre diameter in an experimental Merino flock has led to an increase in coefficient of variation of fibre diameter relative to the control flock. The 1994 born progeny also showed significantly ($p<0.05$) more variation in the subjectively assessed size of the crimps in and across the fleece than the control line. The results suggest that coefficient of variation of fibre diameter should be considered in a multitrait selection index to prevent the deterioration in coefficient of variation of fibre diameter and possibly staple strength.

Keywords: Merino sheep, selection, coefficient of variation of fibre diameter, wool traits.

INTRODUCTION
Greeff (unpublished) has shown theoretically that selection to increase clean fleece weight (CFW) while simultaneously reducing fibre diameter (FD) using a multiple trait selection index, may result in a decrease in staple strength (SS) over time. There are no SS data available for a long term selection experiment to confirm or deny this prediction. However, because of the strong negative phenotypic and genetic correlation between SS and coefficient of variation of fibre diameter (CVFD) (Howe \textit{et al.} 1991), this relationship may be used to indicate whether selection for wool production with a constant or reduced FD may have changed CVFD and thus possibly SS.

MATERIAL AND METHODS
We studied CVFD in the 1994 and 1995 born progeny of a South African Merino line selected for CFW with a check on FD since 1969 and an unselected control flock (Cloete \textit{et al.} 1992). Recordings included CFW, FD and CVFD. Variation in the size of the crimps across the fleece and within the staple was subjectively assessed by 2 experienced classers on a 50 point scale. In theory, a score of one was allocated for excessive variation in the visually assessed size of the crimp (e.g. from the shoulder to the britch or between summer and winter growth in the staple). If no variation could be detected, a score of 50 was given. Data were subjected to least squares analysis of variance (Harvey, 1990) with a fixed model that included the effects of line, year of birth, sex, age of dam, birth type and the respective interactions.
RESULTS AND DISCUSSION
The selection line had a 21% higher (P < 0.001) mean (± SE) CFW than the control line (4.57 ± 0.05 kg vs 3.78 ± 0.05 kg), the interaction between line and year of birth being non significant (P > 0.05). No difference was found for FD (20.9 ± 0.1 μm vs 21.1 ± 0.1 μm). However, the selection line generally had a higher (P < 0.01) CVFD than the control line, but the effect varied across years (P for interaction = 0.005; Table 1). CVFD of the selection line were respectively 13% and 5% higher than the control line for the 1994 and 1995 born progeny. A significant (P < 0.05) line difference was found for variation in the size of the crimps in 1994, but not in 1995.

CONCLUSIONS
Selection for CFW with a check on FD resulted in an increase in CVFD in this experiment for the birth years studied. The strong genetic and phenotypic relationship between CVFD and SS (Greeff et al. 1995) suggests that this may result in a correlated decrease in SS and that the inclusion of CVFD in a multitrait selection index may well prevent SS from deteriorating.

Table 1. CVFD and subjectively assessed size of the crimps for selection and control line progeny groups

<table>
<thead>
<tr>
<th>Birth year</th>
<th>Line</th>
<th>CVFD (%)</th>
<th>Significance</th>
<th>Size of crimps</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>Selection</td>
<td>19.1 ± 0.3</td>
<td>**</td>
<td>32.7 ± 0.8</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>17.5 ± 0.2</td>
<td></td>
<td>35.1 ± 0.7</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>Selection</td>
<td>19.8 ± 0.3</td>
<td></td>
<td>35.9 ± 0.7</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>18.9 ± 0.2</td>
<td></td>
<td>35.6 ± 0.7</td>
<td></td>
</tr>
</tbody>
</table>

*, ** represents significance at P < 0.05 and P < 0.01, respectively. ns. represents non significance (P > 0.05).

The specific mechanism involved and the cause of the variable response between years remain unclear. Rainfall figures suggested that the food supply during the growth period of fleeces of the 1994 progeny may have been more variable than for the 1995 progeny group. Further research is required to elucidate these findings, to relate it to SS and also to assess its implications for ewe lifetime performance.

REFERENCES