RELATIONSHIP BETWEEN STAPLE STRENGTH AND COEFFICIENT OF VARIATION OF FIBRE DIAMETER WITHIN AND BETWEEN FLOCKS

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SUMMARY
The phenotypic correlation between CVFD and SS over 26 different flocks shorn in spring has been found to be generally negative and ranges from –0.65 to –0.24 with an average of about –0.47. The mean CVFD of a flock is not a reliable indicator of the mean SS of a flock. More work needs to be done to clarify this relationship in autumn shorn flocks.
Keywords: Staple strength, coefficient of variation of fibre diameter, correlation

INTRODUCTION
Low staple strength (SS) is a problem in winter rainfall environments with long dry summers and cold wet winters. It is also a heritable trait and phenotypically and genetically negatively correlated to coefficient of variation of fibre diameter (CVFD) (Greeff et al. 1995). The phenotypic relationship of about 0.4 between staple strength (SS) and coefficient of variation of fibre diameter (CVFD) estimated on about 12 months wool in different studies (Greeff et al. 1995) has recently been questioned. Individual estimates of close to zero have reportedly been found by the Australian Merino Society (Collins, pers. comm.). This has led to concern by growers about the variability in the phenotypic relationship, and in turn to concerns as to whether the genetic relationship held in their flock. This paper investigates the variability of this phenotypic relationship within and between different research, commercial and stud flocks in Western Australia.

MATERIALS AND METHODS
The data used in this study were collected during the screening of approximately 12,000 spring shorn sheep in 26 different flocks. This particular study aimed to identify animals that produced genetically sound or tender wool to establish the Staple Strength Resource Flocks at Katanning and was discussed by Greeff et al (1997). Prominent Merino research, commercial and stud flocks participated in this project. This makes this database very representative of the Merino industry in Western Australia. SS and CVFD were measured on each animal. The average flock size was 442 and ranged from 106 to 1,107 animals per flock. It was not possible to separate sex and flock effects as rams and ewes are normally kept separate, which resulted in sex and flock being confounded.

RESULTS AND DISCUSSION
The relationship between CVFD and SS in two representative flocks (Flock A, n = 520; Flock B, n = 578) is given in Figure 1. It is clear that the relationship can be quite different but it indicates that the negative phenotypic relationship between CVFD and SS exits in both flocks. Animals with low CVFD tend to have a higher SS. This relationship appears to be somewhat curvilinear in flock A

because after 30N/ktex it would seem that the slope has flattened and that no relationship exists between CVFD and SS. This curvilinear relationship was not found in any of the other flocks.
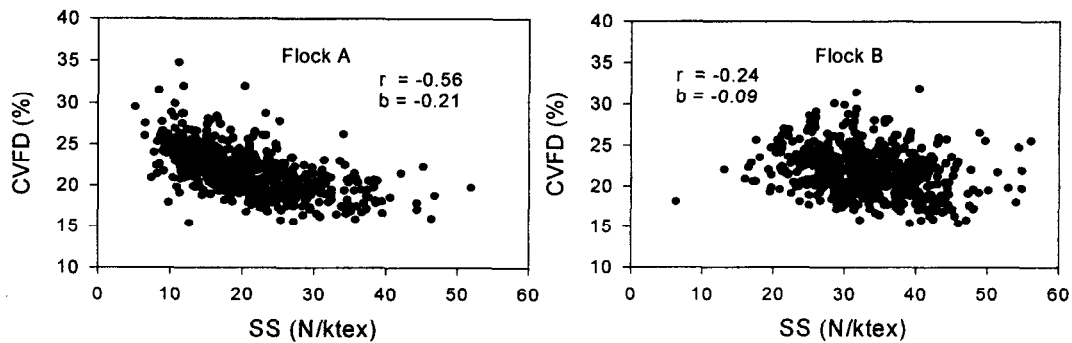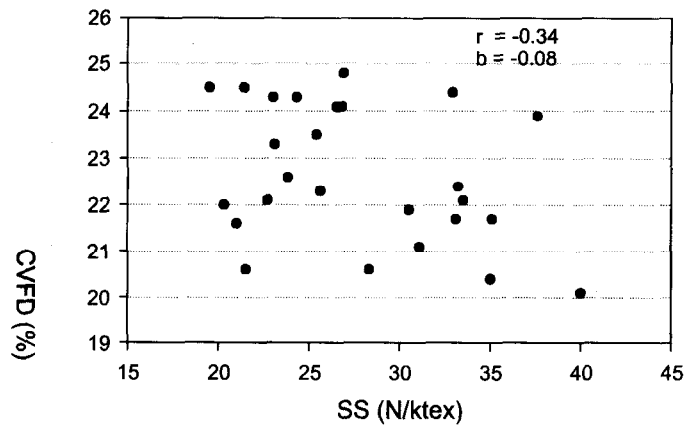

Figure 1. Relationship between CVFD and SS in two different flocks.

This raised the question as to whether the relationship between CVFD and SS changes over a range of mean SS measurements. In Figure 2, the correlation found in the 26 flocks is plotted against the mean SS of each flock. It is clear that the relationship does not change over flocks with different SS means.
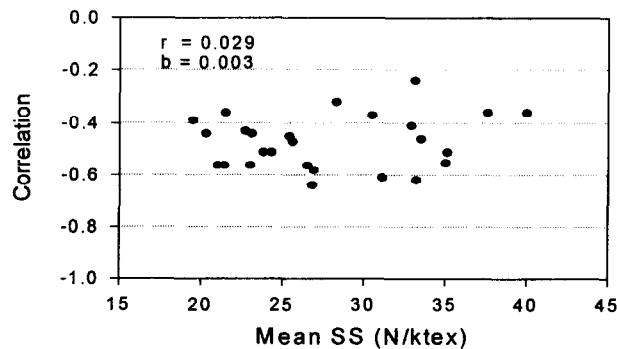
Figure 2. Distribution of the correlation estimates between CVFD and SS over a range of SS means.

The consistent negative relationship between CVFD and SS (genetic and phenotypic) has lead some ram buyers to assume that flocks with low CVFD will also have sheep with sound wool. Figure 3 indicates the relationship between mean CVFD and mean SS across these flocks.

Figure 3. Relationship between the mean CVFD and mean SS of different flocks in Western Australia.

Figure 3 indicates that a negative relationship exists between CVFD and SS across flocks. The negative trend is, however, only slight in that for every 1 N/ktex increase in SS, CVFD decreases by 0.08 percentage units. The correlation between the mean CVFD and mean SS across flocks is only -0.33. This is at the lower end of the relationship and implies that it would be unreliable to use the mean CVFD to get an indication of the SS of a particular flock because CVFD only explains about 11 % of the total variation in SS.

CONCLUSIONS

This study indicates that the phenotypic correlation between CVFD and SS over 26 different flocks is generally negative and varies from –0.65 to –0.24 with an average of about –0.47 in spring shorn sheep in Western Australia.

Time of shearing may also affect SS and hence the correlation as it is generally assumed that SS of autumn shorn wool (shorn when the average fibre diameter is at its lowest point along the staple) should be higher than SS of spring shorn wool. Hansford (1997) published results on the relationship between CVFD and SS in spring and autumn shorn wools from 7 different properties in Western Australia. The correlation varies from –0.58 up to –0.18 on six properties, whereas one property had a positive correlation of 0.12. The average correlation across properties was –0.46, which agrees very well with the correlation of –0.47 obtained in this study. The positive value of 0.12 should be interpreted with care as no explanation was given for this outlier. Neither could any pattern be detected with time of shearing. Greeff (unpublished) on a small dataset, found that the phenotypic correlation between SS and CVFD in spring shorn wool was –0.42 and –0.38 in autumn shorn wool. These results indicate that the phenotypic relationship between CVFD and SS appears to be

consistently negative with an average correlation close to -0.40, irrespective of when the animals were shorn.

However, this does not imply that lower values can not be found. As the average SS of these flocks in this study ranges from 19 to 40 N/ktex, estimates closer to zero may be found especially in cases where the average SS is very low or where the average SS is higher than 40N/ktex. More research is necessary to elucidate this relationship in very sound and very tender wools.

ACKNOWLEDGEMENTS

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