

Wool Testing Services Info-bulletin

Wool Colour (C/2°)

What is wool colour?

Traditionally, the colour of wool has been expressed in terms of tristimulus values X, Y and Z. The numbers can be thought of in terms of the brightness of the red, green and blue components. In practice we talk of Y as representing **brightness**, and the difference between Y and Z (Y-Z) as **yellowness**.

In New Zealand we expect Y values in on average to vary between the 40's or low 50's for oddments, to the high 60's for merinos. Similarly Y-Z can be expected to vary from -2 for very white merinos to as high as 10 or more for oddments. **Values quoted are in C/2° space**, which is still used in NZ. (see below)

Average colour will vary over the season and from location to location. It will vary from season to season, depending on the weather. Breed, physical environment, shearing times and on-farm practices all play a part.

How is it measured?

Colour results are certified against IWTO-56. This gives "clean" or "**base**" colour. It is the **best** value that can be obtained, and therefore gives a good indication of the lightest shade that the fibres can be dyed to. Lighter wools can be used in a greater range of end-uses.

Wool samples are scoured in a highly-controlled process. After gentle drying, they are then Shirleyed to remove vegetable matter and to blend the fibres, and then conditioned in a controlled environment. Specimens are packed into special cells at a fixed pressure and then measured on computerised colour instruments. Sufficient measurements are taken on 2 instruments to ensure that the results are significantly better than the published precision, which is of the order of ± 1 unit for Y-Z.

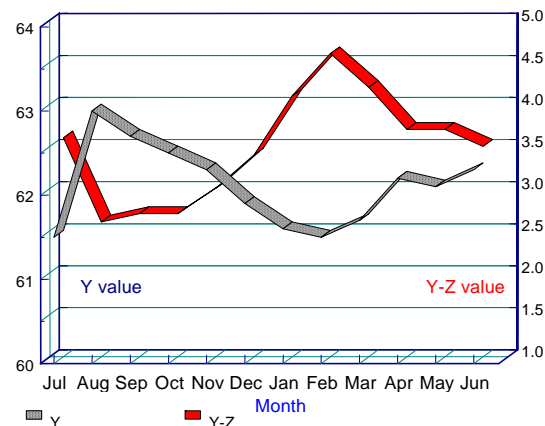
The original measurement system used a reference wool calibration mechanism invented by WRONZ some years ago. In 2001 laboratories moved to a new tile calibration system based on the CIE D65/10° colour space, resulting in different values to the C/2° space, especially for Y-Z (see Info-bulletin 2.3).

'As-is' colour

The same base colour measurement process is used on greasy and scoured wool, so there should be good correspondence between results obtained before and after scouring. However, this can cause perception difficulties. Depending on the type of wool, time of year, scouring efficiency, scouring additives, etc. the scoured wool may appear to have a different visual appearance to the base colour.

It is therefore useful to have a measurement of the '**as-is**' or commercially-scoured colour, since this should correlate reasonably well with visual perception and also with the colour results which are obtained on-line by the scour's QC system. In the as-is measurement process, the cleaning and scouring step is omitted from the laboratory procedure.

However, the sampling and measurement procedure for the 'as-is' colour test are not, in our view, as well standardised, and therefore whilst the results should be consistent within a



Seasonal variation in XB FLEECE colour

laboratory, there may be differences between laboratories. 'As-is' results are therefore only reported as additional information in NZ, if and when requested.

Usually, 'as-is' colour will be lower in terms of X, Y and Z values than the certified colour. The difference in Y could be as much as 10 units. The Y-Z results should, however, on average be similar, although this depends on the type of wool and the specifics of the scouring process used.

Combining results

Colour scales are **not** linear in the same way as with other measurements. In order to estimate the colour of a consignment, measurements on individual lots cannot be combined by either averaging or weighted averaging. The test method specifies a complex set of formulae that must be used if the colour of a consignment is to be estimated accurately. This is now incorporated in the computer programs used by most NZ exporters, although still occasionally causes errors.

The stability of colour

Colour measurements on New Zealand **scoured** wools stored under normal conditions are very stable, and whilst individual bales may show changes of up to half a unit in Y-Z, in general there should be no significant deterioration over 3 years. Certificates on scoured wools are valid for 2 years on merinos and 12 months on crossbred wools.

However, **greasy** wools behave differently. Crossbred wools may show Y-Z deterioration of up to 5 units over a 3 year period, although according to WRONZ, the average in one trial was only 1.5 units over this period. Halfbred wools showed similar trends but less deterioration. In this trial, whilst indicating deterioration in Y values, merino wools showed only small changes in Y-Z (of about 0.3 units over 3 years). Currently test certificates on NZ greasy crossbred wool are only valid for 6 months, whereas merino certificates are valid for 2 years.

The propensity for greasy wools to yellow over time continues to be an issue in some years. An incubation test has been developed at Lincoln University, and a standardised test may be developed in due course. See Info-bulletin 2.2.