



COLOUR MEASUREMENT

Introduction

Colour or average “Yellowness” is an important characteristic of wool because it is related to dyeing performance and it is not necessarily related to the colour of Greasy Wool. A number of independent research studies have shown that the colour of greasy wool is an extremely poor indicator of the clean colour of the same wool when it is scoured. This is perfectly understandable given that the greasy colour is strongly affected by wool grease and dust, both of which can generally be removed by scouring.

The benefit of testing the average clean colour of greasy wool presale is that it provides predictability of the processing potential of the wool and reduces the likelihood of discounts been applied incorrectly to wool that appears to have un-scourable colour but when measured objectively it is found that the colour scours out. In New Zealand all auction wool, including merino, is presale tested for clean colour measurement.

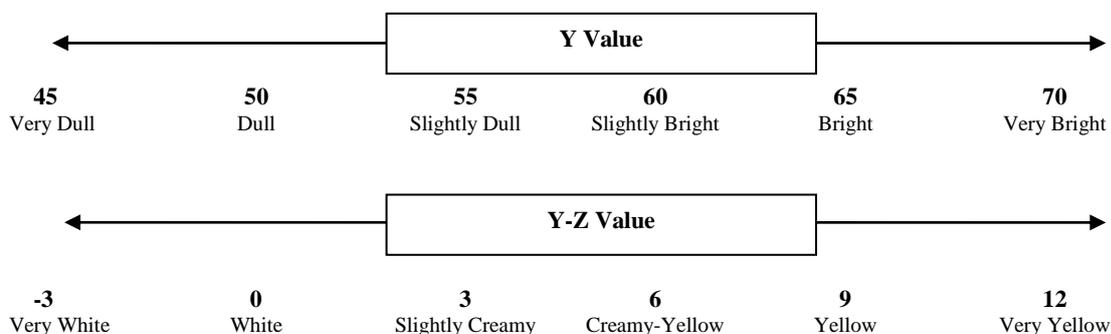
The ability to dye wool is very much related to the colour. The colour of the dyed product will be determined by the colour of the clean wool and that of the added dye. Top makers are now increasingly measuring the colour of their tops and providing this information to their customers (including dyers).

Measurement

The measurement of colour involves separating the light reflected from a clean wool sample into the three additive primary colours of red, green and blue. For wool measurement, these colours are represented by the Tristimulus values of X, Y and Z. Two key parameters are used for specifying wool colour:

- Y – representing of luminance or **brightness** of the wool; and
- Y-Z – representing the **yellowness*** of the wool.

The typical values for Y and Y-Z as they apply to New Zealand wool are shown in the scales below:





It should be noted however that there is a general negative correlation between Y and Y-Z for wool colour measurement. White wool (those showing a low Y-Z value) tends to be associated higher brightness (high Y value), and while yellow wool (high Y-Z) often is characterised by lower brightness (low Y). Typical values across a wide range of New Zealand wool are shown in the following graph.

* Mixing blue and yellow makes the colour green, so, subtracting the blue (Z) from the green (Y) gives a measure of yellowness

Process

NZWTA physical test process follows the IWTO56 methodology as below.

Wool is scoured, dried and Shirleyed (to remove vegetable matter) and homogenise the wool. Sub-samples are then conditioned (at controlled temperature and humidity) and placed in a special holder with one face exposed to a light source. After the colour readings have been taken the specimen is turned over for a further set of readings. This process is repeated on another spectrophotometer all readings are averaged to give the certified result.

Interpretation of Results

A Certificate will show all three tristimulus values. In practice the X and Y values are very similar in colour measurement and for practical purposes the X value can be ignored.

From a value point of view, two aspects of colour measurement are important. One is lightness (brightness) and the other is yellowness. In this context, Y is regarded as the level of brightness and Y-Z is an indicator of yellowness. If Y is numerically high the wool will be bright but if it is low they wool will appear dingy. Generally, if the value of Y-Z is numerically low the wool will be white, but if Y-Z is numerically high the wool will be yellow. Good colour wools are lighter (higher value of y) and less yellow (lower value for Y=Z). Two lots of wool may appear visibly different, but if their measured colour values are identical they will be indistinguishable in colour after processing.

Colour in New Zealand wool breeds

New Zealand wool is traditionally free from black and pigmented fibre and is recognised as having inherently good colour (white and bright). Colour is influenced by a number of factors, including breed, the section of body in which the wool was shorn (body wool, bellies/pieces, crutchings etc) and the environmental conditions in which it was grown. Fine wool breeds will generally be whiter and brighter than their crossbred counterparts and will have an inherent ability to withstand colour degradation.

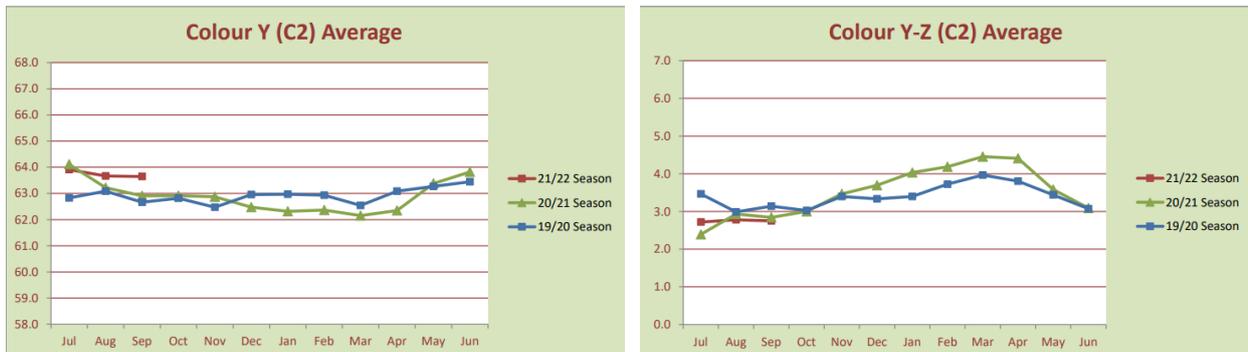
Note: Almost all Merino wool is very white, it is rarely tested commercially.

BREED	Y (Brightness)			Y-Z (Yellowness)		
	Good	Average	Poor	Good	Average	Poor
Merino	>67.5	67.5 – 65.0	<65.0	<1.5	1.5 - 2.5	>2.0
Halfbred/ Corriedale	>65.0	65.0 - 62.0	<62.0	<2.5	2.5 – 3.0	>3.0
Crossbred	>61.0	61.0 - 57.5	<57.5	<4.5		>6.5

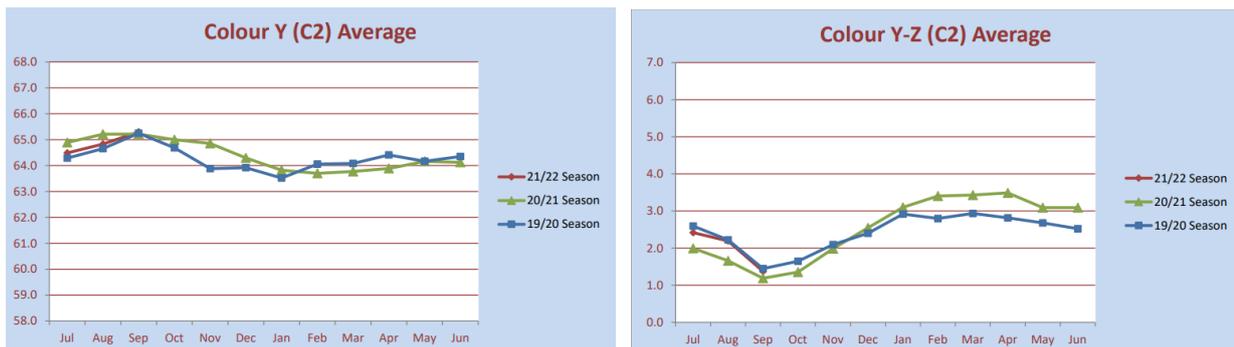


The seasonality of New Zealand Crossbred Wool Colour

North Island Greasy Crossbred wool colour by season



South Island Greasy Crossbred Wool colour by season



Causes of colour degradation in wool.

There are a number of reasons why wool will become discoloured. These include:

- Coarse wool breeds are generally of lower brightness and higher degree of yellowness than their fine wool equivalent irrespective of the environmental conditions.
- Warm and moist conditions generally promote yellowing of wool especially over prolonged periods. This colour does not usually scour out.
- Prolonged periods of wetness may promote fleece rot especially along the back of finer wool which will traditionally take more time to dry after rain. However, in very high rainfall areas wool may be washed clean, and providing conditions are not slow drying, the wool will be white and bright.
- Wool can be affected by natural stains from faecal material, urine, grass and even mud. These stains may sometimes scour out, but some permanent staining will remain. Where staining occurs, photo fading of the finished product may result.
- Longer wool tends to be slower drying, and hold more contaminants and hence wool discoloration will increase with increasing staple length.
- Greasy wool will discolour in storage. Generally, the more yellow the original colour the wool is, the sooner and more marked the change will be.
- Scouring wool will markedly slow the change of colour during storage.



Colour the moving target

Colour measurement will only tell the reflectional properties of wool at the time it is tested. Over time wool colour will degrade. For this reason, colour tests results have a limited life for which the test is valid. For this reason, buyers of greasy wool should be aware of when the wool was tested.

Period of validity of a test certificate for colour (months)

Breed	Greasy	scoured
New Zealand Merino	24	24
New Zealand Other breeds	6	12

For further information, please contact **NZWTA** on **+64 6 835 1086** or email: testing@nzwta.co.nz