# Unpublished Report

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**Suint and elemental analysis of phenotypic selections from the whole INF flocks and extreme phenotypes from selected sires from Turretfield**

**Aims:**

- To determine the differences in suint pH, suint yield, suint elemental composition and greasy wool elemental composition of extreme scoured wool colour phenotypes selected from the Information Nucleus Flocks

**Animal selection**

Scoured wool colour (Y-Z) was measured on the 2007 progeny of the INFs. Extreme individuals from either end of the distribution of colour (n= 38 high, and 32 low colour) were identified as follows:

High colour group = 10.265 ± 1.56 (range 9.1 to 15.1)

Low colour group = 7.54± 0.68 (6.3 to 8.4)

**Methods**

2.0g wool from each animal was hand-carded to remove as much loose dirt and VM and placed in a 50mL Greiner sterile tube. 8mL of sterile water at 37C was added to each tube and the sample incubated at 37C for 30 mins (wool squeezed at regular intervals throughout). After 30mins wool was removed and squeezed with forceps (= first extract). A repeat of the above produced a 2nd extract. The pH of the first extract was measured using a pH meter. After the 2nd extract the wool was removed and place don filter paper and dried at 37C for 3 days. The 2nd extract was added to the first extract and centrifuged at 3800rpm. The supernatant was transferred to a 10mL syringe barrel and filtered through a 0.45um filter until 5mL of clear liquid was obtained. To each clean, filtered fluid 150uL of Nitric acid was added to give a final concentration of 3% Nitric, and the sample sent for analysis by ICPAES. Dry wool was weighed to allow determination of suint content.

1. **Suint pH, suint yield and scoured wool colour**

**Table 1. Suint pH and suint yield of extreme wool colour phenotypes of the INFs 2007 drop.**

| SWC group | SWC | Suint pH | Suint yield |
|---|---|---|---|
| High | 10.265 | 7.225 | 0.168 |
| Low | 7.54 | 6.918 | 0.116 |
| P< | 0.001 | 0.051 | 0.001 |

Regression analysis (SWC vs pH): r=0.47 (P<0.012)

Sheep with high colour had a higher yield of suint and a higher suint pH than low colour sheep. This confirms previous findings.

2. **Elemental analysis of the extreme phenotypes from the Turretfield INF**
   **20 extreme high and 20 extreme low SWC plus approx 24 Turretfield extremes (approx 70 total), suint extracted and ICPAES- analysed for 20 elements (macro and micro).**

**Table 2. Mineral element concentrations (mg/kg wool) present in the suint extracted from the wool of extreme phenotypes selected from the Information Nucleus Flocks as being High or Low scoured wool colour.**

| Mineral element | High | Low | H/L | P= |
|---|---|---|---|---|
| B | 0.009472 | 0.005548 | 1.70 | 0.001 |
| Ca | 6.5548 | 5.8839 | | 0.276 |
| Co | 0.0009142 | 0.0009310 | | 0.944 |
| Cu | 0.0041056 | 0.0042984 | | 0.449 |
| Fe | 0.11035 | 0.09157 | 1.21 | 0.049 |
| K | 110.1 | 101.2 | | 0.277 |
| Mg | 1.1335 | 1.232 | | 0.287 |
| Mn | 0.1542 | 0.1032 | 1.49 | 0.001 |
| Na | 7.659 | 9.249 | 0.82 | 0.062 |
| Ni | 0.000371 | 0.000411 | | 0.806 |
| P | 0.5094 | 0.5868 | 0.87 | 0.021 |
| S | 1.2138 | 1.1985 | | 0.797 |
| Zn | 0.0490 | 0.0777 | 0.63 | 0.004 |
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High colour phenotypes were characterised by high Boron, high Iron, high Mn, low Sodium, low Phosphorus and low Zinc levels in the suint extract.

**Table 2. Mineral element concentrations (mg/kg wool) present in the greasy wool of extreme phenotypes selected from the Information Nucleus Flocks as being High or Low scoured wool colour**

| Element | High | Low | H/L | P value |
|---|---|---|---|---|
| Al | 2174 | 2379 | | 0.62 |
| B | 1.751 | 1.255 | 1.39 | 0.008 |
| Ca | 1009.7 | 1025.1 | | 0.90 |
| Co | 0.0007492 | 0.001127 | | 0.11 |
| Cr | 3.2576 | 3.2704 | | 0.97 |
| Cu | 4.179 | 4.699 | 0.89 | 0.017 |
| Fe | 1451 | 1568 | | 0.65 |
| K | 25674 | 23888 | | 0.39 |
| Mg | 487.5 | 558.6 | | 0.37 |
| Mn | 21.829 | 20.389 | | 0.62 |
| Na | 1442.4 | 1945.3 | 0.74 | 0.012 |
| Ni | 0.0002927 | 0.0005037 | | 0.20 |
| P | 208.9 | 212.7 | | 0.70 |
| S | 20974 | 21603 | | 0.28 |
| Ti | 125.9 | 128.7 | | 0.87 |
| Zn | 81.99 | 85.75 | | 0.24 |

High wool colour animals had greasy wool which contained more boron, less copper and less sodium than low wool colour animals.

**Discussion**

This study is the first to analyse the elemental composition of suint from animals with extreme scoured wool colour phenotypes. The results provide evidence that animals with yellow wool after scouring have suint with higher levels of boron, manganese and iron and lower levels of sodium, phosphorus and zinc, than animals with whiter wools. We also confirm previous findings that high colour animals have more suint and suint with a higher pH than low colour animals. Together these results support our current working hypothesis that scoured wool colour or basal wool colour is produced by bacteria resident on the skin of sheep and further that genetic differences in colour are a consequence of differences between sheep in their resident skin microbiota. These may be due to differences in the secretion of antimicrobial peptides, recently been demonstrated in other species. Recent studies have also confirmed that bacterial endproducts such as phenazines are present in the chromophore profile of wool. The elemental differences demonstrated in this experiment are interesting. We are now embarking on a search of literature in relation to those elements which differed between the groups to determine if there are any links to microbial dynamics and the formation of chromophores. It may be possible to manipulate the elemental profile of skin and wool to improve the basal whiteness of wool. Our current experiment examining the impact of removal of skin bacteria on wool colour, may provide another option, that of reducing bacterial activity by backline application of antimcirobials.