Example: Variation in the yield of a dyestuff

An experiment was carried out to investigate how much of the variation in yield in the manufacture of a dyestuff was due to the variation between batches in one of the raw materials. Five laboratory determinations of the yield were made for each of six randomly chosen batches of raw material, with the results plotted below.

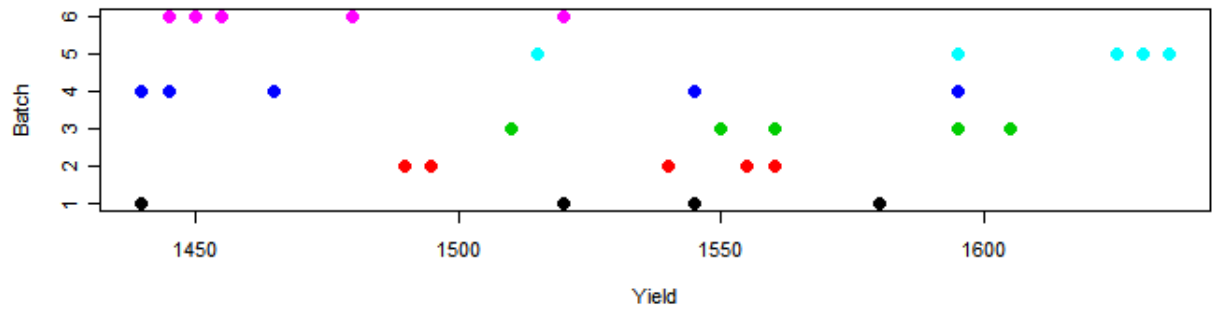

Figure 1: Yields for batches 1–6.

```
dyestuff.mer <- lmer(yield ~ 1 + (1 | as.factor(batch)))
```

The output from `summary(dyestuff.mer)` includes estimates of the variance components σ^2 and σ_a^2, and of the fixed effect, the overall expected yield μ, as follows.

```
Linear mixed model fit by REML
Formula: yield ~ 1 + (1 | as.factor(batch))

   AIC   BIC logLik deviance REMLdev
 325.7 329.9 -159.8    327.4   319.7

Random effects:
 Groups           Name        Variance Std.Dev.
 as.factor(batch) (Intercept) 1764.0   42.001
 Residual                     2451.3   49.510
Number of obs: 30, groups: as.factor(batch), 6

Fixed effects:
            Estimate Std. Error t value
(Intercept)  1527.50      19.38   78.81
```