

Purposes:

- Use both scalar and matrix notation to contrast the two primary types of linear models used in plant breeding.
- Describe what is meant by shrinkage predictions
- Describe and contrast BLUEs and BLUPs
- Gain experience in the application of mixed linear models
- Utilize BLUP values to reduce costs while maintaining confidence in selections

Keywords: Multi-Environment Trial (MET), Variance due to GxE interactions, interactions due to heterogeneous variance, interactions due to changes in rank

Useful R commands

- `rm()`
- `attach()`
- `factor()`
- `lm()`
- `lmer()`
- `aov()`
- `summary()`
- `sink()`

Reading:

Chapter 12: MET - Linear Mixed Models

Bernardo, sections 11.1 – 11.4 and 11.7.

Due to budget considerations, you have been asked to reduce the number of plots again by $\frac{1}{2}$ while still obtaining useful information for selection, including GxE, on all 49 lines in “MET ds5.csv” using the sample of ten environments. We still assume that the ten environments of DS3 are from a set of locations that are representative of the targeted population of environments.

We decide to evaluate 10 samples of 24 lines + the check in all ten environments. For each environment, we will obtain a random sample of 24 of the 49 lines, and include the check.

- Name the resulting subset of data “MET ds5 0.25.csv”

Questions:

1. Generate a report indicating the number of environments that provide data for each line in MET ds5 0.25.csv.
2. Provide a mixed model for yield in MET ds5 0.25.csv.
3. Implement your mixed model on MET ds5 0.25.csv and report the resulting estimates of variance components. (see “lmer example.R”). Be sure to include interpretive statements in your report.
4. Obtain BLUP values for all 50 lines, then provide a brief report on the comparison of the values with the BLUP values from DS3, and DS3 0.5 [hint: estimate differences or generate a scatter plot the predicted values from DS3 on one axis vs the predicted values of DS3 0.5 on the other, or calculate the correlation between the two sets of values or regress one set on the other or...]. Be sure to include interpretive statements in your report.