Statistics 850 **yandell** **Spring 1995**

Homework # 10—Due Mon 1 May

This problem involves an on-going biometry consulting project. A student in plant pathology examined the growth of a soil pathogen in several different soils. He was interested in comparing the effect of tree root systems on the pathogen. Three of the soils (VERMIX, PROMIX and GRNHOUS) are in a certain sense controls, the first two being artificial and the third coming from a controlled environment. A fourth soil contains only GRASS. The other four are of particular interest, as the scientist wants to know whether soil from tree NM-6 has lower score than those of the other three trees.

The experimental design requires some care. For each type of SOIL, there were 6 soil samples (REP(SOIL)). These soil samples were innoculated with pathogen. Then, these soil samples were split in half (ACC). One half was autoclaved (that is, sterilized) and the other half was not. Now there are 12 half-samples (ACC*REP(SOIL)). Each of these 12 half-samples was placed in storage and scored for pathogen (by some objective criterion not of concern here) on 6 different dates (SCORE1–SCORE6). [Other measurements were taken periodically, but are to be ignored here.]

Your task is to assess whether NM-6 has significantly lower score than the other tree soils for the non autoclaved (ACC=NOTAUTO) samples only. In the process, it is important to characterize the difference between the four tree soils and the four controls. Also, since the scientist understands split plot better than repeated measures, you must show the connection between these two approaches. Data are in `hwk10.dat` with SAS suggestions in `hwk10.sas`.

1. Lay out the full model for repeated measures for this problem. Define terms. Briefly summarize the difference in assumptions between split plot and repeated measures.

2. Compare all 8 soils for pathogen score using a split plot approach. Contrast the controls and the tree soils in some way that highlights the differences you observe in you interaction plot(s).

3. Now compare only the 4 soils from trees. You may do this either by selecting those 4 soils (as in the `hwk10.sas` example setup) or with contrasts.

4–5. Repeat steps 2 and 3 using a repeated measures approach. Discuss in some detail the similarities and differences. You must comment briefly on polynomial (or other of your choice) contrasts over time, the "univariate tests" with and without "epsilon" correction, and the "multivariate tests". Look for complentary interpretations across these methods, and refer to your interaction plots. Note any evidence which may not be complementary, indicating shortcomings of the repeated measures approach for this problem.

6. Think simple. Summarize your findings in an elegant way which can inform the scientist about the main results.