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

Homework # 2—Due Mon 13 Feb

1. This problem came up in consulting work with a client in horticulture. This person was interested in cloning plants. Basically what she did was place some plant tissue (say a small part of a leaf) in a dish which has a "food preparation" on it. The dish is sealed and placed in a controlled chamber with adequate light and proper temperature. The "food preparation," or media, is designed to encourage growth of new plant shoots from the tissue. The response of interest here is the number of "adventitious shoots" (`advplt`), or new plants growing out of the tissue. Basically, the more adventitious shoots one can produce, the better the growing media. The key question is: what is the best growing condition for the shoots?

The researcher wanted to test the effect of two chemicals on clonal growth, `BA` and `TDZ`. The original design had 3 levels of `BA (0,0.44,4.4)` and 4 levels of `TDZ (0,0.2,2,20)`. Further, there is an extra control (`trt=20`, saline water plus BHTA). The designation of treatment label `trt` is indicated in the SAS code and in the following table:

	TDZ			
BA	0	0.20	2.0	20
0	0	1	2	3
0.44	4	5	6	7
4.4	8	9	10	--

Unfortunately, tissue did not survive at high levels of both treatments together (presumably they were chemically burned). Thus the two-way part of the treatment structure is unbalanced, with one empty cell. For this problem, consider that there are 12 treatment groups in a one-way layout.

The design structure was a bit complicated. However, for the purpose of this problem, consider the design to be completely randomized. An added problem is that `advplt` is a count, and many values are zero (0). The suggested transformation to stabilize variance is square root. The data can be found in file `hwk2.dat` (in the usual directory, `st850-1/data`), with some SAS suggestions for this problem in `hwk2.sas` for your information.

(a) Present one or more key graphs to summarize the data. Comment on any problems with assumptions.
(b) Find means and standard deviations for each treatment group.
(c) Construct overall test for equal means. If differences are found, order the means and then perform pairwise `t`-tests to determine significant differences.
(d) Repeat (a)–(c) without the zeroes.
(e) Comment on issues of multiple comparison. That is, select two methods and briefly discuss their merits and short-comings in the context of this problem.
(f) Comment on the comparison of group means, with and without zeroes, noting that the `trt` levels represent 3 levels of treatment (`TDZ=0.2,2,20`) plus 2 controls (`TDZ=0` saline water; `TDZ=-1` BHTA).