2006 - Statistics 215b Final - Take Home Part

You are free to consult any books or written material. However you are not to discuss the examination with any other persons, until you have handed in your answer.

Prepare a scientific paper concerning the data and questions below. Be sure to include pertinent graphs and figures.

Please hand in your papers at the in class part of the final, Tuesday June 9.

Onion seeds are planted in June and bulbs are harvested in January. The bulbs are subject to white rot while they are growing. This disease is caused by a fungus. The fungus lives in the soil as hard dormant spores. When the onion plant grows, the roots exude the characteristic onion odor. The odoriferous chemical stimulates the fungal spores to germinate and grow toward the onion bulb. Treatment of the fungus is difficult as the young onion plants are delicate, hence chemicals cannot be dug into the soil except prior to planting. Strategies to deal with the situation have included coating of the seed, soil sprays, and foliar sprays of the growing plants.

A trial comparing 10 chemical treatments to a Control, which was a particular standard preplanting soil treatment, was carried out. The Control alone tends to work poorly as it is active in the soil when the fungus is dormant. The trial was laid out in an array of plots of 11 rows by 7 columns. Plots are 4 m long with a 1 m buffer between plots in a bed. The columns corresponded to beds 1.5 m wide. Adjacent beds are separated by about 0.5 m, and the soil is molded so that the surface of the beds are about 0.25 m above the separating strips. The rows correspond to adjacent plots within a bed and there will be some guard plants between each plot. Each treatment occurs once in each column and the number of times a pair of treatments occurs in the same row is as equal as possible. [Here m refers to meters, while l/ha refers to liters per hectare.]

The various treatments are labelled 1 to 11 as follows:

Label	Treatment
1	Control
2	Control + Chemical A Seed Treatment
3	Control + Chemical B 0.6 l/ha
4	Control + Chemical B 1.2 l/ha
5	Control + Chemical B 2.4 l/ha
6	Control + Chemical B 1.2 l/ha + Chemical A Seed Treatment
7	Control + Chemical B Foliar + Chemical A Seed Treatment
8	Control + Chemical C 1.5 l/ha
9	Control + Chemical C 3.0 l/ha
10	Control + Chemical C 6.0 l/ha
11	Control + Chemical C 3.0 l/ha + Chemical A Seed Treatment

The number of diseased and dead bulbs was counted on 5 occasions during the growing season and the count of newly emerged plants was also recorded. The data for one occasion are in the file

www.stat.berkeley.edu/~brill/Stat215b/oniondata

whose first few lines are recorded at the end of the question.

Questions of interest included: Which chemicals (if any) provided superior handling of the fungus compared to the standard treatment (1= Control)? Did either of chemicals B or C (rival drug companies) have an effect? Which mode of delivery (concentration, soil vs foliar, seed treatment or not) provided best handling of the problem?

Prepare a scientific report describing analyses addressing these and other interesting questions. In particular you might:

1. Develop a stochastic model for the situation.

2. Justify the model developed, being specific about its form.

3. Interpret the model and discuss its limitations.

4. Look for evidence of spatial trend or correlation.

First Few Lines of the Data File:

Column	Row	Treat	Disease	Total
1	1	8	7	273
1	2	7	75	315
1	3	1	20	300
1	4	11	4	222
1	5	4	8	282
1	6	10	0	187
1	7	9	0	241
1	8	5	4	278