PLSC 731 - Plant Molecular Genetics
Final Exam – 2008

Points: 100 pts
Due: May 8, 2008; 12:00 pm

1. Quantitative inheritance is a key aspect of phenotypic expression in plants. Spikelets per panicle is an example of an important trait controlled quantitatively. Xing et al. in the paper "Fine Mapping of a Major Quantitative Trait Loci, *qSSP7*, Controlling the Number of Spikelets Per Panicle as a Single Mendlian Factor in Rice" describe experiments that place a gene controlling the trait to a small interval in the rice genome. You are to provide a ***critical, detailed*** review of the article. Your answer should demonstrate that you understand the principles of QTL mapping without describing the general steps of the process. You will certainly need to obtain additional articles to complete this answer. The specifics of your review are:

1. 1 – 1.5 pages, in length should be sufficient
2. Single-spaced, 1 inch margins, 12 pt Times Roman font
3. The body of the answer should:

   a. describe the importance of the trait
   b. discuss the results of the previous papers that formed the basis for this paper
   c. describe the fine-mapping of the QTL
   d. explain what is meant by a single Mendelian factor in respect to a quantitative trait
   e. provide other relevant information you feel is important

30 points

2. Association mapping has the power to fine-map genes controlling complex traits by investigating the natural variation within a species and exploiting the linkage disequilibrium within the species to map genes that affect the trait to a small interval. One such experiment is described in "Association Mapping of Partitioning Loci in Barley". You are to provide a ***critical, detailed*** review of this article that demonstrates that you understand the principles of association mapping without discussing all of the general principles we have discussed in class. You will certainly need to obtain additional articles to complete this answer.

1. 1.5 – 2.0 pages, in length should be sufficient
2. Single-spaced, 1 inch margins, 12 pt Times Roman font
3. The body of the answer should:

   a. discuss the importance of this trait
   b. review previous attempts to discover the genetic loci that controls this trait
   c. compare the results of previous experiments with the AM experiments described here
   d. explain the purpose of the different experimental and statistical approaches used in the analysis
   e. provide other relevant information you feel is important

35 points

3. Quantitative inheritance is a key aspect of phenotypic expression in plants. A combination of genetic and molecular genetic experiments has recently culminated in the cloning of a number of genes that affect traits that are expressed quantitatively. You are to review the article entitled "The Wheat VRN2 Gene Is a Flowering Repressor Down-Regulated by Vernalization" and provide a ***critical, detailed*** review of the article. Your answer should demonstrate that you understand the principles of map-based cloning without going into all of the general details that were discussed in class. You will certainly need to obtain additional articles to complete this assignment. The specifics of the review are:

1. 1.5 – 2.0 pages, in length should be sufficient
2. Single-spaced, 1 inch margins, 12 pt Times Roman font
3. The body of the answer should:

    a. detail the importance of the trait
    b. describe the original genetic experiments (with supporting experimental data) that originally defined the location of the QTL
    c. discuss subsequent fine-structure mapping experiments that refined the genetic and physical location of the QTL
    d. describe how the gene was cloned
    e. discuss the experiments that proved the putative gene was indeed the gene
    f. describe the function of the gene
    g. provide other relevant information you feel is important

35 points

NOTE: Your answer should not be a simple restatement of the information provided in the paper. You should completely analyze the paper and then reorganize the information and explain the results, conclusions, and importance completely in your own words. That will be a major component of your grade. Be sure that your answer incorporates information and knowledge from previous experiments.