PLSC 731
Plant Molecular Genetics
Spring 2010
Exam 1
Due, April 8, 2014; printed copy in class

Upon my honor, I have neither given nor received aid in writing this exam."

_____Name

This is an essay exam. You must answer all questions with **complete sentences** (except for question 4). If you use a table or a figure, it must be referenced in your answer. The answer to each question cannot be more than one page. Use the standard formatting guidelines required for the crop description paper.

1. Molecular geneticists are always looking for additional markers. This is especially true for those working in species with limited genomic resources. Cabrera et al. (2009) describe the development and utility of COS (conserved orthologous set) markers. Very carefully read this paper, and develop an essay that addresses the following issues in this order: a) What is the value of COS markers for within family analysis? b) Describe the steps involved in developing COS markers. c) Discuss the evidence from this paper that demonstrates that COS markers are useful as a within family research tool. d) Do these experiments provide sufficient evidence to support this claim? e) How can these markers be used for synteny studies beyond a within family comparison? (**25 points**)

2. *Capsicum* sp., peppers, are important component of human diets worldwide. Nicolaï et al. performed a molelcular analysis of a large collection of *Capsicum* genotypes. Provide a ***thorough*** summary of the experimental and statistical approaches used by the research team, and discuss their results in the context of the development of core collections. (**25 points**)

3. Varshney et al. performed a detailed analysis of drought tolerance in chickpea. Summarize the experimental procedures, phenotypically, genotypically, and statistically. Your discussion should describe the "QTL-hotspot" concept and how it relates to the results provided in this manuscript. Also, speculate on the underlying molecular control of drought tolerance provided by the CaLG04 hotspot. (**30 points**)

4. Create a table that lists all molecular markers discussed in class, the advantages and disadvantages of each, and the type of inheritance for each marker. Include the COS markers from question 1 above. (**20 points**)

References

Cabrera et al. (2009) Development and bin mapping of a Rosaceae conserved ortholog set (COS) of markers. BMC Genomics 10:562. (Question 1)

Nicolaï et al. (2013) Genotyping a large collection of pepper (*Capsicum* spp.) with SSR loci brings new evidence for the wild origin of cultivated *C. annuum* and the structuring of genetic diversity by human selection of cultivar types. Genetic Resources and Crop Evolution 60:2375. (Question 2)

Varshney et al. (2014) Genetic dissection of drought tolerance in chickpea. Theoretical and Applied Genetics 127:445. (Question 3)