

## PLSC 731 - Plant Molecular Genetics

### Evolution, Domestication, Dissemination, US Commercialization, and Molecular Characterization of a Crop Species

**Due:** February 13, 2020, in class; (**note:** 25% penalty for late papers)

**Grade value:** 200 points

It is very important to understand the history of that species with which you are working. As Barbara McClintock said "*You must have a **feeling for the organism***". It is important to understand the historical events that lead to the materials that are used in a breeding program or genetic study. Finally, whenever applying molecular techniques, it is important to know the molecular tools available for that species. The purpose of this mini-review is to become very acquainted with one crop species. In most cases, this is the species that you are focusing on in your research. Your paper must discuss:

- **The Evolution of the Species:** What is the taxonomic relationship of this species to other species in its genera and family? What is the estimated date when this family and species diverged from its nearest phylogenetic neighbor?
- **The Domestication of the Species:** There is a distinct difference between wild and domesticated species of a plant species. Describe these phenotypic differences, and what is understood about the genetic control of these traits. Are there particular races of this species that relate to the domestication? When was this species domesticated and what traits were associated with the domestication?
- **Dissemination of the Domesticated Lines:** Crop plants all have a center of origin. First, describe the center of origin and how that was determined. What was the dissemination pathway of this crop throughout the world? How did this crop end up in the United States? You should pay particular attention to the races and how they were distributed throughout the world.
- **US Commercialization of the Crop:** Each crop species has been commercialized in the United States. Therefore, at some point in time, the crop was brought into the US, and plant breeding efforts began with those materials. Subsequently other materials were introgressed into this original material, and new modified germplasm was created. Describe all of these events, and provide experimental results that used molecular techniques to describe the diversity of the original materials and the variability of the "current" breeding materials. What are the historic and current levels of production (acres and production) in the US.
- **Molecular Characterization of the Species:** You should now discuss a) the number of chromosomes and genome size of the species; b) the types of the molecular marker maps that have been developed and the genetic distance of those maps by focusing on recent papers; c) the nature of the parents used to develop these maps and why the parents were chosen; d) three interrelated examples of the application of molecular markers for genetic studies with this species; and e) the major genomic features described in the sequencing paper for the species.
- **Genetic Improvement Target for the Species in Africa or Central America.** For the species, identify and discuss the relevance of a trait that needs improved in an African or Central America country and outline an improvement program that uses genetics and molecular genetics.

*You must make sure that your review is based on the most current research. Simply basing your review on one submitted in the past by another student will result in a low grade. **Therefore it is important that you prepare a very current review.***

#### Format

- **Length:** Body: 6 **full** pages, excluding cover page (maximum) and reference page; title and name should be on a cover page and references on a separate page(s).
- **Font:** Times Roman, 12 pt.
- **Margins:** One inch on each side and top and bottom. (**Note:** The MS Word default is 1.25 inch; if you do not know how to adjust the margins seek help from someone.)
- **Spacing:** 0.5" indent for each paragraph; each paragraph single spaced; a double-space between each paragraph
- **References:** A separate reference page is required. Select a journal and use the reference style from that journal. The maximum number of WWW sources is **one**.