

NCR-167 Report from the University of Minnesota

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Mission and Program Description

My mission at the University of Minnesota is (i) to conduct research that is meaningful to corn breeders and (ii) to educate future plant breeders. My research focuses on developing methods for gene discovery with plant breeding data; elucidating the nature of genetic variation for quantitative traits; and enhancing germplasm adapted to the northern U.S. corn belt. My work involves theoretical research, computer simulation, molecular marker analysis, or field experimentation. I advise graduate students, serve on graduate committees, and teach two graduate courses and one undergraduate course.

Program Highlights, January–December 2003

- Three graduate students in the program obtained their degrees:
 1. Jianming Yu, Ph.D. thesis: *Changes in genetic variance during advanced cycle breeding in maize*. Jianming is currently a postdoctoral research associate in my program. He is conducting simulation research on *in silico* mapping in cross-pollinated crops.
 2. Martin Arbelbide, M.S. thesis: *Random mating prior to selfing in maize backcross populations*. Martin is currently a Ph.D. student in my program. He is conducting simulation research on *in silico* mapping in self-pollinated crops.
 3. Jennifer Taller, M.S. thesis: *Diverse adapted populations for improving northern maize inbreds*. Jenni is currently a USDA lab scientist in St. Paul.

- We published four papers in peer-reviewed journals:
 1. Lu*, H.-J., H.W. Ohm, and R. Bernardo*. 2003. Mapping QTL for popping expansion volume in popcorn with simple sequence repeat markers. *Theor. Appl. Genet.* 106: 423-427.
 2. Bernardo*, R. 2003. On the effectiveness of early generation selection in self-pollinated crops. *Crop Sci.* 43: 1558-1560.
 3. Lu*, H., J. Romero-Severson, and R. Bernardo*. 2003. Genetic basis of heterosis explored by simple sequence repeat markers in a random-mated maize population. *Theor. Appl. Genet.* 107: 494-502
 4. Bernardo*, R. 2003. Parental selection, number of breeding populations, and size of each population in inbred development. *Theor. Appl. Genet.* 107: 1252-1256.

- A visiting research fellow, Bertrand Parisseaux, successfully applied *in silico* gene mapping methods to data sets from his company (Limagrain Genetics). Results were presented at the 2004 NCR-167 meetings. A manuscript has been submitted to *Theoretical and Applied Genetics*.
- We continued to conduct the Minnesota corn maturity tests. The testing program comprised nearly 700 hybrids and 12 locations, with each hybrid being tested at three locations in its declared maturity zone. In 2003, Minnesota state law was amended, however, so that the maturity tests (and the major source of graduate-student funding for our program) will be discontinued after 2006.
- A Ph.D. student, Dindo Tabanao, successfully obtained all the field data (total of 6720 two-row plots across four locations) needed for his dissertation.
- I taught a graduate course entitled *Publishing in Plant Science Journals* to 10 graduate students in spring 2003. The rationale for this course was that we teach M.S. and Ph.D. students how to conduct scholarly research, but we fail to formally teach students how to communicate their research findings through a peer-reviewed journal article. Before the end of the course, each student had to write a manuscript, based on his or her M.S. or Ph.D. research, that was ready (except for minor changes in format) for submission to a plant science journal.
- I obtained funding from the Institut National de la Recherche Agronomique (INRA) for a sabbatical leave. From August to December 2004, I will be working with Dr. Alain Charcosset at the INRA research station in Gif-sur-Yvette, France.