Northern Transformation Labs Tour/Workshop
September 24-25, 2001

Scientists from transformation labs in KS, MN, ND, NE, and WI met in St. Paul and Madison for tours and discussions. As most of us had met on the previous tour, discussions began as soon as we got together in St. Paul. Dr. Gary Muehlbauer organized speakers from a variety of research areas to update us on their work. First was Dr. Bill Bushnell, USDA-ARS, Cereal Disease Lab, who described what is known about the FHB infection process. He identified several targets for antifungal protein (AFP) expression, including the vascular tissues and the internal surfaces of the lemma and palea. He also indicated that excretion of the AFP into the intercellular spaces would be helpful. Dr. Liane Rosewich Gale, a postdoctoral scientist in Dr. Corby Kistler's (USDA-ARS) lab discussed their work on population genetics of *Fusarium graminearum* lineages. While overall variability within and among lineages was rather low, they have developed a diagnostic set of six RFLP markers that can be used to determine the lineage of *F. graminearum* isolates. The next speaker was Dr. Gary Fulcher, from the Food Science and Nutrition Dept. at the University of Minnesota. He described some of the effects of FHB on wheat quality and his work on phenolic compound effects on Fusarium growth. Several phenolic compounds can inhibit fungal growth and are more prevalent in Sumai 3 than in susceptible cultivars. He also briefly mentioned some collaborative work with Dr. Martinelli on treatments that can reduce DON in barley without reducing germination.

We then moved on to research being conducted in Gary's project. First was Dr. Warren Kruger, a postdoctoral scientist working with ESTs and gene discovery. He has identified approximately 3,500 unique ESTs, of which almost half are unknown sequences not listed in the public databases. Those related to known sequences included defense response or stress-related genes, resistance gene analogs, potential fungal pathogenesis genes, and others. Discussions were lively, with scientists interested in finding new candidate genes for transformation, and also with some interest in developing proteomics projects. Gary then described progress in evaluating some of his transgenic wheat lines, including greenhouse FHB results. For each of the three genes inserted, there are at least a few lines that showed some reduction in FHB from these preliminary tests. Dr. Caroline Mackintosh, another postdoctoral scientist with Gary, described her current work in transformation of wheat and barley. She is working with several genes and showed us some of the putative transgenic plants under development. The final talk of the day was by Dr. Kent Evans, Dept. of Plant Pathology, who works closely with breeders and geneticists, screening their materials for resistance. He described their FHB screening methods and some of the recent improvements they have made in their techniques to get more reliable results. After Kent's talk, we all packed up and drove to Madison for the night.

In the morning, we met at the USDA-ARS Barley Malt Lab to visit with Dr. Ron Skadsen's group. Ron began with an overview of his program and a brief description of some earlier work with permatin transformation and expression patterns from a lemma-specific promoter that a previous post-doc had identified. Unfortunately, the duration of gene expression from this promoter appears to be too short to be effective against FHB. Ron was followed by Dr. Jianming Fu, a postdoctoral scientist transforming barley with a

hordothionin gene. Several modifications of this gene were necessary to obtain good levels of expression and this work is in progress. Ms. Maria Laura Federico, a graduate student, has been using differential display to isolate pericarp-specific promoters. She has identified a candidate *Ltp* promoter and is developing a deletion series to identify the important regions for pericarp specificity. Maria was followed by Dr. Tilahun Abebe, another postdoctoral scientist, who is using suppression subtractive hybridization to identify lemma/palea-specific promoters. At this time, he has a pool of approximately 300 clones which he is further examining for differential expression.

Dr. Bernie Jones, a USDA-ARS research chemist, discussed work with his graduate student, Ms. Anja Pekkarinen, to isolate and characterize inhibitors of proteinases used by Fusarium to attack barley. This generated additional discussion about collaboration with Gary's group on gene discovery and interest in using any genes associated with these inhibitors for transformation. We then moved on to Dr. Heidi Kaeppler's (Univ. WI) laboratories, where Heidi gave us a brief overview of her group's work on transforming wheat by particle bombardment and *Agrobacterium* methods. A brief tour of the labs followed, including viewing some of the microscope equipment used to detect expression of constructs containing the green fluorescent protein from jellyfish. Discussions continued for a short while before departure for the trip back to Minneapolis.