

PROGRESS REPORT

PROJECT NO: BJKV67, BJKV68

TITLE: Marker-assisted breeding of fusarium head blight resistance in wheat

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ACCOMPLISHMENTS: Over past three years, a total of 376 lines were evaluated with five markers on chromosomes 3B and 5A associated with FHB resistance in collaboration with the genotyping center. Based on the field data from the multi-state nurseries and marker data from the genotyping center, we identified 23 spring wheat cultivars resistant to FHB, of which 8 (35%) possess known resistant QTL on 3BS and 5AS. Hard red spring wheat 'Lassik', released by University of California Davis, has high protein gene *GPC-B1* and very good resistance to stripe rust. Lassik was also identified having the *FHB1* gene via molecular marker UMN10. In 2009, Lassik was crossed with several lines derived from IDO584 and IDO586, which have resistance (*H25*) to Hessian Fly. In 2010 and 2011, the progeny from these crosses have been increased in greenhouse and evaluated for resistance to Hessian fly. In 2011, we had severe stripe rust epidemic in field nurseries in Aberdeen, the progeny from these crosses showed very good resistance to stripe rust and most of them have short plant height. Out of 752 F2 headrows evaluated, over 300 F3 lines were selected and harvested. These lines are being screened for FHB in the GH and via MAS for FHB and H25 in winter 2011. These lines will also be planted in yield trials in spring of 2012. Some of these lines will be selected and harvested on the basis of field performance, yield, bread baking quality, and marker genotypes. Both hard white and red spring wheat lines will be derived from these lines and can be released for irrigation production if desired. 

A total of 50 spring wheat cultivars and advanced lines were evaluated in two field (2008 and 2009) and three GH experiments (2010 and 2011). FHB resistance was characterized based on the mean resistance of the 50 lines. DON content smaller than 2 ppm, severity smaller than 26% in field and 31.5% in GH were suggested as resistant reaction. Out of 50 lines evaluated, ten PNW lines (Whitebird, IDO629, Otis, Lolo, IDO599, IDO686, IDO668, IDO671, Penawawa, and Lassik) and two resistance checks had good resistance in the two field and three GH experiments and DON resistance. IDO599, IDO668, IDO686, and IDO671 are potential new releases of soft white spring wheat. Lassik is a hard red spring wheat cultivar released by University of California, Davis (UCD). Otis is a hard white spring wheat cultivar released by Washington State University (WSU). Lolo and Whitebird are two soft white spring wheat cultivars released by the University of Idaho (UI). Penawawa is a soft white spring wheat released by Washington State University. An additional eight cultivars and lines have good

resistance in the two field experiments and low DON content and showed a susceptible reaction in the three GH experiments. In addition, four of the 50 have good resistance in the field and in GH ; while four have good resistance to DON and in the GH .

PROJECTIONS:

As we have established screening protocols for greenhouse and field and identified some of FHB-resistant lines we are going to focus on pyramiding of FHB resistance with resistance to stripe rust, stem rust, Hessian fly, resistance to late maturity alpha amylase, and desirable end-use quality in coming years. Additional new crosses were made in field in summer 2011. These crosses were made for pyramiding of stripe rust, stem rust, FHB, and cyst nematodes. The F1s have been planted in greenhouse and currently being back or top-crossed to elite lines. The F2 and BC1F1 will be planted in spring 2012. We also expect to accelerate the development of hard white spring wheat varieties using the new germplasm from NSGC and CIMMYT. 

PUBLICATIONS:

- Chen, J., C.A. Griffey, S. Liu, and M.A. Saghai Maroof. 2012. Registration of 'VA04W-433' and 'VA04W-474' FHB-resistant Wheat Germplasm. *J. Plant Registration* 6 (1): 111-116.
- Chen, J., J. Wheeler, W. Zhao, W. Grey, C.R. Hollingsworth, D. See, and J. Marshall. Evaluation of resistance to fusarium head blight in fifty spring wheat cultivars and advanced lines grown in Pacific Northwest. Submitted to *Annual Wheat News Letter*.
- Chen, J., R. Zemetra, E.J. Souza, M.J. Guttieri, K. O'Brien, J. Wheeler, J. Clayton, J.M. Marshall, and X. Chen. Registration of 'IDO599' FHB-resistant wheat (will be submitted to JPR).