Improving Seedling Emergence in Winter Wheat

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Water use efficiency is the most important factor for dryland farming, including the 2.0 million dryland farm acres of Eastern Washington, receiving less then 10 inches of annual precipitation. Winter wheat is planted deep into tilled summer fallow and farmers need varieties that can emerge quickly. Successful stand establishment from late summer planting directly effects grain yield and water use efficiency in this region. Most of the semi-dwarf cultivars in PNW contain Rht1 and Rht2 dwarfing genes that have an adverse effect on coleoptile length and thus impede seedling emergence. We have been funded by the Washington Wheat Commission to improve the emergence of the new semi-dwarf soft winter wheat variety Xerpha. Four approaches are being taken for this project. First we are testing the emergence of the available dwarfing mutant lines, or other material known to increase coleoptile length, under simulated PNW dryland conditions. Valuable material will be used as a donor parent. Secondly, we have collected 700 wheat cultivars from across the globe to capture variation in coleoptile length in wheat. Analysis of 250 of these lines has shown a coleoptile length variation of 39 mm to 103 mm. Lines with the longest coleoptiles will be used as alternate donors. Third, seeds of soft white wheat variety Indian were treated with 30mM, 40mM, and 50mM of EMS with the objective to generate mutants in dwarfing genes other than the currently used Rht genes. The mutagenized heads from greenhouse will be space planted in the field as head-rows for selecting the dwarf mutants. Fourth, the cultivars Moro (soft white club) and Buchanan (hard red common) are being used as good emergence donors in the interim to transfer that trait into Xerpha. The initial crosses have been made and the backcrossing experiment is in progress.

Breeding for Plant Parasitic Nematode Resistance in Wheat

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Plant parasitic nematodes are important soil borne pests that have been linked to major crop damage resulting in economic loss. Second to fungi, nematodes are one of the oldest characterized parasites of wheat. Pratylenchus ssp., common name root-lesion (RLN), has been associated with wheat yield loss worldwide including the Pacific Northwest. In semi-arid dryland agriculture *Pratylenchus thornei* and *P. neglectus* species are considered the most important. Several surveys have detected *P. thornei* and/or *P. neglectus* in 90% of sampled fields in the PNW. Yield loss of intolerant cultivars caused by *P. thornei* and *P. neglectus* has been reported at 50% and 37% respectively in these growing regions. Using resistant cultivars in crop rotations is considered the simplest and most convenient method for controlling nematode populations. The objectives of our research is 1. To identify the number and location of loci for resistance to *Pratylenchus* ssp in the Iranian land race AUS28451. 2. To characterize resistance to *P. neglectus* in a set of Iranian landraces previously selected for resistance to *P. thornei* and 3. To characterize differences in expression patterns of wheat genes in nematode resistance and susceptible cultivars using microarray analysis. For objective 1, we are developing recombinant inbred and doubled haploid mapping populations from a cross between AUS28451 by the susceptible locally adapted cultivar Louise, F3 RILs are currently being grown. Doubled haploid development will be done during the summer of 2009. For objective 2, we are constructing nematode extraction facilities, have increased seed of the landraces and will begin evaluation during the fall of 2010. The results of this research will provide locally adapted germplasm with improved nematode resistance, new molecular markers that can be used to select for that resistance, as well as new exotic sources of resistance to multiple Pratylenchus species.