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PROJECT 1 ABSTRACT
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Development of specialty spring wheats, such as white wheat and waxy starch cultivars, for growers in the Northern Plains region of the U.S. is necessary for producers to remain competitive in domestic and international markets. A report from U.S. Wheat Associates indicated that seed supplies of one Canadian white spring wheat variety nearly tripled from 2003 to 2004, and white wheat acreage in Canada is expected to continue to increase. Additionally, based on the most recent U.S. Farm Bill, spring wheat producers can receive premiums if they choose to participate in an incentive plan encouraging the production of white wheat. Unfortunately, no specialty spring wheat has been released with a significant level of genetic resistance to Fusarium Head Blight (FHB) in order to mitigate the risk of producing specialty wheats in the Northern Plains, where FHB is a major problem. The goal of this project is to hasten the development of FHB resistant specialty wheat cultivars for the U.S. Northern Plains. Specialty white kernel spring wheats, sawfly resistant spring wheats, spring wheats with high grain protein, and spring wheats with waxy starch characteristics have been hybridized to 'Alsen' and North Dakota advanced lines with Type II resistance to FHB derived from 'Sumai 3'. Doubled-haploid (DH) lines continue to be developed from these crosses to rapidly incorporate resistance into regionally adapted specialty spring wheat cultivars. One DH line, NDSW0345, has a white kernel, resistance to wheat stem sawfly, and exhibits resistance to FHB since Alsen is in its pedigree. In 2004, NDSW0345 was included in the Uniform Regional Hard Red Spring Wheat Nursery, the first Uniform Regional Hard White Spring Wheat Nursery, and the Uniform Regional Scab Nursery. To incorporate another source of resistance into specialty spring wheats, backcross reciprocal disomic lines have been produced from crosses between 'Frontana' and 'Chris' spring wheat monosomic lines. These lines are being evaluated to determine which chromosome or chromosomes carry a major gene or genes for FHB resistance in Frontana. In 2005, the critical chromosome lines expressing resistance will be hybridized to backcross-derived lines of Alsen, which have been developed to pyramid the Sumai 3 source of resistance with resistance from *Triticum dicoccoides*. The backcross-derived lines of Alsen were developed from hybridizations with FHB resistant synthetic hexaploid germplasm lines. In addition to using DH breeding, the release of specialty spring wheat cultivars with different sources of FHB resistance will be hastened by using an off-season nursery in New Zealand, evaluating lines for resistance in nurseries located at Fargo and Langdon, ND, and by using marker-assisted selection (MAS) for the FHB resistances derived from Sumai 3 and *T. dicoccoides*. Resistant cultivars will be made available to regional U.S. spring wheat producers to reduce their risk of producing specialty wheats, and to help them remain competitive in domestic and international markets.