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Project Title: Rapid Development of Specialty Spring Wheat Germplasm and Cultivars with Diverse Sources of FHB Resistance.

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PROJECT 1 ABSTRACT

(1 Page Limit)

Specialty wheat cultivars are promising alternatives to the red spring wheat cultivars traditionally grown in the Northern Plains region of the U.S. Because of this promise, the most recent U.S. Farm Bill includes an incentive plan to encourage growers to produce white spring wheat. However, no significant level of genetic resistance to Fusarium Head Blight (FHB) exists in specialty spring wheat germplasm or cultivars. The overall goal of this project is to accelerate the development of FHB resistant specialty wheat germplasm and cultivars for the Northern Plains. Specialty white seeded spring wheats, red spring wheats with high grain protein, and spring wheats with waxy starch characteristics have been hybridized to 'Alsen', a North Dakota adapted red spring wheat with type II FHB resistance. Double-haploid lines have been developed from these crosses to rapidly incorporate FHB resistance into adapted specialty spring wheat germplasm and to rapidly develop resistant specialty wheat cultivars. These lines will continue to be developed and evaluated for FHB resistance with the intent to release germplasm and cultivars combining unique quality traits with FHB resistance. Synthetic hexaploids containing a *Triticum dicoccoides* source of FHB resistance have also been produced. These synthetics have been evaluated for FHB resistance and backcrossed to 'Alsen' with the 'Sumai 3' source of resistance to pyramid resistance genes into adapted specialty spring wheat germplasm. The source of FHB resistance in *Triticum dicoccoides* is a QTL on chromosome 3A, and introgression of this QTL into backcross lines has been followed using the microsatellite marker, *Xgwm2*. Pyramiding the 'Sumai 3' source of resistance with the *Triticum dicoccoides* source will be accomplished by marker-assisted selection for backcross lines having the *Xgwm533* marker, associated with the 'Sumai 3' gene for FHB resistance, and the *Xgwm2* marker, associated with the *Triticum dicoccoides* gene. To incorporate another source of resistance into specialty spring wheats, backcross reciprocal monosomic lines are being produced from crosses between 'Frontana' and 'Chris' spring wheat monosomic lines. These lines will be initially compared and evaluated to determine which chromosome or chromosomes carry a major gene or genes for FHB resistance in 'Frontana', and the critical chromosome lines with resistant will be hybridized to the wheat lines derived from the *Triticum dicoccoides* backcross series to 'Alsen'. The release of specialty spring wheat germplasm lines and cultivars with pyramided diverse sources of resistance will be accelerated by using an off-season breeding nursery in New Zealand. Resistant cultivars will be made available to spring wheat producers seeking an alternative to red spring wheat and needing FHB resistance. Resistant germplasm with diverse sources of resistance will be made available to breeders for developing durable FHB resistance