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PROJECT 1 ABSTRACT

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Presently, the primary source of resistance to Fusarium Head Blight (FHB) in spring wheat cultivars is derived from the Chinese genotype, 'Sumai 3', and it is expressed as resistance to the spread of the fungus in the head. This source is present in 'Alsen', which was grown on approximately 37% of the spring wheat acreage in North Dakota in 2003. Because of the widespread deployment of this source of FHB resistance in the spring wheat region, there is a risk that the Sumai 3 resistance will not be durable or as effective in the face of future FHB epidemics. Therefore, we are anticipating the need to complement the resistance in Alsen with different sources of FHB resistance. Our proposal is to use marker-assisted selection (MAS) and the production of doubled-haploid (DH) plants to rapidly pyramid different genetic sources of FHB resistance into Alsen spring wheat. A wheat synthetic hexaploid has been developed with a quantitative trait locus (QTL), *Qfhs.ndsu-3AS*, providing FHB resistance from *Triticum turgidum* L. var. *dicoccoides* (*T. dicoccoides*) chromosome 3A. This synthetic was artificially inoculated in greenhouse studies and found to express a level of FHB resistance to spread within the head nearly equal to Alsen. Synthetic x Alsen backcross-derived lines have been produced to transfer the *T. dicoccoides* resistance to Alsen and to pyramid it with the Sumai 3 source of FHB resistance. Detection of *Xgwm533*, a microsatellite marker linked to the Sumai 3 source of resistance in Alsen, and *Xgwm2*, a marker for the *T. dicoccoides* source of resistance, suggests both sources were present in some BC₂F₁ produced by using Alsen as the recurrent parent. We have subsequently produced BC₄F₁ plants and propose that they be pollinated with maize to produce DH plants. The *Xgwm533* and *Xgwm2* markers will be used to detect the Sumai 3 and *T. dicoccoides* QTL in the DH plants. Plants with only the Sumai 3 QTL and plants with both the Sumai 3 and *Qfhs.ndsu-3AS* QTL will be selected and tested for FHB resistance to spread within the head. Our goal is to test if the pyramiding of both QTL results in a higher level of resistance than is expressed in Alsen. Selected BC₄F₁ DH plants having both QTL will also be hybridized with 'Frontana' and 'CM-82036' hexaploid wheats. Our goal is to pyramid other sources of resistance into Alsen spring wheat. Others have successfully used marker-assisted selection to follow the transfer of FHB resistance QTL from Frontana and CM-82036 in backcross derived lines. Two QTL for resistance in Frontana and CM-82036 map to chromosomes 3A and 5A and are likely different from the Sumai 3 and *T. dicoccoides* QTL. The Frontana source of FHB resistance is thought to express resistance to initial infection by the fungus.