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PROJECT 2 ABSTRACT

(1 Page Limit)

Since early 1990s, Fusarium head blight (FHB) has been the most serious disease of wheat in the spring wheat region of the United States. Although numerous sources of FHB resistance have been identified in wheat and its relatives in the past decade, it has been a grand challenge to integrate the FHB resistance with the adaptability during FHB resistance breeding. Therefore, it is essential to develop high breeding value spring wheat lines with FHB resistance derived from unadapted sources via pre-breeding. The objective of this proposal is to develop adapted hard red spring wheat (HRSW) germplasm by transferring FHB resistance from unadapted sources into the HRSW cultivars. We previously developed a HRSW line 10LDN-CG1073 (pedigree: 'Glenn'/PI 277012//'Howard') with a high level of FHB resistance. We further developed three elite HRSW lines 15FAR1157-1, 15FAR1162-1, and 15FAR1162-2 (pedigree:10LDN-CG1073/2*Faller) with a combination of improved FHB resistance and adaptability by backcrossing 10LDN-CG1073 to HRSW cultivar Faller. To develop high-breeding value spring wheat germplasm that could be used directly in the HRSW breeding programs, we proposed to develop about 300 doubled haploids (DHs) from the F_1 hybrids of the three lines crossed with HRSW cultivars 'ND VitPro', 'Elgin-ND', Faller, and 'Bolles'. The DH production will be performed using the wheat × maize hybridization method well established in our program. The DH lines will be genotyped using the STARP markers for *Fhb1* and the 5AS/5AL QTL from PI 277012. The lines carrying the *Fhb1* combined with 5AS and /or 5AL QTL will be evaluated in greenhouse and the FHB nurseries and the top lines will also be evaluated for agronomic traits, yield and quality in a yield trial. In separate studies, we previously identified three synthetic hexaploid wheat (SHW) lines SW93, SW183), and SW187, two hexaploid wheat accessions, and a wheat-*Thinopyrum ponticum* amphiploid with high level of FHB resistance. We are currently transferring FHB resistance from these sources into HRSW cultivars ND VitPro, Elgin-ND, Glenn, 'Linkert', and Bolles and three breeding lines (ND828, NDHRS16-14-36, and NDHRS16-13-89) using backcross method. We expected that approximately 500 BC_1F_5-derived advanced lines will be developed. In FY20-21, these lines will be extensively evaluated and characterized and elite HRSW germplasm lines will be selected and released to breeding programs.