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Project Title: Development of White and Specialty Spring Wheat Germplasm and Cultivars Resistant to Scab Disease.

PROJECT 3 ABSTRACT

(1 Page Limit)

Fusarium head blight (FHB) or scab is the major fungal disease affecting all spring wheat in the U.S. Northern Great Plains. It is therefore, imperative that white and specialty spring wheat (WSW) varieties express FHB field-level resistance. The use of genetically resistant and adapted cultivars is the best strategy for an efficient, economical, and safe control of FHB disease in the spring wheat growing region while protecting our environment. The hard red spring wheat (HRSW) cultivars developed by NDSU breeding program since 2000 (Alsen, Steele-ND, Howard, Glenn, Faller, Barlow) with moderate FHB resistance which have been grown on more than 50% of ND wheat acres is an example to follow to develop adapted white and specialty wheat germplasm and cultivars for the spring wheat region. The ultimate objective of this project was to develop adapted WSW germplasm to ND and the spring wheat region with enhanced FHB resistance. Proven breeding methodologies including classical and novel techniques such as molecular markers to facilitate screening of resistance lines were utilized. The specific objectives of this projects were: 1) developing WSW germplasm and cultivars which combine higher levels of resistance to FHB (with low disease severity and DON levels), superior grain yield and endues product quality; and 2) identifying and introgressing multiple FHB resistance that reduces disease infection and DON levels into adapted WSW germplasm base. This project was funded by NDSU-AES and USWBSI for many years hoping that white wheat market and demand will increase in the spring region. This did happen; therefore USWBSI has stopped its funding. This current project is intended to carry on some testing for FHB of the existing material.

To achieve this objective, WSW genotypes will be tested for FHB reaction using the on-going scab nursery. Advanced and elite lines will be tested in multiple field trials in ND to identify FHB and other major insect/diseases resistant genotypes that meet the desired adaptation, agronomic and quality criteria for cultivar release. The complex nature of genetic resistance to FHB in wheat is significantly affected by the environmental conditions. Therefore, appropriate field evaluations for FHB resistance will be used. In addition, the available molecular markers are useful tools to select efficiently and to combine several types of resistance to FHB with other economical-value traits. We will use the off-season nursery in New Zealand (NZ), Puerto Rico, and Arizona to accelerate the generation advance and seed increase for ND trials. Past experience showed that selection for maturity, height, lodging resistance, and grain shattering can be done in NZ. This project will allow NDSU breeding program to generate more FHB data on existing WSW germplasm.