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PROJECT 2 ABSTRACT
(1 Page Limit)

Growing genetically resistant cultivars is the best strategy for an efficient, economical, and safe control of Fusarium head blight (FHB) in hard red spring wheat (HRSW) produced in North Dakota while protecting our environment. Recently developed HRSW cultivars by NDSU breeding program such as "Alsen" (2000) and "Steele-ND" (2004) with the USWBSI support, were among the first commercially cultivar released with moderate FHB resistance that are being grown extensively in ND. In 2003 crop season, Alsen was grown on more than 2.3 million acres in ND alone (37.4% of ND wheat acres). However, new adapted cultivars with higher resistance levels, combining different sources of resistance to FHB and other diseases, and which have grain shattering resistance are needed. Therefore, using classical breeding techniques and MAS, this project aims to:

1- develop improved HRSW cultivars with higher level of resistance to FHB and shattering; and superior bread-making quality.

2- identify and introgress new FHB resistance from diverse germplasm sources into adapted germplasm base of the HRSW breeding program.

Superior genotypes will be used to develop segregating populations for early generation selection and advancement of lines that combine FHB and grain shattering resistance with desired agronomic and quality traits. Advanced and elite lines will be tested in multiple site field trials in ND to identify FHB and shattering 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 which require a continuous search of new sources of resistance and the employment of appropriate breeding strategies and selection methodologies to deal with a diverse germplasm base and very large breeding populations. Tuned field and greenhouse evaluation for FHB resistance and the newly identified molecular markers –mainly QTL's located on 3 BS and 3 A chromosomes- will be used select efficiently and to combine several types of resistance to FHB with other economical-value traits. In addition, we will use the off-season nursery in New Zealand to accelerate substantially generation advance and seed increase for ND trials. Experience from previous winter cycles in NZ showed that selection for maturity, height, lodging resistance and shattering can be done in NZ. The introgression of diverse germplasm sources of FHB and shattering resistance will provide the germplasm base for selection of enhanced and combined types of FHB resistance. This project successfully develops superior HRSW cultivars with resistance to FHB as a control measure to minimize the effect of FHB on the production, export, processing and consumption of HRSW.