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Project Title: Development of Hard Red Spring Wheat Cultivars Resistant to Scab.

PROJECT 1 ABSTRACT
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Developing and using adapted and 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. In 2000, "Alsen", a HRSW developed by NDSU breeding program with the USWBSI support, was the first commercially cultivar released with moderate FHB resistance derived from Chinese Sumai-3 source. 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 to FHB and other diseases with grain shattering resistance are needed. Therefore, using classical breeding techniques and modern tools such as MAS, this project, continue to aim to:

1) **continue developing improved HRSW cultivars with resistance to FHB and shattering that are adapted to ND production and have acceptable bread-making quality; and**
2) **identify and introgress FHB resistance from diverse germplasm sources into adapted germplasm base of the HRSW breeding program.**

Improved parents 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 resistance to FHB resistance in wheat is complex and 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. Appropriate techniques for field and greenhouse evaluation for FHB resistance including MAS have been developed but need to be continuously tuned and improved for increased selection efficiency and to combine several types of resistance to FHB with other economical-value traits. In addition, the utilization of an off-season nursery in New Zealand accelerate substantially generation advance and seed increase for ND trials. Experience from previous winter cycles in NZ showed that selection for traits such as maturity, height, lodging resistance and shattering may well be accomplished in NZ as well. 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 accelerates the successful development of improved HRSW cultivars with resistance to FHB and grain shattering as a control measure to minimize the effect of FHB on the production, export, processing and consumption of HRSW.