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Project Title: Discovery and Pre-Breeding of Novel Fusarium Head Blight Resistant Sources into Spring Wheat.

PROJECT 2 ABSTRACT

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From 1998 until now, we have identified about 300 lines of Fusarium head blight (FHB) resistant spring wheat germplasm by vigorous screening of the worldwide collection in the National Small Grains Collection. Those selections compose a diversified FHB resistant gene pool based on origin, pedigree, and differences in field and greenhouse Type II test results. The best novel FHB resistant lines are being deployed into breeding programs, and lines at variable breeding stages have been developed. However, the utilization of the selections is not satisfactory due to the lack of adequate information of the novelty, and the low direct breeding value of the unadapted germplasm. Additionally, continuous introduction of new FHB resistant germplasm in wheat at a smaller scale is vital to sustain the demand of new resistance to achieve higher level of resistance in commercial varieties. The objectives of this proposal are to:

1) Characterize identified sources of FHB resistance in spring wheat by evaluating the types of resistance and by haplotyping with DNA markers linked to resistance QTL.
2) Introgress and pyramid novel sources of FHB resistance into an adapted spring wheat background.
3) Screen new sources of potential FHB resistance.

Accession identified as highly resistant to FHB after three years of field testing will be characterized for Type II reaction in greenhouse point inoculation tests. The newly identified FHB resistant germplasm from this funding period and the putative sources of resistance identified prior to this funding period (about 300 lines) will be genotyped with DNA markers closely linked to FHB resistant QTL.

The best resistant PIs will be used as pre-breeding parents. The priority will be given to putative novel resistant sources, i.e. lines without Type II resistance or lines of Type II resistance without the 3BS QTL (*Qfhs.ndsu-3BS*). The best three FHB resistant selections will be crossed with the FHB susceptible spring wheat cultivar Wheaton and moderately resistant broadly adapted line MN99436-6. The agronomically best, FHB resistant RILs will be selected, genotyped with FHB QTL markers as appropriate, and backcrossed to their respective recurrent parents. FHB resistant RILs derived from the second round of cross will be released as new germplasm. To pyramid different genes, lines with complementary QTL will be crossed and screened for higher FHB resistance.

About 100 spring wheat lines will be introduced. The new introduction along with selections from past three years will be evaluated in the field over different locations. Lines passing three year's field selection will be characterized and subjected to DNA marker screening for novelty.