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PROJECT 1 ABSTRACT
(1 Page Limit)

Development of two-rowed malting barley (*Hordeum vulgare*) cultivars for the Upper Midwest with better resistance to Fusarium head blight (FHB) or scab, *Fusarium graminearum*, is the objective of this project. Secondary goals include 1) identification of two-rowed breeding lines with better FHB resistance, 2) accumulation of genes for FHB resistance in two-rowed breeding lines adapted to North Dakota (ND), and 3) examination of genetic factors that restrict development of Midwest barley cultivars with FHB resistance. A modified pedigree scheme is being used to generate breeding lines that are more resistant to FHB and better adapted to ND. Semidwarf, early-heading cultivars from Eastern China are being used as the primary source of FHB resistance (*Rfg*) genes. The inheritance of FHB resistance and several key agronomic traits is complex; thus, more emphasis is being placed on isolation of FHB resistant lines from single crosses. The FHB reactions of lines and populations will be evaluated in FHB screening nurseries in China and ND. Several morphological traits mapped near the six-rowed spike (*vrs1*) locus in chromosome 2H have limited progress in combining essential agronomic traits with *Rfg* genes. The agronomic effects of early maturity (*Eam6*) and plant height (*hcm1*) genes in 2H have been investigated, but recombinants with *Rfg* genes have not been identified. Agronomic and molecular marker data on single-seed descent lines from a Shenmai 3/ND19119 cross will be collected to aid in identifying recombinants.

Analyses of traits in cultivars from eastern China indicate that characteristics that promote FHB escape are as important as FHB resistance. The key traits are lodging resistance (short stature), early maturity (*Eam5* and *eam9*), and short grain-fill-period. The *Eam5* and *eam9* genes for short-day response seem necessary to develop early, semidwarf lines (*sdw1* and *sld5*) for long-day conditions. The *Eam6* gene and resistance to spot blotch, *Bipolaris sorokiniana*, are required for the production of two-rowed barley in ND. Testing of FHB escape mechanisms will require development of agronomically acceptable lines with good consumer acceptance. The utilization of two-rowed barley is based primarily on malt quality and traits such as large, plump kernels, low grain protein, and high malt extract values. Three-way and other complex crosses have been made to combine these characteristics with high yield. Selected breeding lines from complex crosses will be tested for FHB and other disease reactions, agronomic traits, and malt quality using field plots, disease nurseries, and laboratory facilities.