PI: Jerome D. Franckowiak **PI's E-mail: j.franckowiak@ndsu.nodak.edu**

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PROJECT 1 ABSTRACT
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Development of two-rowed malting barley (*Hordeum vulgare*) cultivars for the Upper Midwest having better resistance to Fusarium head blight (FHB) or scab, incited primarily by *Fusarium graminearum*, is the objective of this project. Secondary goals include 1) identification of two-rowed barley lines with better FHB resistance, 2) accumulation of genes for FHB resistance in two-rowed barley lines adapted to North Dakota (ND), and 3) examination of genetic factors in chromosome 2H that restrict incorporation of FHB resistance into Midwest barley cultivars. A modified pedigree scheme is being used to generate breeding lines that are more resistant to FHB and better adapted to ND. The FHB reactions of lines and populations will continue to be evaluated in FHB screening nurseries in China and ND. Studies of early-heading cultivars from Eastern China as a source of FHB resistance (*Rfg*) genes are being expanded. Because the inheritance of FHB resistance and many agronomic traits is very complex, more emphasis is being placed on single crosses than three-way crosses. Advanced lines are being tested in ND for other diseases, agronomic traits, and malt quality using field plots, disease nurseries, and laboratory facilities.

A group of linked genes in chromosome 2H near the six-rowed spike (*vrs1*) locus has limited progress in combining essential agronomic traits with *Rfg* genes. Agronomic effects of maturity (*Eam6*) and plant height (*hcm1*) genes in 2H are being investigated. FHB response, heading date, seed size, and plant height data will be collected on lines in three single-seed descent populations from crosses to Chinese cultivars. Preliminary data indicate that all four traits interact and the inheritance of each is very complex. Data collected from the Harrington/Morex (HM) doubled-haploid population grown in short- and long-day environments will be examined further because several of other genes affect expression of the *Eam6* and *Rfg* genes. Combining FHB and maturity data with molecular marker information will better define the interactions between maturity genes and FHB reactions in two-rowed barley. Replacement of the *Eam6* gene in Midwest two-rowed barley with other maturity genes does not seem possible. However, adding short-day responsive genes, *Eam5* and *eam9*, might improve the productivity of two-rowed barley adapted to ND.