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Project Title: Develop Durum Wheat Resistant to Fusarium Head Blight.

PROJECT 1 ABSTRACT

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Fusarium head blight (FHB) caused by the fungus *Fusarium graminearum* Schwabe (telomorph *Gibberella zea* (Schwein.) Petch. has been seriously attacking durum wheat (*Triticum turgidum* L. var. *durum*) in North Dakota and the surrounding states. There is continuous decline in harvested durum acreage and production in ND because of FHB. Fungicides may reduce the disease but the most environmentally safe and economical way to control the disease is with genetic resistance. Our objective is to develop FHB resistant durum wheat cultivars/germplasm with good agronomic and quality traits.

Several populations (50 to 60) will be developed by crossing adapted durum cultivars/experimental lines to known sources of resistance such as the durum cultivar Divide, durum lines with Sumai 3 resistance, resistant Tunisian lines, Langdon *dicoccoides* 3A and 7A substitution lines, *T. dicoccum*, and *T. carthlicum*. Some of these populations will be developed using the doubled haploid system. F₂ and subsequent generations will be planted either at Prosper, Casselton, or Langdon, ND for selection and advance. Some of these populations will be advanced in winter nurseries in New Zealand and Yuma, AZ.

We will be using a modified pedigree breeding method to evaluate several segregating populations each year. F_{2:3} derived lines and subsequent generations first are evaluated for FHB either in the greenhouse using the point inoculation method or in the Prosper field screening nursery. DNA will be extracted from lines evaluated in the greenhouse and screened with robust known molecular markers at the USDA-ARS genotyping center at Fargo, ND. In each generation we will select lines that have less than 30% disease severity. F_{5:6} lines that maintain disease severity less than 30% are advanced and evaluated for FHB resistance, agronomic, and quality traits in preliminary yield trails (PYT's) at two locations. Selected lines from PYT's are evaluated in advanced yield trials (AYT's) at two locations. Selected lines from AYT's are evaluated in elite durum advanced trial (EDA) at three locations. Lines that are selected from EDA are evaluated in the uniform regional durum nursery (URDN) at 12 locations for three years. Lines from the yield trials will be harvested for DON analysis.

Lines that have good levels of resistance and possess good agronomic and quality traits will be released as cultivars to the producers. Some of the identified resistant lines will be used as parents in crosses to generate a second cycle of breeding.