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Research Category: **HWW-CP** **Duration of Award: 1 Year**

Project Title: Transfer of FHB Resistance to NDSU Hard Red Winter Wheat Breeding Material.

PROJECT 1 ABSTRACT

(1 Page Limit)

The primary purpose of the project is to urgently develop winter-hardy, FHB-resistant winter wheat germplasm that can be used (a) immediately and directly as parents in initial crosses with elite breeding lines, and (b), be used in pre-breeding to continue to develop breeding parents with more complex, pyramided resistance. Diverse sources of FHB resistance are being targeted for introgression; ie (a) the Sumai 3-derived genes *Fhb1*, *Fhb2* and *Qfhs.ifa-5A*, (b) two QTL respectively located on chromosome arms 5AS and 5AL of the hexaploid wheat PI277012, and identified by Dr S Xu, USDA-ARS Northern Crop Science Laboratory, Fargo, ND, and (c), a Frontana-derived gene on 3AL. The winter-hardy varieties Norstar, Jerry, Peregrine and Decade were used in crosses with three hard red winter and 13 hard red spring wheat resistance sources. The F_1 from these crosses were used in the following ways:

(1) During 2012, Heartland Plant Innovations produced 583 DH lines off six of the crosses. The material is currently being multiplied and genotyped for the presence of *Lr34*, *Fhb1* and *Rht-B1b* and is destined for field planting in the fall of 2013. Another ± 150 haploid plants were produced at NDSU that are currently being treated with colchicine for chromosome doubling.
(2) Marker-aided single seed descent inbreeding (*Lr34*, *Fhb1*, *Qfhs.ifa-5A* and *Rht-B1b* as appropriate) was initiated with seven crosses with the aim to produce an additional 500-800 inbred lines for field planting in the fall of 2013.
(3) An FHB testing facility at Carrington was expanded to allow for routine FHB resistance screening of segregating populations. Approximately 500 F_3 families pre-selected for plant height and derived from five winter X winter crosses that involve FHB resistance obtained from the University of Guelph, Ontario, Canada were planted (fall 2012) at Carrington. In addition seven F_3 bulk populations from winter X spring crosses derived from the SSD inbreeding program (above) and pre-selected for *RhtB1b* and *Fhb1* (where appropriate) were included. These will be artificially inoculated and selected for FHB resistance and continued conventional inbreeding.
(4) The male sterility gene, *Ms3*, was established in a winter wheat pre-breeding population so as to allow for future recurrent selection as an additional means to continue to exploit and pyramid the FHB resistance genes that are being introgressed.