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(1 Page Limit)

The objectives of this proposal are: 1. Breeding FHB-resistant hard winter wheat. We will make between 50 and 75 crosses having known FHB QTLs, mainly *FHB1*. The key parents used in this effort will be recently developed BC<sub>3</sub>F<sub>3</sub> homozygous lines of Wesley (see objective 3 below). These lines will be crossed to our elite lines (e.g. NE01643 released as Overland, NE01481 [a wheat targeted for production in eastern NE], Infinity CL and Settler CL [Clearfield wheats with broad adaptation], and additional elite lines) having native resistance. 2. Growing the Quadri-State and NUWWSN nurseries along with the regional Germplasm Observations Nursery at 1-2 misted/inoculated locations. We will grow the Quadri-state and NUWWSN nurseries and the RGON in one of our two misted inoculated locations to add important scab information for all winter wheat lines that have potential for release in scab affected areas nationally (NUSSWN), regionally in the primarily scab infected area (Quadri-State), as well as anywhere in the Great Plains (RGON). We will test the Nebraska State Variety Trial in the misted inoculated nursery to develop and provide information lines that are currently adapted or will be adapted in NE to provide growers with FHB data on lines specifically marketed in NE. 3. Cooperating with the Regional Genotyping Center to rapidly develop lines with known and verified QTLs for FHB tolerance. We received 302 packets from Dr. Guihua Bai in which he backcrossed in *Fhb1* into Harding (SD red winter wheat), Wesley (Nebraska red winter wheat), and Trego (KS white winter wheat). We increased all of the lines in the greenhouse and planted all of the lines in three replicated trials in mist nursery, and as short rows in our head row nursery to increase seed and select for both good resistance and agronomic type. We will concentrate on the Wesley FHB1 lines and are increasing them in AZ and in NE. The Harding lines were sent to South Dakota for their use. The genotyping center will screen segregating populations for FHB QTLs on chromosome 3B and 5A. 4. Cooperate with USDA-ARS scientists to sort kernels on hardness, disease tolerance, and protein content (if heritable) to increase breeding efficiency so as to advance only those lines with acceptable market standards for scab testing. In objective 1 above, we use of soft red winter wheat parent lines having pyramided QTLs for FHB. One of the difficulties in using this material is that the soft kernel traits is dominant, hence much of the resulting population has soft kernels. By sorting the population to remove soft kernels, we can greatly enrich the populations for hard wheat kernels, thus increasing the chance of finding adapted lines with the right market class and FHB resistance. 5. Over 500 samples will be submitted for DON testing. Clearly there are two economic losses associated with FHB: A. the actual lost grain yield potential due to the disease, and B. the presence of DON. We will use bulk samples with replicated checks (to estimate error) from our mist nurseries of lines in the NUWWSN, Quadri-state, Nebraska State Variety Trial, Nebraska Intrastate Nursery (our elite nursery), Triplicate (our advanced nursery), duplicate (our intermediate nursery), and those lines coming out of our FHB population selections. Our goals will be to accurately estimate the level of DON in widely grown lines and to reduce the level of DON in our future released lines.