

**Minnesota Wheat Research and Promotion Council
CROP YEAR 2013 RESEARCH REPORTING FORM
Form Due November 15, 2013**

1. PROJECT TITLE	
Study of Potential new Sources of Resistance to Emerging Stem Rust Races	
2. PRINCIPAL INVESTITAGATOR (S) A. PI# 1 Name: Jose Gonzalez	3. PI #1 Business Address <i>Regular mail:</i> Dept. of Plant Sciences- SNP247. South Dakota State University Brookin <i>FEDEX/UPS:</i> Seed Technology Laboratory SDSU Innovation Campus. 2380 Research Parkway Brookings, SD 57006
b. PI # 2 Name: Karl Glover	
c. PI #3 Name:	
4. REPORT DATE 11/14/2013	5. REPORTING PERIOD Jan 2012-Nov 2013
6. TERMINAL REPORT <input checked="" type="checkbox"/> _____ PROGRESS REPORT _____	
7. AMOUNT OF GRANT \$19,830	
8. PUBLICATIONS Mapping Sources of Resistance to Emerging Stem Rust Races in Wheat. In preparation for Euphytica or comparable journal.	

9: EXECUTIVE SUMMARY

Research Question:

The question was to study the resistance of SD4279 (an elite HRSW line from SDSU) to Ug99 and TRTTF (Ethiopian isolate) stem rust isolates. The goal is to provide useful information to regional breeding programs in order to develop varieties resistant to Ug99 and TRTTF in anticipation to a potential migration of these races into the USA.

Results:

We have identified two loci conferring the resistance, one for each of the races mentioned above. One of the genes identified (conferring resistance to Ug99) had been previously mapped, although not made public by a Canadian research group. Our results help to validate theirs. The second loci (conferring resistance to TRTTF) had been hypothesized but not actually mapped using molecular markers. We have been able to identify SNP markers linked to this gene; two of them within less than 2 cM of the gene.

Application/Use:

The markers identified in this study will facilitate the transfer of the Sr resistance genes mapped into improved cultivars adapted to our growing region. SD4279 is a very promising parental line to be used by regional breeding programs.

Materials and Methods:

For phenotypic evaluation of segregating populations derived from SD4279 we used two F2:3 populations derived from SD4279 crossed with two different parents (Brick/SD4279 and Select/SD4279). We inoculated ~100 F2:3 families from each cross in replicated experiments at the Cereal Disease Research Lab in St. Paul, MN.

For Genotyping of populations derived from SD4279 and QTL/gene mapping we used a 9K i Select SNP Beadchip Array was run in the USDA-ARS Biosciences Research Laboratory in Fargo, North Dakota. Polymorphic SNPs were selected with Illumina GenomeStudio V2011.1 software. Additionally, parents were haplotyped with 179 SSR markers that were chosen across the 21 wheat chromosomes based on their proximity to the centromere according to Somers' consensus map (Somers et al., 2004). The selected polymorphic markers were grouped and ordered with JoinMap4 (Van Ooijen, 2006). Grouping was done with an independence LOD threshold starting at 3.0 and ending at 30. A regression mapping algorithm and Haldane's function were utilized to order the markers and the map was constructed with MapChart (Voorrips, 2002).

Economic Benefit to a Typical 500 Acre Wheat Enterprise:

The economic impact is difficult to estimate correctly. The impact will be depending on several factors including if the stem races in questions do arrive to the US or not. Additionally it would depend on other traits present in the cultivars developed with these genes. These traits (ie, yield, quality, etc..) will affect the market penetration of those potential cultivars and therefore their impact.