Spring Wheat Breeding
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Reporting period: July 1, 2016 – June 30, 2017
Total project period: (Continuous)
Report type: Annual progress report

Research Summary:
The objective of this research program is to develop and release new and improved hard
red spring wheat cultivars to regional producers in SD, MN, and ND. This objective has been
successfully accomplished through the release of six cultivars since 2011 (i.e., ‘Advance’,
agronomic, disease resistance, and end-use quality characteristics, but are all known for
their regionally competitive levels of grain production.

Introduction:
Specific objectives of this program are to 1), continuously create and evaluate hard red
spring wheat germplasm populations for eventual derivation of experimental breeding
lines, 2), further evaluate experimental breeding lines for agronomic performance
potential, resistance/tolerance to biotic and abiotic stresses, and end-use quality
characters through conducting replicated performance trials, and 3), ultimately new
cultivar release at a rough frequency of one every other year.

Description of Accomplishments:
During this reporting period, 360 unique hybridizations were created. These are known as
F₁ populations and should result in the same number of segregating F₂ populations next
year. Operations within the program are cyclical and continuous, so that a subset of
materials from within selected first year segregating populations (i.e., F₂’s) in ‘year x’
become F₃ materials which are evaluated in ‘year x+1’. Likewise, lines from within selected
F₃’s, evaluated in ‘year x+1’, are evaluated as F₄’s in ‘year x+2’. During the 2017 growing
season, field trial plots of about 300 F₂, 600 F₃, and 500 F₄ populations were grown at two
locations and tested for grain yield potential, volume weight, protein content, Fusarium
head blight resistance, and some end-use quality characteristics. At the end of ‘year x+2’,
focus then shifts from within segregating populations to individual experimental breeding
lines by selecting the best 72 F₄ entries for continued evaluation as Preliminary Yield Trial
(PYT) entries for a single year. Lines tested as PYT entries in 2017 were grown at seven
locations throughout the SD spring wheat production region. Upon completion of PYT
examination each year, several lines are then chosen for perpetuation as Advanced Yield
Trial entries. Typically, AYT entries are examined for three or four years prior to release as
a cultivar. During each year, poorly performing AYT entries are removed from
consideration which allows for new entries to be admitted each year. In 2017, 36 lines
were tested along with 12 check cultivars. Trials were grown in nine SD locations, two in
ND, and as part of a collaborative research agreement with a European seed company, and
one location in England with another European seed company. Lines in the AYT are tested
for grain yield potential, volume weight, protein content, Fusarium head blight and other
disease resistance, and many end-use quality characteristics. Comparisons over years and locations are made with respect to the check cultivars. When line performance over two or three years suggests there is potential for consideration as a cultivar release, steps are initiated for more wide-spread agronomic testing, usually via SDSU Crop Performance Testing, and seed increase which takes place in conjunction with SD Foundation Seed Stocks Division. As of fall 2017, two experimental breeding lines were in various stages of seed increase for potential release as early as fall 2018.

**Projections:**
During fall 2017 no advanced experimental breeding lines were proposed for release. As many as three additional experimental breeding lines will be sown in California as first year seed increases for potential release in fall 2019.

**Publications:**


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