

Barley Coordinated Agricultural Project Workplan for Year 4
Stephen Neate , Institution: North Dakota State University

WORK PLAN: Research: We will finish assessing sub-crown internodes from the 2008 field trial (60,000 total) for detection of common root rot (CRR) resistance. We will finish assessing sub-crown internodes from the greenhouse trials in which disease reaction to *Cochliobolus sativus* and *Fusarium graminearum* were compared as variability in field disease reaction between years may be due to a disease complex involving these two species. Data from all trials will be analyzed using association mapping software and a paper written for publication. We will participate in a collaborative FHB trial with the four Midwest breeding programs (384 entries) in which we will plant two misted and inoculated FHB nurseries (Fargo and Langdon, ND) in single row plots (1.5 m long) with 2 replicates per location. Data on heading date, FHB severity, and DON will be collected. We will conduct preliminary greenhouse screening of barley isolates of *Stagonospora nodorum* and *Septoria avenae* on a subset of CAP lines to determine the viability of conducting association mapping of resistance genes for these pathogens.

Education: I have employed one PhD student, Sanjay Gyawali, who will be involved in the CRR and *Fusarium* disease screening trials described above. We will employ an undergraduate student from September to August to assist in the laboratory and greenhouse. A postdoctoral fellow in my laboratory will be trained in the use of association mapping software and will get experience in data analysis.

Outreach: I will include details about the CAP project in my presentations at ND Research and Extension Centre farmer meetings in July 2009.

Barley Coordinated Agricultural Project Biannual Progress Report
Year 3

FY08 (4/1/08 – 9/30/08)

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1) Describe the research, education, and outreach activities you completed in the first half of the FY08 (4/1/08 – 9/30/08)

Research 384 entries of spring barley (the 2007 set which was increased in 2006) were tested in large scale field screening for resistance to common root rot in the summer of 2008. Plots were 1 row x 8ft and replicated 8 times for a total of 3,072 plots. At late dough stage in August plants were dug to obtain from each plot, 20-25 sub-crown internodes of greater than 2cm in length. From August to September the approximately 25% of the 60,000 sub-crown internodes from the field trial were cleaned by stripping the membrane off in preparation to being assessed for disease. In September the disease scores from the 2006 barley set and barley core set of lines was uploaded to the barley CAP online database.

The 2006 (384), 2007 (384) and barley core set (56) were screened for disease reaction either in the greenhouse or growth chamber using inoculum from four isolates of *Cochliobolus sativus* which had been isolated from the field in North Dakota and characterized for aggressiveness. Each treatment was replicated four times. After seven weeks, 15-20 sub-crown internodes were sampled from each pot. All sub-crown internodes have been cleaned and are ready for scoring.

We participated in the collaborative Fusarium Head Blight (FHB) experiment led by Kevin Smith. We planted two misted and inoculated FHB nurseries at Fargo and Langdon ND in which we sowed the 384 2008 spring barley set. In July each plot was assessed for heading date and at mid dough stage in August, 10 plants from each plot were assessed for disease, followed by sampling at maturity for DON analysis.

Education One PhD student, Sanjaya Gyawali implemented the design, planting, maintenance and disease assessment of the common root rot controlled field trials, as well as data tabulation from the field. My Gyawali attended the Barley CAP association genetics workshop in St Paul in June. Four high school science students from across North Dakota were employed over summer and learnt about establishment, maintenance, disease assessment and harvest of the trials.

Outreach The ND Barley Council Representatives attending the summer meeting toured the laboratories and greenhouse and were introduced to the aims and outcomes of the Barley CAP as well as the staff and students working on the project. Around 30 farmer and industry representatives were in the audience.

2) List specific outcomes and deliverables accomplished in the first half of FY08 (4/1 – 9/30).

- Undertook large scale field experiments for common root at Langdon North Dakota.
- Completed sampling and cleaning of 60,000 sub-crown internodes in preparation for disease assessment
- Undertook FHB field experiments, completed disease assessments and forwarded the data to Kevin Smith for uploading into the database. Submitted samples for DON analysis.