

**Barley Coordinated Agricultural Project Work Plan FY07 (4/1/07 – 3/31/08)**  
**Paul Schwarz, North Dakota State University**

**1) Describe the research, education, and outreach activities you are planning for the next year (4/1/07 – 3/29/08)**

**Barley Information Specialist**

**Research:** We will analyze data obtained from the 2006 survey of barley growers (n=5000) in Idaho, Montana, and North Dakota.

**Education:** Prepare CAP related educational programs for state extension personnel.

**Outreach:** Make results of survey available. Results can be subdivided by state and possible crop reporting district within a state.

**Malt Quality Assays**

**Research:** We will analyze the 960 CAP breeding lines (2006 crop) for beta-glucanase content as delineated in the CAP Participants Guide. Malt samples will be provided by Dr Mark Schmitt at the USDA Cereal Crops Research Unit (Madison, WI). The assay method will be based on absorbance change with azurine cross-linked barley beta-glucan. Each sample will be assayed a single time at room temperature and a single time after incubation for 10 min. at 60°C. The difference in activity will be used as a measure of beta-glucanase thermal stability.

**Education:** A post-doctoral research scientist (Dr Yin Li) will conduct the analyses.

**Outreach:** Results will be submitted for publication in a peer-reviewed journal that is utilized by malting and brewing industry stakeholders.

**2) List specific outcomes and deliverables that will be accomplished in the first 6 months (4/1 – 9/30). These will be used as benchmarks for your bi-annual progress report.**

**Barley Information Specialist**

- Present results from the 2006 survey at the American Society of Brewing Chemists annual meeting in Victoria, BC (June 2007).
- Publish results from the 2006 survey of barley growers.
- Submit and publish a magazine article on barley breeding (incorporating Barley CAP) that is targeted towards stakeholders in the craft brewing industry.
- Publish two issues of IBMS newsletter that will include updates of the Barley CAP activities.

**Malt Quality Assays**

- The beta-glucanase data for all the lines will be provided to Kevin Smith; University of Minnesota.

**3) List specific outcomes and deliverables that will be accomplished in the second 6 months (10/1 – 3/31). These will be used as benchmarks for the bi-annual progress report.**

**Barley Information Specialist**

- Prepare and disseminate program(s) developed for education of extension personnel on the Barley CAP (i.e., train the trainer).
- Incorporate CAP related information into the IBMS website.
- Publish IBMS newsletter that will include updates of the Barley CAP activities.

**Malt Quality Assays**

- Begin beta-glucanase assay of 2007 crop samples.
- Readdress feasibility of LOX (lipoxygenase) assay.
- Prepare publication of results on thermal stability of barley beta-glucanase.

**Barley Coordinated Agricultural Project Annual Progress Report**  
**FY06 (4/1/06 –3/31/07)**  
**Paul B. Schwarz, North Dakota State University**

**1) Describe the research, education, and outreach activities you completed in FY06 (4/1/06 – 4/1/07).**

Research Our objective is to screen germplasm for lipoxygenase and  $\beta$ -glucanase activity. Dr Yin Li was hired to conduct this research in May 2005. Breakdown of cell wall  $\beta$ -glucans during germination is a major component of malt modification and beta-glucanase, does not develop until seed germination. The enzyme is quite heat liable, and less than 10% of the activity developed during seed germination remains in the kilned malt. The enzyme is readily inactivated in mashing, and thus heat stable beta-glucanase is of interest to brewers, as it can help avoid lautering and filtration problems associated with beta-glucans. We have decided not to screen beta-glucanase in green and kiln malts (as originally planned), as the number of sample assays (n=1920) and preparation (freeze-drying or extraction) of large numbers of green malts would be prohibitive. Rather we will screen beta-glucanase on kilned malts provided by the USDA-ARS CCRU in Madison, WI. These will be assayed at both 25 and 55°C to provide an indication of thermal stability. We are currently waiting for samples.

Lipoxygenase (LOX) assay is very difficult to adapt to high throughput screening, as it requires grinding of germinating barley in liquid nitrogen, and the reaction products (fatty acid hydroperoxides) are extremely unstable. A limited number of samples will be screened once we develop a suitable assay.

Education No graduate students were hired.

Outreach A barley information specialist (BIS) was hired with Barley CAP funding, and equal matching funds from both NDSU-IBMS and North Dakota Barley Council on November 1, 2006. The BIS is responsible for the development of a national outreach and education program on barley production and end-use quality. Outreach and educational components of the Barley CAP project are to be clearly incorporated, and approximately 30-35% of BIS efforts will be directly devoted to Barley CAP work. The target audiences for these programs include US barley growers and commodity organizations, cooperative extension specialists, the US malting and brewing industry, as well as interested consumers. The specialist is expected to work closely with representatives of the target audience/stakeholders in the collection, development and dissemination of information. All information /programs will be collected at a single site, but available in multiple formats to best meet the needs of various audiences. The specialist will also be available to make presentations at local to national meetings, or to assist others with presentation materials

**2) List specific outcomes and deliverables accomplished in FY06 (4/1/06 – 4/1/07).**

- Dr Yin Li hired as visiting scientist (Post-Doc) to work on beta-glucanase and lipoxygenase assays (May 2006).
- Evaluated beta-glucanase assay methods and selected colorimetric method using a dyed cross-linked  $\beta$ -glucan substrate.
- Developed protocol for screening for beta-glucanase thermal stability.
- Developed job description, advertised, interviewed candidates, and hired barley information specialist (Ms Karen Hertsgaard, November 2006)
- Arranged for Barley CAP presentation (by Dr Lynn Dahleen) in our NCI/ASBC Barley Malt Shortcourse (August 2006).

**Outreach Activities conducted by barley information specialist**

- Barley Grower Survey
  - Assisted in final edits on survey
  - 5000 surveys mailed to growers in ND, MT and ID the end of November 2006
  - 1400 surveys returned
  - Chose and notified 60 growers of winning prizes for returning survey by December 15, 2006
  - One purpose of the survey is to determine the best methods for disseminating information on barley CAP work to growers

- Presentations on survey
  - North Dakota Barley Council County Representatives on December 14, 2006 – presented introductory information on myself and the IBMS including preliminary survey results and general information on Barley CAP research to 30 to 40 growers
  - Assisted Brian Steffenson on presentation for Barley CAP meeting on January 12 – provided preliminary survey results for his outreach presentation
- Idaho outreach
  - Created three slides utilizing CAP materials for Kelly Olson, administrator of the Idaho Barley Commission. During February and March Kelly and Dan Mader of the Commission presented this information to approximately 545 growers in Idaho during Winter Cereal Schools sponsored by the University of Idaho Extension Department.
- Press Releases
  - “Cooperative Research Focus of Barley Conference” released from NDSU Ag Communications January 30, 2007. Contents included updates on Barely Improvement Conference and CAP Meetings held January 10-12, 2007. Press release also published in March Barley CAP and IBMS Newsletters.
  - Submitted a CAP press release to Gary Muehlbauer to submit to “Prairie Grains” Tracy Saylor on February 20, 2007.
- Participated in a Conference Call planning session with Barbara Alonso and Peggy Lemaux on February 26, 2007
  - Determined to obtain single bullet points from all CAP researchers with the purpose of developing press releases
- Published Barley CAP articles in 2 Institute of Barley and Malt Sciences newsletters (December 2006 and March 2007).
- Provided articles for 2 Barley CAP Newsletters (December 2006 and March 2007)