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IBC will hold producer referendum on future barley assessment

The IBC board has strongly reaffirmed its commitment to holding a producer referendum on the question of whether the board should have the authority to set the Idaho barley assessment rate in a range from $.02 cents per hundredweight (less than a penny a bushel) up to a maximum of $.04 cents per hundredweight (less than 2 cents per bushel). Producers who have sold barley in the past two years will be mailed a referendum ballot by the Idaho State Department of Agriculture during the first two weeks of November 2009. If the majority of producers vote in favor of this proposal, the IGPA will submit legislation to the 2010 Legislature to implement the assessment changes. ***The IBC board, however, does not envision making any assessment increases until at least the 2012 budget year (July 2011) and will continue its grower outreach efforts to gather additional input on IBC programs.***

UI barley research receives 3rd year of federal grant funding

With the support of the National Barley Improvement Committee (NBIC), a consortium of barley producers, researchers and industry, the University of Idaho has received a third year of special grant funding through the USDA for its Barley for Rural Development research program. BRD is managed by Dr. Juliet Windes, UI cereal agronomist/pathologist based in Idaho Falls and Aberdeen. UI first received funding for this multi-faceted research effort in 2006. Dr. Windes expects to receive more than $216,000 in the current federal fiscal year 2009. She credits the UI's success in securing additional funds for barley research to the strong lobbying support of the NBIC, which she serves on along with Idaho barley commissioner Ron Elkin, Buhl, and the efforts of Congressman Mike Simpson, who serves on the House Appropriations Committee, as well as other members of the Idaho congressional delegation.

Since 2006, BRD funding has been used to support a wide array of research efforts, including Juliet's current research on winter barley agronomic performance and screening for soil borne disease tolerance. She will initiate new work at

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Aberdeen researchers make big advancements in barley breeding

AT THE EPICENTER OF IDAHO BARLEY RESEARCH is two young research scientists based at the USDA Agricultural Research Service's National Small Grains and Potato Germplasm Research Center in Aberdeen, Idaho. Working together, Don Obert, the barley breeder in the federal agency's only barley germplasm improvement program located in the U.S., and Eric Jackson, a molecular biologist, are harnessing the most advanced molecular mapping techniques to dramatically improve efficiencies in their well coordinated barley breeding effort. ***The end result will be more accelerated commercial releases of barley varieties with improved agronomics for growers and end use quality for their customers.***

Barley variety improvement is a team effort at ARS research facility in Aberdeen, ID, led by Dr. Don Obert, barley breeder (right) and Dr. Eric Jackson, research molecular biologist.

Fortunately for the Idaho barley industry, these two industrious research scientists are making a powerful one-two punch in this country's barley breeding capacity, which overall remains relatively modest compared to other major commodities, like wheat, corn and soybeans. Due to limited economic returns, barley breeding investments in the U.S. have been largely public, residing in the ARS facility in Aberdeen, as well as a handful of state universities scattered across the northern tier states. There are a few notable privately funded programs, including malting barley breeding centers operated by Anheuser Busch in Fort Collins, CO and Miller Coors LLC in Burley, ID and a prolific feed and food barley breeding program operated by WestBred LLC in Bozeman, MT.

The ARS Aberdeen barley breeding program has produced a long and impressive legacy dating back to 1922, and remains critical to the future competitiveness of barley production in Idaho. By combining their unique skills and molecular breeding technologies, Obert and Jackson and other team members are well situated to expand this program to meet the changing needs of our industry well into the 21st Century.

Don Obert, who earned his Ph.D. in Plant Breeding and Genetics from Kansas State University, assumed the barley breeding position in 2002, upon the retirement of longtime breeder Darrel Wesenberg. With additional funds provided by the Idaho Barley Commission and cooperative grant funding from the University of Idaho, Obert has been able to greatly expand the scope of his program to more than 700 plant crosses annually, accelerated seed production by utilizing winter nurseries in New Zealand and testing at seven main locations across Idaho – Potlatch, Tammany, Fenn, Filer, Aberdeen, Soda Springs and Tetonia – plus cooperative nursery evaluations in Ashton (Univ. of Idaho), Idaho Falls (Anheuser Busch) and Fairfield, MT (Anheuser Busch). This expansion required assembling a top-notch team of support scientists, significant upgrading of planting and harvesting equipment and modernizing their data collection and processing systems.

"These expansions are already showing dividends," says Obert. "We expect to release our first food barley variety later this year with better yields and higher levels of beta-glucan fiber that food manufacturers are seeking. Growers need to be patient, but we think our targeted molecular breeding approach will help us shave at least one to two years off of the time required to develop and release competitive spring barley cultivars. For malting barley, that means 10 to 12 years, instead

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Aberdeen researchers make big advancements in barley breeding *continued from front page*

of 12 to 15 years, from the time of the initial cross to final variety release."

Expansion of winter malting barley breeding – Since 2006, Obert has released ***North America's first two winter malting varieties*** – Charles and Endeavor – which resulted from Darrell Wesenberg's pioneering work on winter malting barley development. These varieties are showing excellent adaptation to key production areas in the Magic Valley and North Idaho. Obert says winter malting barley development has become a central focus of his breeding program for several reasons: the yield gains can be significant (as much as 35% for the Charles variety), less irrigation demand, and more management flexibility for the grower. The real hurdle for a truly successful winter barley program will come when he can isolate the genes for winter hardiness and backcross these into the malt quality traits found in our best spring barley cultivars so that production can expand to our largest growing area in eastern Idaho.

Combining molecular assisted selection with traditional breeding techniques – The other member of this dynamic barley improvement duo is ***Eric Jackson***, who was hired as a research molecular biologist in 2007. Eric earned his Ph.D. in Plant Science with an emphasis in plant pathology and breeding from the University of Arkansas. Eric brings a strong drive, vision and an ability to build collaborative relationships that are adding another important dimension to the center's barley breeding capabilities.

Eric's main research tools are not found in a greenhouse or field nursery, but instead in a high tech laboratory where he employs the most advanced genetic mapping methods to fairly quickly and efficiently "decode" the genetic make-up of Obert's barley germplasm. It almost sounds simple but really involves very precise and complex analytical techniques and evaluations.

Why is this molecular mapping dimension important? According to Jackson, these techniques are generating very specific genetic data on Obert's breeding materials, compared to only the phenotypical data that were known until recently (physical manifestation of specific traits). In other words, he can identify genetic profiles, particularly focusing on the relationships between specific genetic regions and desired traits by using molecular markers or signposts in the barley genome. Knowing sooner and with more precision which lines bring what traits to the table helps Obert make quicker decisions on viable back-crosses that will piece together the desired traits into competitive backgrounds that are better adapted to Idaho's diverse growing conditions. Some traits are more complex and involve multiple genes – like yield and malting quality – which makes Jackson's job more challenging.

Jackson assesses his progress since arriving in early 2007: "We are making incredible progress in mapping the genes involved in beta-glucan fiber component of barley that is important to food markets and good progress in mapping beta-glucanase enzymes that are important to brewing. Other targets of my molecular assisted selection techniques include the enzymes involved in diastatic power that are very important to brewing and tocopherols and tocotrienols (Vitamin E) important to human health."

Besides barley quality, Jackson is also mapping genes involved in disease resistance, focusing on stripe rust and stem rust, which can be potential threats under the right environmental conditions. Although neither disease has been a significant threat in our region, Jackson believes it better to "breed for prevention rather than crisis management."

Looking down the road five years – Jackson's and Obert's goal is to compile a comprehensive catalog of their barley genetic maps that will eventually allow them to ***click on a computer to locate the genes involved in the specific traits they want and use these in molecular back-crosses that should generate new plant material with the desired traits in acceptable agronomic backgrounds in about a third of the time now required under traditional plant-***

UI barley research receives 3rd year of federal grant funding *continued from front page*

Gordon Gallup's farm in Ririe this year to evaluate barley in crop rotation to suppress diseases and nematodes. She also is evaluating Dr. Obert's experimental barley lines to map tolerance to foot rot disease. Some BRD funding is passed through to ARS barley breeder Don Obert, also based in Aberdeen, for barley variety development and improvement (see ARS story).

About 20% of the BRD funds will be awarded as competitive sub-grants to other researchers at the UI and ARS Aberdeen. Some recent research highlights include:

- Effect of seeding rate and seed size on competitiveness of malt barley with broadleaf weeds in organic production systems (Dr. Don Morishita, UI, Kimberly)
- Development of production practices and variety evaluations for novel food barleys in Northern Idaho (Dr. Stephen Guy, UI, Moscow)
- Improving utilization of NIRS to develop rapid characterization of malt and food barley (Dr. Juliet Windes, UI, Aberdeen)
- Expedited development of feed barleys with novel end use traits like low phytate and high beta-glucan (Dr. Phil Bregitzer, ARS, Aberdeen)
- Molecular mapping of malting quality traits (Dr. Eric Jackson, ARS, Aberdeen).

Highlights of the ARS National Small Grains Germplasm Research Facility (NSGGRF)

- 1922 – federal barley breeding program was launched at Aberdeen Research Center that was established by local farmers in 1911 and later purchased by the University of Idaho in 1925.
- 1988 – modern NSGGRF facilities dedicated at current site.
- 2006 – Advanced Grain Genetics Laboratory was dedicated ($5.1 million, 12,000 sq. ft addition).
- Commercial release of North America's only winter malting barley varieties – ***Charles*** was released in 2006 and ***Endeavor*** in 2008. ***Charles*** was approved for malting by the American Malting Barley Association in late 2008.
- Development of environmentally friendly, low phytic acid/high available phosphate barleys – released ***Herald*** in 2006 and ***Clearwater*** in 2007. These barleys improve phosphorous mineral nutrition in monogastric animals while reducing phosphorous run-off in rivers and streams.
- Release of better yielding feed barleys – ***Lenatah*** (2007), ***Tetonia*** (2006), ***Creel*** (2002), ***Criton*** (2002), ***Bancroft*** (2001), ***Camas*** (1998).
- Improvement of rainbow trout production through nutritional, genetic and physiological discoveries. Intensive research on using grain (barley) in fish diets.
- Management of the National Small Grains Collection.

OF MAPS, BARLEY AND HUMANS

Barley and humans have a lot in common – besides the latter liking to drink and eat the former. Both have about the same amount of DNA in every cell and each has about the same number of genes. The human genome is mapped and sequenced, thanks to a huge and expensive international effort. That's like a Google Earth shot of I-84 between Boise and Pocatello with ½ inch resolution. The barley genome is just mapped, but not sequenced. That means only a subset of the total DNA sequence is mapped – a Google Earth shot of same stretch of road with 20 mile resolution. Just a few years down the road we'll have equally good maps of both organisms.

— Dr. Pat Hayes, Oregon State Univ. barley breeder

ing breeding methods. But it will take more time to continue mapping traits of interest and in more barley backgrounds, including the world barley cultivar collection that is housed at the Aberdeen research facility. It also will require more manpower – Jackson and Obert are hoping to piece together the needed funding to hire a bioinformatics expert to help them build this computerized database.

Together, Obert and Jackson are committed to building the best applied molecular breeding program for barley that can be found anywhere in the world. They think it will be well worth the effort. "Using these genetic data to better target the traits that we are seeking means that we will need to make fewer crosses in the future," says Obert, "freeing up resources to evaluate more individual plants within our crossed populations and thereby increase our odds of success. ***At the end of the day it means more timely commercial releases of barley varieties that better meet growers' and end users' needs."***

Producer toolbox – optimizing irrigation and energy efficiencies

Numerous on-line materials are readily available to help barley producers better optimize their irrigation efficiencies while ensuring malt quality. ***Extensive irrigation research has been conducted by Dr. Howard Neibling, UI Extension Water Management Engineer, Twin Falls, ID.***

- "Scheduling the Last Irrigation on Wheat and Barley" is a new UI Extension Bulletin that will be published in summer 2009 and available on the UI drought website at **www.uidaho.edu/extension/drought**. A summary is currently available on this website. This bulletin summarizes research determining 1) conditions for irrigation cutoff on various soils to give little or no yield or quality penalty, and to 2) estimate yield or quality penalty if an earlier irrigation cutoff is required. It also provides a method for determining the economic cost of excessively early irrigation cutoff.
- A collection of malting barley irrigation information and irrigation tools (ET planner, pumping cost calculator) are also be available on the UI drought site.

On-Farm Energy Calculators – USDA NRCS has developed a number of tools for producers to evaluate their on-farm energy and nitrogen use and identity areas for improvement, including: Energy Self Assessment Calculator and Energy Estimators for nitrogen, tillage and irrigation. These farm assessment toolkits can be found on line at **http://nfat.sc.egov.usda.gov**; **http://ipat.sc.egov.usda.gov** and **http://ecat.sc.egov.usda.gov**

Development of winter food barleys for Idaho

Contributed by Dr. Pat Hayes, barley breeder at Oregon State University, Corvallis, OR

The IBC provides partial funding for Dr. Hayes' winter food barley research.

Americans are increasingly at risk of premature death from both cardiovascular disease and diabetes due to our increasing weight, elevated cholesterol, high blood pressure, and abnormal blood sugars. These risk factors are attributable, in part, to a diet low in fiber and high in refined grains, sugars, and saturated fats. Fiber is so vital for good health that the Institute of Medicine recommends at least 25 grams per day for everyone over the age of four.

Barley is a rich source of soluble and insoluble fiber. Beta-glucan, a fraction of the soluble dietary fiber, is the primary component in barley that is responsible for lowering cholesterol. The Food and Drug Administration (FDA) finalized a rule in 2006 allowing barley foods to carry a health claim specific to soluble fiber and coronary heart disease. This renewed interest in barley as a food has led to increased breeding efforts. Two traits associated with the first generation of food barley varieties are hulless grain and waxy starch. Food barley grain that has an adhering hull is "pearled" to remove the hull. While pearling leads to a loss of bran and its nutritional components, the total beta-glucan content is not affected since there is more beta-glucan in the endosperm than in the bran. The jury is still out on whether the hulless (a.k.a. naked) trait is desirable. Hulless varieties may have germination and/or seedling vigor issues that can lead to lower yields, particularly under stressful field conditions. Waxy starch is caused by a shift in the ratio of amylose: amylopectin from 25%: 75% to ~ 5%: 95%. The higher amylopectin content causes the starch to be waxy, and waxy starch varieties usually have a higher beta-glucan content.

One trait that all food barley varieties adapted to the Pacific Northwest have in common is spring habit. This means they do not have sufficient cold tolerance for fall-sowing in Oregon, Idaho, or Washington. There are compelling reasons – including water use efficiency and high yield – for growing winter barley rather than spring barley in this region. Therefore, with support from the Idaho Barley Commission, the Oregon Grains Commission, and STEEP we've focused on the development of winter food barley varieties. Such varieties will need to be cold tolerant, high in beta-glucan, and high yielding in both the dryland and irrigated environments of the Pacific Northwest. Creating a whole new breeding program based on crossing spring x winter varieties and selecting for cold tolerance, yield, and high beta-glucan is facilitated by a combination of molecular and conventional breeding strategies.

We have produced winter experimental lines with all combinations of the following traits: 2-row vs. 6-row; waxy vs. normal starch; and hulled vs. hull-less. The most advanced are three 6-row, non-waxy, hulless lines (OR85, OR86, and OR87) in our Oregon Barley Elite Trial (OBELT). These lines are in replicated trials at Corvallis and Pendleton, Oregon; Aberdeen, Idaho; and Pullman, Washington. If there is interest, we can provide seed for more trials in Idaho and start Breeder's seed production in 2009/10. That would lead to Foundation seed production in 2010/11. The next generation of lines (~ 150) is in trials at Corvallis, Pendleton, and Aberdeen). If there is interest, we could fast-track the most promising to Breeder's seed production in 2010/11 and Foundation in 2011/12. Working backward, the pipelines is full with early generation material and we will start making the next round of crosses this month. For more information on food barley and links to a host of barley food resources and recipes, see the Barley Foods section of **www.barleyworld**. We really appreciate the support and interest of the Idaho Barley Commission for this project.

Timeline for development of winter waxy food barley germplasm using marker assisted selection (MAS).

Time	Generation	Activity
Winter 2006	Parental	Cross spring waxy x winter non-waxy
Spring 2006	F1	Backcross F1 x winter non-waxy
Fall 2006	BC1F1	First cycle MAS. Targets Vrn-H2Vrn-H2 Wxwx
Spring 2007	BC1F2	Second cycle MAS. Target wxwx
Fall 2007 – Summer 2008	BC1F3	One location assessment – head rows
Fall 2008 – Summer 2009	BC1F4	Multi-location assessment – plots
Fall 2009 – Summer 2010	BC1F5	Pre-commercial assessment

Marketing Year 2010 Global Grain Market Outlook

Near-term Market Outlook – choppy price action is expected to continue as markets digest the new crop supply and demand projections, which right now show a bias toward slightly smaller U.S. and world grain supplies and lower ending stocks. The exception is world wheat stocks, which USDA is projecting will continue building unless crop problems surface in some of the major producing markets. On the plus side, outside markets (equities, dollar and crude oil) are becoming less of a drag on commodity trading. Improving investor confidence means more speculative money will continue to flow into commodities, providing upside price potential.

U.S. and Global Brewing Outlook – The global beer industry was under pressure in 2008 as volumes failed to meet forecasts in many markets, and manufacturers faced rising commodity prices and inflation for much of the year. U.S. beer sales volume increased only .6%, while global demand rose about 5% (2007 U.S. sales increased 1.3%). Anheuser-Busch Inc., now a subsidiary of the global Anheuser-Busch InBev conglomerate saw 1.6% domestic growth in 2008, while its closest competitor, MillerCoors' sale volume increased .4%. The craft or specialty beer market segment experienced much better growth, with sales volumes increasing 5.8% in 2008. The overall share of the domestic craft segment has increased to 4% of production and 6.3% of retail sales. 2009 outlook remains cloudy due to the current decline in consumer spending.

U.S. Grain Supply & Demand — USDA, May 12, 2009 (million bu)

	BARLEY		CORN		WHEAT	
	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
Harvested Acres (mln)	3.8	3.4	78.6	79.3	55.7	77.8
Carryin	68	89	1,624	1,600	306	669
Production	239	225	12,101	12,090	2,500	2,026
Imports	30	25	15	15	125	115
Total Supply	338	339	13,740	13,705	2,930	2,810
Food, seed & industrial	170	170	5,040	5,410	1,001	1,033
Ethanol			3,750	4,100		
Feed	65	70	5,350	5,250	250	240
Exports	14	20	1,750	1,900	1,010	900
Total usage	235	240	12,140	12,560	2,261	2,173
End stocks	89	79	1,600	1,145	669	637

World Outlook for Barley in MY 2009-10 (May 12, 2009)

- World barley production is projected to be down 5% to 146.3 MMT. US production is pegged 6% lower at 4.9 MMT.
- World barley supplies are estimated to be 2% higher at 176.5 MMT, due to larger carry-in, while US supplies are also projected 2% higher at 6.8 MMT.
- World barley trade is expected to fall by 6% to 17.2 MMT. US exports are projected to increase 14% to .4 MMT, due to less competition out of the Black Sea region.
- World barley consumption is projected to increase 1% to 144.5 MMT, and US usage is expected to increase 2% to 5.2 MMT.
- World barley carryover stocks are estimated to increase 6% to 20 MMT, while US carryout is projected to fall 11% to 1.7 MMT.

World Outlook for Coarse Grains in MY 2009-10 (May 12, 2009)

- World coarse grain production is projected to fall 2% to 1,082 MMT. The US crop is expected to decline 1% to 323.1 MMT.
- World coarse grain supplies are estimated to be 1% higher at 1,265 MMT, but US supplies are expected to fall 1% to 368.4 MMT.
- World coarse grain trade is expected to increase 3% to 106.4 MMT. US exports are expected to increase 10% to 53.1 MMT.
- World coarse grain consumption is pegged to increase by 2% to 1,093 MMT and is expected to exceed production. US usage also is expected to increase by 2% to at 285.8 MMT, on steady growth in domestic ethanol use.
- World coarse grain carryover stocks are estimated to decrease by 6% to 172 MMT, while US stocks are expected to fall by 27% to 33.2 MMT.

World Outlook for Wheat in MY 2009-10 (May 12, 2009)

- World wheat production is projected 4% smaller at 657.6 MMT. The US wheat crop is expected to decline 19% to 55.1 MMT.
- World wheat supplies are estimated to increase 3% to 824.7 MMT, while US supplies are expected to decline 4% to 73.4 MMT.
- World wheat trade is expected to decrease 8% to 121.8 MMT, due to smaller supplies of feed wheat. U.S. exports are estimated to decrease 7% to 25 MMT, due to increased competition from Canada and Australia.
- World wheat consumption is projected to increase by 1% to 642.3 MMT, and U.S. consumption is expected to increase by 2% to 34.6 MMT.
- World wheat carryover stocks are estimated to increase by 9% to 182.4 MMT. US stocks are pegged to decline 5% to 17.3 MMT.

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