# Breeding Procedure Speeds Up Winter Wheat Variety Development

BROOKINGS — Agricultural producers and waterfowl will benefit from a project at South Dakota State University that uses an innovative plant-breeding technique to shave perhaps two years off the time needed to produce winter wheat varieties for farmers in the Prairie Pothole Region of North America.

Using a technique that has been known since the 1980s but only more recently routinely implemented, breeders are pollinating wheat plants with corn to produce doubled-haploid wheat plants. The technique doesn't produce genetically modified plants or even combine the genes of the two crops because the corn chromosomes are transferred by pollination, a traditional crossing method, and the corn chromosomes, which are the carriers of the genes, are biologically eliminated during development of the wheat plants. In effect, the corn chromosomes act like placeholders that will be replaced by the wheat plant's own chromosomes during the production of the doubled-haploids.

The resulting doubled-haploids are homozygous lines with identical chromosome sets carrying genes originating only from the wheat parent. Consequently, instead of needing approximately six generations of conventional self-pollination, such homozygous lines are produced in only one. This procedure makes it easier and faster for breeders to select for desirable traits and produce finished varieties from those lines.

It's part of a push to produce winter wheat varieties specifically for the Prairie Pothole Region, an area of nearly 300,000 square miles that is home to millions of glacially formed wetlands.

South Dakota State University is one of three area universities involved in a Ducks Unlimited and Bayer CropScience initiative Winter Cereals: Sustainability in Action. The WCSIA initiative seeks to increase agriculture productivity through research and agronomic assistance, while improving the habitat important to North America's waterfowl and other wildlife. North Dakota State University and the University of Minnesota are also involved in the project.

SUBMITTED PHOTO

**South Dakota State University winter wheat breeder Bill Berzonsky, right, and postdoctoral researcher Melanie Caffe are developing winter wheat varieties specifically for the Prairie Pothole Region.**

Winter wheat offers a big advantage to ducks in that it is seeded in the fall, so fields are not disturbed by spring planting operations coinciding with when ducks are nesting. Ducks Unlimited Canada's research shows that 24 times more nests are hatched in fall-seeded crops such as winter wheat and winter rye than in spring-seeded crops.

Bill Berzonsky, leader of SDSU's winter wheat breeding project, said postdoctoral researcher Melanie Caffe is working with him to speed up the process of developing winter wheat varieties by developing doubled-haploids.

"I would say in the traditional way, on average, we're probably talking 10 to 12 years from the initial cross to the final release of the variety. It could even be longer than that," Berzonsky said. "With this technique, my estimation is that it probably cuts off maybe one to two years from the process. You'd think it would cut off a lot more than that but we still need to test the doubled-haploid lines extensively in the field."

Berzonsky said using doubled-haploid lines has been done since about the 1980s — perhaps even longer, given the fact that wheat geneticists have long known about a technique that produces similar results but employs a different pollinator, a wild barley species.

"If you read the literature, there are many different types of pollen that can be used to more or less trick the wheat plant into thinking, at least initially, that it's been self-pollinated. At a certain point, really during the development of the embryo itself, the dividing cells start to eliminate the chromosomes of the other species," he said.

Caffe said the technique needs pollen of another plant species such as corn, and she, too, emphasized that it is not genetic modification in the same manner that produces transgenic or GM crops. The procedure doesn't result in combining the genes of wheat and the other species — it only uses the pollen to induce the wheat to keep its own set of chromosomes, which are later chemically doubled in the last step of the procedure.

"This is not transformation. The aim is to arrive at a homozygous line," Caffe said. "Instead of selfing many generations, in one step we can get to the homozygous stage. We cross the wheat with corn, and the chromosomes from the corn are eliminated from the cells during embryo development. In the dividing embryo cells you are going to have only the one set, the haploid set of chromosomes from the wheat."

Berzonsky said that although one goal is to provide nesting cover and habitat for ducks in the PPR, farmers also benefit from adding winter wheat acres to their crop rotations.

"Increasing the acres of winter wheat is good for the growers for a number of reasons. Winter wheat fits into rotations very well. It's a very nice crop because of the no-till aspects of its production, which should help conserve moisture in areas of drought or potential drought and conserve our soil and water resources."

In addition, growing a fall-seeded crop such as winter wheat can lessen or spread the workload during the spring when most crops are being seeded, and it allows producers to avoid dealing with wet conditions that are frequently present in the period leading up to and including spring planting. Finally, winter wheat often produces a higher grain yield than spring wheat because it is already at an advanced growth stage by the time spring wheat is just being planted. This allows the growing plants to take advantage of moisture deposited as snow in the winter and avoids warmer air temperatures during the flowering and grain-fill periods.

Blake Vander Vorst, Ducks Unlimited senior agronomist, said the implementation of the doubled-haploid plant breeding technique at SDSU is an exciting first step to increase the efficiencies of the winter wheat breeding programs in the PPR.

Alan Ayers, Bayer CropScience director of state affairs, agreed. "Improvement in traits such as cold tolerance, disease resistance and grain quality will pay big dividends for growers in the PPR and other regions in the future," Ayers said.

# Help Keep Cattle Comfortable In High Heat

PIERRE – Recent prolonged high temperatures and above-average humidity have created unfavorable conditions for South Dakota livestock. Livestock owners are encouraged to continue efforts to keep cattle and other livestock comfortable using all available resources. Cattle with dark hides, fat cattle, and ill animals are all at greater risk of heat stress. Once heat stress sets in, preventative measures are less effective.

"Producers should be on the lookout for signs of heat stress, such as elevated breathing rate, open-mouth breathing, and excessive drooling or foaming," said Dustin Oedekoven, State Veterinarian. "Producers should contact the Animal Industry Board or their local veterinarian if they have increased death loss or have questions regarding heat stress."

The South Dakota Department of Agriculture, the Animal Industry Board and South Dakota State University recommend the following measures:

• Avoid moving livestock unless absolutely necessary. If cattle must be handled, plan to complete the work as early in the morning as possible.

• Ample water should be made available under shaded areas, when possible. Cattle may consume as much as 50 percent more water during hot weather to regulate their body temperatures. Cattle will drink more water if the water temperature can be maintained below 80 degrees. Sprinklers may also help keep cattle cool and producers should use large droplets, because a fine mist can add to the humidity. In addition, pen mounds in the feedlot should be wet down in the evening to allow cattle a cool place to lie down and dissipate body heat.

• Shade should be provided in well-ventilated areas. It is important that a sufficient area of shade is available so the cattle don't bunch up while competing for cool spots. Airflow may be obstructed by vegetation, buildings, haystacks or windbreaks. Biting insects also should be controlled to reduce stress.

• Cattle produce metabolic heat from digestion. Changing feeding patterns so that a majority of the feed is provided after the heat of the day will assist in keeping cattle cool.

"By taking the appropriate measures, cattle producers can help their cattle make it through this heat spell with minimal stress. Keeping a close eye on their cattle will also alert producers if cattle start experiencing heat stress," added Walt Bones, South Dakota Secretary of Agriculture.

Agriculture is South Dakota's No. 1 industry, generating nearly $21 billion in annual economic activity and employing over 143,000 South Dakotans. The South Dakota Department of Agriculture's mission is to promote, protect, preserve and improve this industry for today and tomorrow. Visit us online at http://sdda.sd.gov or follow us on Facebook.

## Is Your Native Grass Stand Behind?

BROOKINGS — Many landowners who planted CRP acres the end of May, may be wondering why their native stand isn't growing like they expected.

Don't worry, the weather is to blame, says Jason Tronbak, conservation specialist for Millborn Seeds, Brookings.

"Native grasses thrive in warm, sunny weather; they don't do well in cool, wet weather, which was the forecast for May and much of June," said Tronbak, who works with landowners to establish conservation acres and wildlife habitat on their land. "Now that the sun is out, landowners can expect their stand to make up for lost time."

Control Weeds in CRP with Plateau Even though native species didn't thrive in the cool, wet weather, several weed species did just fine.

"Slow stand establishment can lead to weed issues quickly," Tronbak said.

To prevent weed issues next spring, he encourages landowners to consider applying Plateau, a pre-emergent herbicide that works to control annual broadleaf and grasses in native grass and forb stands. Contact Tronbak to learn more about how to utilize Plateau to control weeds next spring,888-498-7333 orjasont@millbornseeds.com.

## Improve Soil Health With Cover Crops

BROOKINGS — Improving soil health is a primary focus for Mark Weinheimer, 36, who farms wheat, corn and sunflowers west of Onida.

"Ultimately the health of everything starts with the soil," said Weinheimer. "I am always looking for ways to build overall soil health which does so many good things that will make our entire cropping system healthier."

Running a no-till operation since the early 1990s, Weinheimer says cover crops are the next step in his mission to improve soil health.

"We're trying to take our soil to the next level," he said.

Cover crop mixtures provide many soil health benefits, says Justin Fruechte, forage and cover crop specialist for Millborn Seeds, Brookings.

"They prevent soil erosion, increase water absorption, create organic matter, fix nitrogen and increase the diversity of soil microbes to improve plant nutrient absorption," Fruechte said.

Two years ago Weinheimer began adding a cover crop mixture to his cropping rotation. He plants a cover crop mixture between his winter wheat and corn rotation and this spring he planted a cover crop ahead of planting sunflowers.

"We typically plant sunflowers June 15, so in the past a good portion of the growing season the ground is idle. I knew I wouldn't get a lot of growth from the cover crop, but I wanted to add some nitrogen to the soil after the corn," Weinheimer said.

When he works with Fruechte to put together a cover crop mixture, he selects mixes to be as diverse as possible — containing at least five different plant species.

"When you look at the native range, there's a large diversity of plants. Plant diversity increases the soil health," Weinheimer said.

Weinheimer adds that increasing the soil health naturally reduces the need for costly inputs.

"The days of cheap fertilizer are over. When we apply fertilizer we're filling a nutritional void in the soil biology that the crop needs. Why not try to fill that void by increasing the soil health through cover crops," Weinheimer said.

Fruechte says that if landowners want to take advantage of the many benefits cover crops provide to boost soil health, July is a good month to plant a mixture on wheat stubble or idle acres.

To learn more about how cover crops can increase your soil health, contact Justin Fruechte at 888-498-7333 or justinf@millbornseeds.com.

# USDA Invites Value-Added Producer Grant Applications

WASHINGTON — Deputy Agriculture Secretary Kathleen Merrigan today announced that applications are being accepted for grants to provide economic assistance to independent producers, farmer and rancher cooperatives and agricultural producer groups through the Value-Added Producer Grant Program.

"By creating value-added products, farmers and ranchers can expand economic opportunities, create jobs and keep wealth in rural communities," Merrigan said. "These funding opportunities will promote business expansion and entrepreneurship by helping local businesses get access to capital, technical assistance and new markets for their products and services."

Application deadline is Aug. 29, 2011. For further details about eligibility rules and application procedures, see the June 28, 2011, Federal Register.

Value-Added Producer Grants may be used for feasibility studies or business plans, working capital for marketing value-added agricultural products and for farm-based renewable energy projects. Eligible applicants include independent producers, farmer and rancher cooperatives, and agricultural producer groups. Value-added products are created when a producer increases the consumer value of an agricultural commodity in the production or processing stage.

In June, the President signed an Executive Order establishing the first WHRC chaired by Agriculture Secretary Tom Vilsack. To better coordinate Federal programs and maximize the impact of Federal investment, the White House Rural Council will work throughout government to create policies to promote economic prosperity and a high quality of life in our rural communities.

USDA, through its Rural Development mission area, administers and manages housing, business and community infrastructure and facility programs through a national network of state and local offices. Rural Development has an existing portfolio of more than $150 billion in loans and loan guarantees. These programs are designed to improve the economic stability of rural communities, businesses, residents, farmers and ranchers and improve the quality of life in rural America.

Visit http://www.rurdev.usda.gov for additional information about the agency's programs or to locate the USDA Rural Development office nearest you

# S.D. Farm Bureau Opposes Clean Water Act Expansion

The South Dakota Farm Bureau Federation has filed comments opposing an effort by the Environmental Protection Agency and the U.S. Army Corps of Engineers to expand their jurisdiction over virtually all water, everywhere.

Last May the two agencies proposed "guidance" to clarify how they will identify "waters of the United States" to be protected under the Clean Water Act. While the agencies stated the move "will improve CWA program predictability and clarity regarding the scope" of the act, Farm Bureau objected because it expands the regulatory reach of the federal government.

"By issuing a 'guidance,' the process skirts the regular rule-making protocol, goes far beyond what Congress has authorized, and defies the majority opinion of the United States Supreme Court," wrote SDFB President Scott VanderWal.

Farm Bureau attributed the success of the Clean Water Act over the past forty years to its structure of shared responsibility between federal and state governments. Under the CWA, states have primary responsibility for establishing the goals or "water quality standards" for navigable waters, and states have exclusive power to determine how and when to achieve those goals through regulatory or voluntary programs.

"The shift in policy proposed by this guidance document would mean that EPA could regulate any or all waters found within a state, no matter how small or seemingly unconnected to a federal interest. Such a boundless approach represents a significant rewrite of current regulations, and is inconsistent with what Congress intended, what the Supreme Court ruled, and what sound science would dictate," he wrote.

VanderWal's comments concluded, "We support enforcement of state and local environmental protection laws. We do not support a backdoor approach that would usurp the authority of the states to regulate non-navigable waters, authority they have had since the CWA was adopted nearly forty years ago. The unfettered regulatory expansion proposed in the "guidance" is unfounded and ill-conceived."