6-18-1999

CropWatch No. 99-14, June 18, 1999

Lisa Brown Jasa
University of Nebraska-Lincoln, ljasa@unlnotes.unl.edu

Follow this and additional works at: http://digitalcommons.unl.edu/cropwatch

Part of the Agriculture Commons

http://digitalcommons.unl.edu/cropwatch/195

This Article is brought to you for free and open access by the Extension at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Crop Watch by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.
From less oil and gas to more protein

New lines of specialty soybeans respond to consumer wants

Specialty or value-added soybean varieties are grown on thousands of acres in Nebraska as an alternative to conventional soybean. Determining whether these products should become part of your farming operation is not a simple task and requires weighing the risks and rewards of each. Knowing the unique characteristics of these products and the special management and marketing they require can aid in making the right decision. (Familiarity with specialty soybean production and marketing requires an understanding of the terms “output trait” and “GMO”, as discussed in the June 4 Crop Watch.)

This article will describe the genetics and breeding behind the development of some specialty soybean types to increase your familiarity with the unique attributes of these varieties.

Specialty soybeans: genetic modifications for seed traits

Genetic modifications for input traits have had a big impact on Nebraska soybean production based on the acres of Roundup Ready and Balance causes concern for some as plants temporarily appear ‘bleached’

In the last few weeks there have been several reports of corn injury from the use of preemergence herbicides including Balance. This is the first year Balance has been used and its mode of action may not be clearly understood. Few can argue against the exceptional weed control offered by Balance, but the widespread crop response and injury is concerning some producers. Understanding how Balance works and the difference between crop response and crop injury may help producers understand and respond to what they are seeing in their fields this year.

This spring has been very cool and wet across most of the state. This has caused much of the corn crop to come up very slowly. Because the corn has emerged slowly, the plants have been in contact with preemergence herbicides for a much longer time. The corn plants have taken up much

(Continued on page 126)
Field updates

Tom Dorn, Extension educator in Lancaster County: Wheat is beginning to turn color, with yield potential being very good on fields with adequate fertility. Some tan spot has been reported in fields planted into last year’s wheat stubble, but the incidence of disease is generally late enough to have only a minor effect on yield. Leaf rust has been reported, but it’s too late to reduce yield much. Most corn has fifth to sixth leaf collar showing and generally looks good. It has been so windy that some Roundup Ready corn has still not been sprayed. I visited one corn field this week which will have to be replanted because black cutworms had damaged a significant percentage of plants by eating into the growing point below ground level. Few cutworms were still in the field.

Gary Zoubek, Extension educator in York County: We’ve continued to receive plenty of moisture: about 3 inches in the York area last Wednesday, with 5-6 inches in some spots and reports of up to 10 inches. We also had some hail that stripped the plants and caused stand loss in both corn and soybeans. In addition, the rain caused considerable erosion and water damage to crops. It will be difficult to get back into some flooded fields to replant. The crop will really take off once we receive some sunshine and warm weather. Producers are working to try and get the fields cultivated in a timely fashion.

Terry Gompert, Extension educator in Knox County: The alfalfa weevil problem was the worse that I’ve seen in 16 years. Alfalfa is now starting to grow, however, even without chemical control. Rains were heavy in places and lacking in other places. That is typical of this time of year. There has been some difficulty with herbicide and cultivation on crop.

Ralph Anderson, Extension Educator in Buffalo County: We are seeing some ECB egg masses, some corn rootworms (some surprisingly large, up to 4th instar) and plenty of army cutworm moths (in homes, garages and shops). Most planting (and replanting) is completed. Corn is growing rapidly and with it, the annual concern for completion of hilling before the corn gets too big. Some of the Isoxaflutole (Balance and other combinations) treatments that showed early injury and then recovery, went backwards again and will probably limit yields on high pH clay spots in hilly pivots. Weed control appears to be excellent.

Ray Weed, Extension educator in Kimball and Banner counties: Winter wheat here is flowering. Many producers are rope wicking volunteer rye in spots missed previously in winter wheat fields. The rye began anthesis earlier than the wheat, which is typical, so it’s important to kill the volunteer rye right before seed set.

The corn crop is growing rapidly with warmer soil and air temperatures. Many acres of dryland sunflowers were planted this year due to contracted acres providing a relatively decent price in comparison to other cropping options.

Crop Watch is published from March to November by the University of Nebraska Institute of Agriculture and Natural Resources Communications and Information Technology, PO Box 830918, 108 Agricultural Communications Bldg., UNL, Lincoln, NE 68583-0918. To order either a printed or electronic (web) subscription or to change your address, write to Crop Watch at the above address or call (402) 472-7981. A sample copy of the Web version is available free at http://www.ianr.unl.edu/cropwatchnews

Lisa Jasa, Editor
Email: ljasa1@unl.edu

For more information about a particular subject, write the authors at the addresses below:

UNL Department of Entomology
202 Plant Industry Bldg.
Lincoln, NE 68583-0816

UNL Department of Agronomy
279 Plant Science Bldg.
Lincoln, NE 68583-0918

UNL Department of Plant Pathology
406 Plant Science Bldg.
Lincoln, NE 68583-0722

UNL Department of Agricultural Meteorology
236 L.W. Chase Hall
Lincoln, NE 68583-0728
more herbicide than they can metabolize, resulting in a much greater than usual plant response.

Balance is a pigment inhibitor that attacks the dividing cells in new plant tissue. Weeds which have been treated generally are devoid of chloroplasts and unable to photosynthesize. This is evident in the dramatic bleaching response in most affected weeds. Because this response is so conspicuous, it’s easy to see a crop response to Balance. The cool, moist spring weather has caused many corn plants to take up an excessive amount of Balance, faster than it can degrade the chemical within the plant. This has caused the plant to respond with bleached and yellowed leaves. For the most part, this should decrease in severity in 10 to 15 days. In some areas, however, the corn has actually died. This injury is unexplainable but probably due to a number of factors interacting with the weather including soil pH, seed depth, soil type and proper mixing of Balance in the spray tank. It is important to understand the difference between injury and crop response. Most studies have shown that crop response is temporary and has no significant effect on yield; however, injury does affect yield if it is severe enough.

We caution producers not to jump into replanting a site simply because they have a response to preemergence herbicides such as Balance. Obviously dead is dead, and some producers have been left with no other option. For most sites in question, the corn should grow out of most symptoms with little or no impact on yield. In some areas including south central Nebraska, the injury has been more prominent. Although University studies have not shown this crop injury, the University of Nebraska is looking into occurrences. Rhone-Poulenc also is examining the interactions responsible for the crop injury.

**Jeff Rawlinson, Extension Technologist, Weed Science**

### Manure reduces sidedress needs

Last year three area farmers learned how to save over $9 an acre on corn and still get top yields. All they did differently was to adequately credit the nitrogen in the manure they applied to their fields.

"With sampling the manure and watching the crop, we see that manure has more nutrient value than we thought," commented Marvin Stech of rural Osmond.

Stech, along with Robert Dickey of Laurel and Harley Greve of Wakefield, planted a nitrogen test plot on their farms. Cooperative Extension and the Lower Elkhorn Natural Resources District co-sponsored the plots. Each farmer applied manure before planting and starter fertilizer at planting. Stech and Dickey also applied nitrogen with the pre-emergence herbicide on their irrigated fields. Greve’s field was dryland corn. All plots were on loam or silt loam soil.

After taking pre-plant residual nitrate soil tests and estimating nitrogen from the manure, the University of Nebraska Soils Laboratory recommended that more nitrogen was not needed. To test this, each farmer applied three rates of additional nitrogen at sidedress time, such as 0, 50, and 100 pounds per acre in randomized test plots the length of the field. Each nitrogen rate was replicated four times in

**Insect update**

Bob Wright, Extension entomologist, South Central Research and Extension Center (SCREC): As of June 15 rootworm egg hatch had not been observed at the UNL Agricultural Research and Development Center near Ithaca. Initial hatch was observed at SCREC near Clay Center on June 4. This delay in eastern Nebraska presumably is due to differences in soil temperatures between the two locations, and points to the need to base treatment timing on local conditions.

European corn borer moths have been active for a couple of weeks in many parts of eastern Nebraska. Some larval feeding should be observable in the field. With the spread of corn planting dates in some locations, remember that corn borer moths will lay more eggs in the taller corn in an area. These fields should be checked first as they are the most likely to be damaged. Base treatment decisions on the number of live larvae, not on the amount of feeding damage. See the June 4 Crop Watch for a worksheet to calculate whether treatment is justified.

Ron Seymour, extension assistant, integrated pest management, West Central Research and Extension Center: I have received several calls this week concerning slow regrowth in alfalfa. These fields had moderate levels of alfalfa weevil grubs prior to first cutting. The adult weevils have begun to emerge from their pupation chambers and are now feeding on the regrowth. Several of these fields required treatment.

The European corn borer moth flight has increased significantly with female moths evident the last few nights. First and second instar corn rootworm larvae are being found in area corn fields. Rose chaffers have begun to emerge, causing damage to homeowners trees, shrubs and flowers.

(Continued on page 129)
STSSoybean grown. Output trait variation has had less influence on soybean production. Some farmers have benefitted from the opportunity offered by these products and many more will have the potential to benefit when product development and market demand meet. Understanding these output traits and their impact on management and marketing will help producers assess their potential for an individual farming operation.

**Quantitative variation in seed traits**

The key to specialty soybeans is the identification of genetic variability that influences seed composition. Protein and oil are the valuable components in the soybean seed. With conventional soybeans, protein accounts for about 40% of the seed and has the most value; oil is about 20%. The relative percentages of protein and oil can change considerably from both genetic and environmental variation. This quantitative genetic variation is controlled by many genes in the soybean plant. By identifying parent lines with the desired genetic variation, soybean breeders have made the proper crosses and selected for either higher protein percentage or higher oil percentage. A result of breeder selection for quantitative variation in protein has been the development of high protein, food grade soybean varieties. These specialty types are marketed to domestic and international buyers for human food uses such as tofu production.

An additional quantitative trait associated with food grade soybean varieties is seed size. Larger or smaller seed size can be selected in parents and more extreme seed sizes identified in offspring. The challenge to the plant breeder is to select for seed composition traits in addition to agronomic performance and yield.

**Qualitative traits, single genes with specific effects**

Seed composition can be altered dramatically by changes in single genes. These genetic changes alter the types of proteins, oils and carbohydrates made rather than the total amounts of each component in the seed protein. A good example of a single gene change that has improved food grade soybeans is the identification of lipoxygenase-null mutants. Lipoxygenase is a protein made in soybean seeds that works as an enzyme and is responsible for the “gassy or “beany” flavor of soy foods. A “null” mutant is a soybean line that cannot make the lipoxygenase protein because of a naturally occurring alteration in a single soybean gene. The change prevents the gene from encoding the lipoxygenase protein, creating a better flavor in products using this soybean.

The connection between genes, proteins and traits has also resulted in genetic alterations for seed carbohydrate and seed oil composition. An important seed carbohydrate change in soybean is the reduction of raffinose and stachyose. These molecules are carbohydrate chains built in the seed by linking sugars to sucrose. The digestive system of many animals, including humans, does not break down raffinose and stachyose. The immediate result of this digestive failure is intestinal gas production. Excessive flatulence is not a good

(Continued on page 127)
Specialty soybeans (Continued from page 126)

trait to have associated with a food product. To help remedy this problem, geneticists have subjected soybean lines to a mutagen to induce genetic changes in selected plants that were less effective in building raffinose and stachyose from sucrose. The single gene mutation identified from this work causes soybean to have 40% more sucrose and 90% less raffinose and stachyose. Incorporating this altered gene into “high sucrose” soybean lines has resulted in an improved food product. The high sucrose varieties available yield less than conventional varieties but farmers have been paid a $1.60 per bushel premium to compensate for yield drag. The degree of yield drag is greatest in the most productive environments. Agronomists familiar with high sucrose soybean suggest that planting on ground with an intermediate production potential results in the best placement for economic return.

Genetic engineering is also used to create single gene changes to influence soybean seed composition. Such change could benefit people who want a soybean oil with less saturated fat and more oleic acid. The enzymes that convert saturated to unsaturated oils are called desaturases and genetic engineers have introduced a modified desaturase gene into a soybean line to alter oil metabolism. The genetic engineering process has been successful in producing soybeans with more than 80% of their oil as oleic compared to the 23% for conventional soybean. This product meets the needs for both food and industrial uses. Selection and crossing by breeders has produced varieties with yields that compare favorably to conventional soybean.

Markets and GMOs

In many cases, buyers willing to pay more for specialty soybeans will need to have non-GMO products. This will be especially true for human food products that have an international market. These market restrictions can limit the search for genetic variation in seed traits to naturally occurring and induced mutations in soybean genes. This also dictates the crossing strategy used by the breeder as the desired output traits are integrated into varieties that have input traits which complement production. Technical restriction on specialty soybean development may change if genetic engineering becomes more widely accepted.

Experts in the specialty soybean area believe we are just beginning to learn how these alternatives will best fit into our food production systems. Continued efforts by the geneticist and plant breeder will bring improved specialty varieties. Ultimately a producer will need to learn where to find a match between these specialty varieties, production environments on their farm, management practice and a marketing opportunity with a net financial benefit. Mastering the terminology and understanding the genetics behind specialty soybeans is a start.

Don Lee
Professor of Agronomy

Precipitation from June 6 to June 13, in inches
Monarch butterflies and Bt corn

ISU entomologist addresses the issues

Concerns over the effects of Bt corn on monarch butterflies came to the forefront several weeks ago when newspapers printed a report on research findings from Cornell University in New York. This week Marlin Rice, an Extension entomologist at Iowa State University, addressed the study in the ISU Integrated Crop Management newsletter. The following abridged version is reprinted with permission from Dr. Rice. To see the original check out his web site at http://www.ipm.iastate.edu/ipm/icm/1999/6-14-1999/monarchbt.html

A study from Cornell University in New York was recently published in the science journal Nature and suggests that pollen from Bt corn may have toxic effects on larvae of the monarch butterfly. The caterpillar, or larval stage, of this insect feeds on milkweed. Because some milkweed grows next to corn in the Midwest, there is the potential that Bt corn pollen may drift onto milkweed and affect monarch larvae. The Cornell study has generated a tremendous amount of coverage in the national media because of the potential clash between biotechnology and wildlife. It’s estimated that this year 30% of the planting in the Corn Belt was to Bt corn. This article answers several questions related to Bt corn and its impact on monarchs.

What did the study report?

First, the Cornell researchers found that after four days, 44% of the monarch larvae that fed on the Bt-pollen-coated leaves had died. No caterpillars died that ate leaves dusted with regular corn pollen or the control leaves. Second, leaf consumption by the larvae was much less on the Bt-pollen-dusted leaves. Third, larvae that survived on Bt-pollen-dusted leaves were less than half the size of larvae that fed on leaves with no pollen. However, the size of larvae that fed on leaves dusted with nonBt pollen was not reported. The study did not include the pollen dosage per leaf.

Have other studies examined the effects of Bt pollen on monarchs?

Iowa State University entomologist John Obrycki and graduate student Laura Hansen conducted a field study to examine Bt pollen effects on the monarch. They placed potted milkweed at several distances from the field edge in a Bt cornfield and nonBt field. The highest concentration of pollen was found on plants within the cornfield. Leaf samples were taken from the milkweed within and adjacent to the field and used to assess mortality of newly hatched larvae. Within 48 hours, there was 19% mortality in the Bt corn pollen treatment compared with 0% in the nonBt corn pollen treatment, and 3% in the control, which had no pollen. This study is ongoing and will continue during this year.

Is Bt corn a serious problem for monarchs?

Both studies suggest that some, but not all, monarch caterpillars may be killed when they eat Bt corn pollen. No studies have been conducted to assess the actual mortality of monarchs on milkweed near cornfields.

It is also not known to what extent monarchs will lay their eggs near Bt cornfields. In the book, The Monarch Butterfly, F.A. Urquhart states that monarchs locate milkweed by sight and prefer to lay their eggs on small milkweed plants 3 to 18 inches high. It is unlikely that very many eggs will be laid on milkweed in tall corn. The potential problem with Bt pollen is that it can drift and land on milkweed outside a cornfield. Corn pollen is relatively heavy, however, and only about 30% of it drifts farther than 8 meters (26 feet). Monarchs feeding on milkweed closest to a Bt cornfield would be most likely to suffer the greatest.

Is all Bt corn pollen harmful to monarchs?

The answer to this question is not known. Five genetic events have been registered with the Environmental Protection Agency (EPA) for use in corn. Information in the EPA Pesticide Fact Sheets shows the concentration of Bt protein (expressed as micrograms per gram of pollen) ranges from 7.1 micrograms per gram in one genetic event to presumably 0.0 micrograms per gram in another event because the protein could not be detected. Only two types of Bt corn pollen were...
Monarches and Bt corn (Continued from page 128)

used in the Cornell and Iowa State studies — Bt 11 and event 176, respectively. Therefore, it is not known how pollen from other Bt events might affect monarchs.

Are there any potential benefits to monarchs from the use of Bt corn?

Results from 3,334 Bt corn producers in a 1997 survey from six states showed that 29.5% of these farmers were planting Bt corn with the intent of eliminating insecticide use for European corn borer control. During a five-year period (1991-1995), 30.6% and 15.3% of the Bt corn producers had used insecticides for first- and second-generation control, respectively. The average number of years (out of five) that they had used insecticides against European corn borers was 2.6 and 2.4 years, again for first and second generations, respectively. When asked about insecticide use for European corn borer control during 1997, 19.3 percent said insecticide use against this pest decreased and only 5.5 percent said it increased. A reduction in broad-spectrum insecticide use should benefit not only the monarch but also many other insect species.

Are there other hazards to monarch survival and is it becoming endangered?

The World Wildlife Fund states that the largest threat to the monarch butterfly is human activities within butterfly wintering grounds (in Mexico), particularly habitat destruction and alteration by logging. Some researchers have suggested that the spraying of herbicides for weed control may consequently be endangering the habitat and food source of the monarch. Other factors also affect its mortality.

The monarch butterfly is neither an endangered nor threatened species in the United States. It is an abundant and widespread insect that ranges from central Mexico to southern Canada.

What should farmers do?

Nothing can be done in the field at this time. If monarch mortality becomes a concern on the farm, the impact of planting Bt corn can be reduced next year by planting the border rows and end rows to a nonBt corn hybrid, thereby effectively moving the Bt hybrid away from the field edge. This planting pattern would reduce the amount of Bt pollen that drifts out of the field and onto nearby milkweed. Border and end-row planting also could serve as part of the European corn borer refuge that is necessary for helping to delay the development of European corn borer resistance to Bt corn.

What is the bottom line?

The monarch and Bt pollen research is still preliminary, but it does indicate that caterpillars may be affected by Bt pollen. More research is needed on the effects of Bt corn on monarchs and possibly other nontarget species. Bt corn has proven to be a valuable pest management tool for the corn producer. It provides nearly 100% European corn borer control, protecting the crop from a yield loss and reducing insecticide use.

Marlin Rice
ISU Extension Entomologist

Manure credits (Continued from page 125)

Manure credits (Continued from page 125)

Manure credits (Continued from page 125)

None of these three trials responded with any significant yield increase compared to the lowest rate of nitrogen applied. The additional expense of applying the extra nitrogen decreased profit. Applying more nitrogen than recommended means more nitrogen is in the soil than the crop can use, which potentially can be leached below the root zone.

The analysis uses $1.90 per bushel corn, $0.15 per pound anhydrous ammonia, and $0.24 per pound UAN solution, and excludes these costs: nitrogen application (up to $6.85 an acre), drying, shrink, and hauling.

Charles Shapiro, Extension soils specialist at the Haskell Agricultural Laboratory at Concord, reviewed the results. “The use of nitrogen credits from manure reduces the need for applying some nitrogen,” Shapiro said. “Once the crop’s nitrogen needs are supplied by manure, fertilizer or other sources of nitrogen will not increase yields or profit.” Seeing is believing for these farmers. For more details on the test plots, contact Dick DeLoughery at the Northeast REC at Norfolk, 402/370-4000.

Dick DeLoughery
Extension Water Quality Education Coordinator

<table>
<thead>
<tr>
<th>Manure</th>
<th>Recommended Nitrogen Plus 50 Corn Yield (bu./A.)</th>
<th>Plus 100 Corn Yield (bu./A.)</th>
<th>Net $/acre loss with additional nitrogen compared to the recommended rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedded hog</td>
<td>Dickey</td>
<td>202</td>
<td>203</td>
</tr>
<tr>
<td>Liquid hog</td>
<td>Stech</td>
<td>193</td>
<td>194</td>
</tr>
<tr>
<td>Poultry</td>
<td>Greve</td>
<td>163</td>
<td>164</td>
</tr>
<tr>
<td>Average</td>
<td>Average</td>
<td>186</td>
<td>187</td>
</tr>
<tr>
<td>-$19.01</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The analysis uses $1.90 per bushel corn, $0.15 per pound anhydrous ammonia, and $0.24 per pound UAN solution, and excludes these costs: nitrogen application (up to $6.85 an acre), drying, shrink, and hauling.
Be alert to the danger; poison hemlock abounds this year

Undoubtedly many of you have seen the large display of tall plants with green leaves and large clusters of small white flowers while driving throughout central and eastern Nebraska. The unusually high moisture this spring provided ideal habitat for poison hemlock, *Conium maculatum*. Because this plant is so prevalent this season, producers should be aware of the dangers surrounding it.

Poison hemlock is a biennial forb that was introduced from Europe. Hemlock is now flowering in Nebraska and will continue to do so throughout July. Poison hemlock is one of the most poisonous of all flowering plants. It contains several alkaloids that, when consumed in even small doses, can be lethal. Ingestion of as little as 0.25 percent of an animals body weight of poison hemlock is lethal.

Poison hemlock is identified by alternate fern-like leaves which are divided into lobes of lanceolate leaflets. Each leaflet is toothed or highly divided. The leaf surface is smooth and hairless. The petioles of lower leaves are sheathing. Stems are hollow, erect and green with purple blotches. Poison hemlock sends out a long taproot, characteristic of biennials. The flower is white with notched petals, growing in small clusters. Poison hemlock is found growing along roadsides, moist shaded areas and along riparian areas.

Fortunately, hemlock is not palatable so livestock will not consume it readily unless they are very hungry or if the plants are altered. Thus, the best strategy to reduce poisoning is to avoid overgraze or even reduce the stocking rate in infested pastures which will decrease the likelihood of livestock consumption. Fencing

chemical control of hemlock in pastures as herbicides such as 2,4-D can increase palatability causing livestock to graze treated plants. As plants mature, they remain highly toxic with the roots containing the highest concentration of alkaloids followed by the vegetative material. Mechanically removing plants may work as long as the cut dry matter is removed from livestock access. Dry plants on the ground or in hay may still be toxic.

Poison hemlock is a plant we have lived with for several years. Be aware of its abundance this year and how to deal with it. Also, teach children to stay clear of poison hemlock as well. Taking precautionary measures may reduce the likelihood of problems with this highly poisonous plant.

Jeff Rawlinson
Extension Technologist Weed Science
Bruce Anderson
Extension Forage Specialist

From April 1 to June 13, percent of normal precipitation