2005

Crop Watch No. 2005-3, March 25, 2005

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

CROP WATCH

University of Nebraska Cooperative Extension
Institute of Agriculture and Natural Resources

University of Nebraska Lincoln

No. 2005-3, March 25, 2005

In winter wheat

Potential for early rust may warrant fungicide

Leaf rust overwintered in some winter wheat fields in southern Nebraska and could become a significant production factor this year.

Last fall's weather was quite favorable for wheat growth. Some wheat planted in mid-September, particularly in west central and south central Nebraska, put on extensive growth -- as much as 8-10 inches in some fields -- before winter. A recent survey of wheat fields found that because of the excessive fall growth, these fields are showing significant cold temperature dieback. Fields in Lincoln, Keith, Perkins, Chase, Dundy, Hitchcock, Furnas, Harlan, Franklin, Webster, Nuckolls, Thayer, Jefferson and Gage counties were surveyed.

In general the wheat crop looks normal for mid-March. The stands are generally good with some variation in growth and color. Wheat in the west central area north of Imperial shows considerable yellowing due mostly to the tips of the leaves showing dieback due to cold temperatures. Some yellowing is probably due to a lack of nitrogen; however, in these fields the overall health of the wheat is good. Plants that were sampled had healthy crowns and roots, indicating that root and crown rot was not present. Wheat along the Kansas border had more growth than that north and did not show the extensive yellowing. One field in south central Nebraska showed symptoms of either soil-borne wheat mosaic or wheat yellow mosaic (spindle streak). Affected plants were in a drainage area which is where you would expect to find symptoms of these diseases.

Overwintering rust

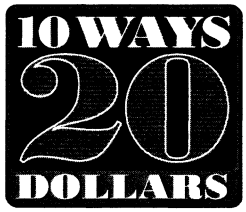
Some fields surveyed had orange leaf rust pustules on the lower leaves. This is unusual since leaf

(Continued on page 23)

Inside

Assess potential and target wireworm treatments to save costs

With planting season quickly approaching, assessing the potential for wireworms can help determine whether treatment is warranted and possibly save you an unnecessary expenditure.



Wireworms, the larvae of click beetles, cause damage in corn fields by feeding on seed prior to and shortly following germination. Feeding also may continue after emergence as wireworms tunnel into the lower stalk of corn plants. Damage is usually visible as irregular patches of thin plant stands.

Integrated pest management for wireworms is one of the topics in the "Ten Easy Ways to Boost Profit $20 an acre" program. You may be able to reduce production costs by $5 an acre or more by focusing seed and soil treatments where the risk is greatest. UNL insecticide efficacy trials have

(Continued on page 24)

Ag briefs

Monsanto, UNL to develop dicamba-tolerant crops

The University of Nebraska - Lincoln and Monsanto Co. have signed an exclusive licensing agreement to develop crops tolerant to the broadleaf herbicide dicamba. This agreement is based on discoveries by UNL plant scientists. Biochemist Don Weeks and colleagues identified a gene that can make dicamba-sensitive crops such as soybeans tolerant to the widely used herbicide. The University has several patents pending on this discovery.

After a competitive process the university granted exclusive license to Monsanto to integrate this trait into high-yielding commercial crop lines. University scientists will provide technical support to move this technology from the lab to field as soon as possible, said Prem Paul, UNL vice chancellor for research.

Product commercialization is not expected until the first part of the next decade. For more inforamtion on UNL's research, see *CropWatch* on the web at *http://cropwatch.unl.edu*

Vicki Miller, IANR News Service

Market Journal

This week's **Market Journal** broadcast will feature an interview with Alex Martin, Extension weeds specialist, on early season weed control. Cooperative Extension's television for ag business decisions, Market Journal is available by satellite, NET, or on the Web.

Watch or listen on the web using RealPlayer as host and Agricultural Economics Specialist Doug Jose visits with farm and ranch specialists. Market Journal also is available on NET at 6:30 a.m. Saturdays and on NET2 at 9 a.m. on Sundays. For more sources and information, see *http://marketjournal.unl.edu*

Field update

Bill Booker, Extension Educator in Box Butte County: The wheat crop is looking good throughout Box Butte County and the Panhandle; however, there are some unique concerns for the 2005 crop in addition to more traditional concerns.

Excellent growth and cover of the Panhandle wheat crop last fall was attributed to average to above average moisture and above average temperatures. The warm humid weather extended into the fall with near record dates for late frost. Early planted wheat exhibited symptoms of moderate to severe yellowing of the older leaves, primarily due to leaf rust. Russian wheat aphid also was evident in some fields (See other *CropWatch* stories this week on how to scout for and manage these pests.).

Below average precipitation since January 1 (less than 50% of normal for most of the Panhandle), temperatures averaging 4-6 degrees above normal and high or consistent winds the last 10 days could lead to moderate to severe moisture stress the next few weeks. Early planted wheat or that which suffered from wind erosion is likely to exhibit signs of damage first.

The key is to monitor the wheat fields and notice where it is ***not*** greening up now or changing color in the next few weeks. Possible causes include leaf rust, Russian wheat aphids, wheat streak mosaic (especially in areas that were hailed near harvest last year), army cutworms, and root and crown rot if stressful conditions linger on.

Most wheat looks good with dead leaves keeping it from looking fully green. The key is to monitor the fields if there is a concern about areas that are not greening up as quickly as the rest of the field.

New NebGuides

The following NebGuides were recently released and are available from your local Extension office and soon will be available on the publications web site at *http://anrpubs.unl.edu*

Operating Characteristics of Center Pivot Sprinklers (G04-1532)

Planning Your Riparian Buffer: Design and Plant Selection (G05-1557)

Installing Your Riparian Buffer Tree and Grass Planting, Postplanting Care and Maintenance (G05-1558)

CROP WATCH

cropwatch.unl.edu

Crop Watch is published from March to November by Cooperative Extension and Communications and Information Technology in the University of Nebraska Institute of Agriculture and Natural Resources, PO Box 830918, 108 Agricultural Communications Bldg., UNL, Lincoln, NE 68583-0918. To order a print subcription or to change your address, write to ***Crop Watch*** at the above address or call (402) 472-7981. The newsletter also is available on the Web at **cropwatch.unl.edu**

Lisa Jasa, Editor; Email: ljasa1@unl.edu

Be alert for Russian wheat aphid resurgence

Since the early 1990s Russian wheat aphid infestations have been sporadic; however, in the last two years, we have seen an increase in Russian wheat aphid activity in western Nebraska. In 2004, Russian wheat aphid infestations were light in most fields through early spring, but sub-economic infestations were present in most winter wheat fields. In late May, an influx of winged Russian wheat aphids began to infest late developing wheat fields and spring barley fields. Winter wheat fields that were delayed in development and spring barley fields were most likely to be heavily infested with aphids. A number of barley fields were treated for Russian wheat aphids unless they had reduced yield potential due to drought conditions

Last fall, the presence of Russian wheat aphids was noticeable in several winter wheat fields, but no economic infestations were found. The extended fall coupled with the mild winter will increase the risk of severe infestations developing in western Nebraska.

The increased incidence of Russian wheat aphids the last few years seems to be due to the increased presence of aphids throughout the region. This may be due to the presence of a new biotype of aphid that is capable of surviving on wheat that was formerly resistant (containing the Dn4 gene). All of the varieties developed at Colorado State University with resistance carry this gene (e.g. Halt, Prowers 99, Prairie Red, Ankor, Yumar). This biotype has been named "biotype 2" Russian wheat aphid, as opposed to the original "biotype 1" aphid.

We have tested a number of aphid populations collected throughout the Nebraska Panhandle for their ability to survive on Halt or other lines with the Dn4 gene. Populations have been mixed with about 50% of each biotype. Therefore, the new biotype is prevalent in Nebraska, just as has been found in Colorado.

The extended fall and mild winter increase the risk of severe infestations of Russian wheat aphids.

Because Russian wheat aphids have not been much of a problem up to the last two years, there may be a tendency to overlook this situation, but, as we progress into spring, growers should monitor winter wheat for these aphids. We are not expecting widespread serious aphid infestations this spring, but it is likely that we will see some serious infestations. To identify these problem fields in time to manage them properly, it will be important to scout fields for aphids this spring in a timely manner. To avoid potential losses from this pest, growers need to review and be aware of the specifics of aphid scouting, aphid identification and management options.

Gary Hein, Extension Entomologist
Panhandle REC, Scottsbluff

Early rust *(Continued from page 21)*

rust usually does not overwinter this far north. What is different this year is that last fall a significant leaf rust outbreak occurred in the Panhandle and in parts of west central and south central Nebraska. Weather conditions last September and October were ideal for rust development: good fall moisture and extended warm temperatures. Some of the rust apparently survived the winter on the lower, more protected leaves. In addition to what I found on the survey, I have had other reports of orange rust pustules on the lower leaves. A similar situation has occurred south of Nebraska, where leaf rust overwintered. Unseasonably warm weather in February and March in Kansas and Oklahoma accelerated the wheat's maturation rate, resulting in much higher levels of leaf rust incidence and severity from Texas to central Kansas.

If these conditions continue, leaf rust could become a significant production factor this year. Research from Kansas State University indicates that 25% leaf rust severity on the flag leaf at flowering can result in a 15% yield loss. With the current rust situation in the three states to our south and with leaf rust present in some Nebraska counties along the Kansas border, Nebraska producers should pay close attention to rust development in their fields prior to flowering.

Management

On irrigated fields or dryland fields with good yield potential, a fungicide application may be needed to protect the yield. At this point I'm hesitant to recommend an early fungicide treatment; however, there is some research data on the fungicide Headline that indicates that an early treatment of 3 fl oz per acre at the 4-6 leaf stage when the spring herbicide is applied followed by a second treatment at boot to flowering can result in increased yields as well as protect the crop from rust, powdery mildew and leaf spot diseases. With the early rust potential this year, this might be an option for growers to consider. Another option is to wait and see what happens with the rust and then, if necessary, make the application at flag leaf emergence (Feekes 8-9) or boot (Feekes 10). The primary objective is to protect the flag leaf from severe infection. This will extend the grain fill period by keeping the plants green longer during grain fill.

John Watkins
Extension Plant Pathologist

Wireworms *(Continued from page 21)*

shown no significant stand loss when comparing treated and untreated plots in most of their studies from 1998 through 2004. Many of these studies were conducted on farmer fields reported to have wireworm populations or high risk situations such as conversion from CRP or pasture. The results of these studies can be viewed at *http://www.entomology.unl.edu* by selecting "field crops entomology" and "University of Nebraska field trial results." The Quad Counties On-farm Research Project compared fields with treated seeds and fields without and found a yield advantage from treatment only once in ten plots from 2001 through 2004.

The data suggest that yield losses to wireworm are not pervasive and may not warrant routine insecticide treatment. Since the field tests were also subject to other soil insects such as white grubs and seed corn maggot, the same conclusion might be drawn about them.

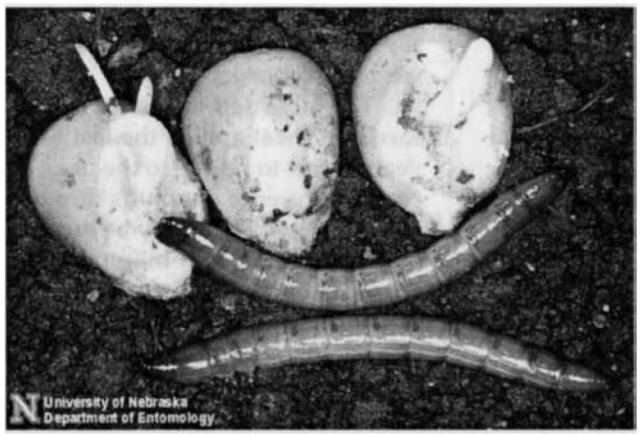
There is no effective rescue treatment for wireworm, so how do you determine if an "insurance" treatment would be worthwhile? Consider the following factors:

1. If you have a history of confirmed wireworm damage, treatment of seed or soil is likely to break even or provide profit. Try to determine the extent of the infestation. You may be able to target your treatment to small areas of the field.

2. If you have a high risk situation, such as in corn following sod, small grains or grassy weed conditions, use wireworm bait stations to help decide if treatment is warranted.

3. If the field is low risk, you could add profit by forgoing an "insurance" treatment for wireworm. Bait stations can help with the decision on these fields, too.

4. Once soil temperatures are above 60°F, wireworms move lower in the soil profile and corn germinates more quickly, reducing potential damage even further. Target your traps to early planted fields if you have limited labor available to check traps.



Wireworms will feed on corn seed and seedling roots, causing early season damage.

To create a trap for wireworms, dig a hole about four inches deep and add 1/2 cup of untreated wheat and untreated shelled corn (*above*). Cover the hole with loosely packed soil, and cover the soil with 18-inch square pieces of black and transparent plastic anchored on the edges with soil (*below*). The plastic helps heat the soil with sunlight and speeds seed germination. Mark each station with a flag or stake. In 10 to 14 days, dig up the stations and count the number of wireworms.

Bait stations provide a pre-plant indication of wireworm populations. The NebGuide, *Insects That Attack Seeds and Seedlings of Field Crops (G91-1023)*, describes how to create a bait station. It is available on the web at *http://ianrpubs.unl.edu/insects/g1023.htm*.

Stations should be placed in the field at least two weeks prior to planting. Best results will be obtained with at least 10 stations per field. More than one wireworm per station is considered a large infestation which may require planter box and soil treatment. Fewer than one wireworm per station presents the opportunity to save on the cost of soil or seed treatments.

Making this decision isn't risk free. Research suggests that while the risk is small, the magnitude of risk is subjective and varies among farms and farmers.

Andy Christiansen
Extension Educator

Corn flea beetle survival expected to be average

Conditions generally were not highly favorable for overwintering survival of the corn flea beetle this year. The map shows the sum of the average monthly temperatures (F) for December, January and February. If this value is above 90 in an area, high winter survival of the corn flea beetle can be expected. Areas with values of 80-90 are expected to see average survival and areas below 80 are expected to see below average survival.

Based on this map, northeastern Nebraska did not have favorable conditions for flea beetle survival over the winter. Southeastern and central Nebraska are expected to have average survival, and southwestern and western Nebraska are expected to have above average survival.

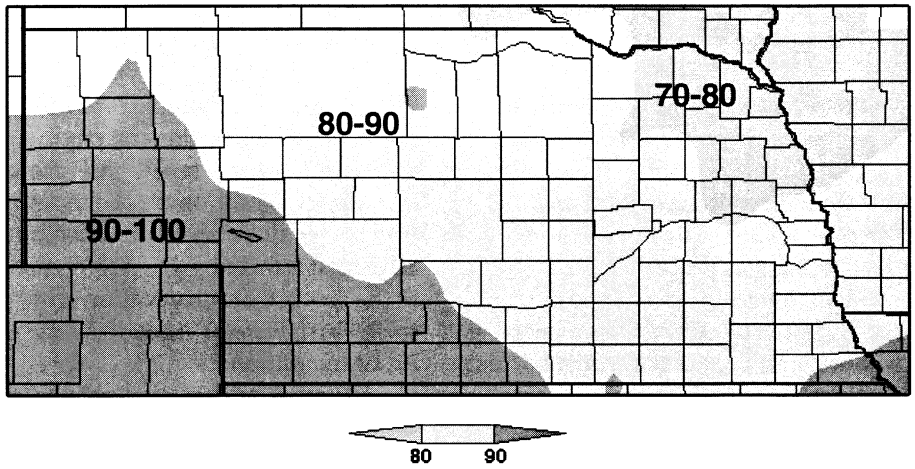
Corn flea beetles overwinter as adults in protected areas near corn fields. They become active in April and feed on a variety of grasses before corn emerges. Corn flea beetles can directly injure corn by feeding on seedling plants; however, probably more importantly they may vector the bacterium which causes Stewart's wilt. (For more information, see the NebGuide, *Stewart's Wilt of Corn in Nebraska*, G1462, available from your local Extension office or online at *http://ianrpubs.unl.edu/plantdisease/g1462.htm)*

To minimize damage:

- Avoid hybrids or inbreds known to be more susceptible to Stewart's wilt (see seed catalog or local seed company representative).
- Avoid early planting dates if susceptible inbreds or hybrids are planted.
- Seed treatments containing imidacloprid (Gaucho, Gaucho Extra and Prescribe), clothianidin (Poncho) or thiamethoxam (Cruiser) are systemic and provide protection from feeding by flea beetles and other early season soil insects.
- Scout for corn flea beetles on seedling corn. Postemergence treatment may be warranted on dent corn if 50% of plants show severe flea beetle injury (plants look silvery or whitish, or leaves begin to die), and five or more flea beetles per plant are found. If susceptible inbreds or hybrids are grown, an insecticide may be needed when two to three flea beetles per plant are present and 10% of the plants show severe flea beetle injury.

A variety of foliar insecticides are also effective in controlling flea beetles. They include: Lorsban 4E, 2-3 pints per acre; Sevin XLR Plus, 1-2 quarts per acre, Asana XL, 5.8-9.6 fl. oz per 1000 row-feet; Lannate LV 0.75-1.5 pints per acre; Pounce 3.2 EC 4-8 fl. ounce per acre; Warrior 2.56-3.84 fl. ounce per acre), Mustang Max 2.72-4.0 ounce per acre; Baythroid 2 1.6-2.8 ounce per acre. Additional information is available on the UNL Department of Entomology Treatment Recommendation Web site at *http://entomology.unl.edu/fldcrops/pestipm.htm.*

Bob Wright
Extension Entomologist



The potential for overwinter survival of the corn flea beetle can be estimated by adding the average monthly temperatures (F) for December to February. Values over 90 indicate high survival while those from 80 to 90 indicate average survival. *(Map developed by Al Dutcher, State Meteorologist, High Plains Climate Center.)*

Problems, benefits of spring alfalfa tillage

Some alfalfa growers in the Great Plains periodically cultivate, often using a spring-tooth harrow, disk or specialized tillage equipment. Usually it is done to control weeds like mustards and downy brome, but sometimes light tillage is used to incorporate fertilizer, smooth rough spots, or lessen compaction. And some folks claim this tillage increases production by splitting crowns into two or more plants.

Are these claims true, or just old alfalfa grower's tales? Tillage can stimulate early alfalfa growth by blackening the soil, but recent research shows that spring tillage aggressive enough to control weeds, also damages stands and yields. Likewise, light tillage that does not harm stands usually fails to control weeds. Also, when tillage cuts open the crowns, diseases can enter the plant. It usually takes a while for damage from crown and root diseases to become visible, so if the field will be rotated to another crop in a year or two, losses will be slight, if any. But, if the stand is long term, don't till. Spring tillage does little harm or little good. You'll need to decide if it's worth it to you.

Bruce Anderson
Extension Forage Specialist

Carbon sequestration may offer income for some producers

Nebraska farmers can apply to receive money for carbon sequestration when participating in a new pilot project to lease carbon credits from their land. The application deadline is this Friday, April 1.

University researchers are studying the effects of tillage, crop rotations, soil conservation practices and grassland management practices to determine how best to measure changes in carbon levels.

In the meantime, several university agronomists helped start a pilot project with the Chicago Climate Exchange (CCX) which targets carbon offset payments for the United States, Canada, Mexico and to a limited level, Brazil. The Iowa Barm Bureau is working as the aggregator for carbon credits for sale on the Chicago Climate Exchange.

The payment for no-till, ridge-till, or strip till could be a $1 per acre per year for the cropping years 2003, 2004, 2005 and 2006. If you did not no-till, ridge-till, or strip till plant in 2003 or 2004 you cannot participate in the pilot program. New CRP or new grass that was established after January 1, 1999 is eligible. The key is that you must certify you have new grass or no-till crop plantings ALL four years of the pilot program (2003-2006). Soybeans cannot be planted more than two of the four years in a rotation.

If you no-tilled in 2003 and 2004 and because of the severe storms you need to do some soil scraping or spot tillage to smooth areas of the field, that appears to be acceptable as long as spot tillage does not go over 5%. Whole field tillage with discs, field cultivators, chisel plows, one pass tillage tools, etc. would cause the applicant to surrender any payment of that field plus interest. All farms are subject to random spot checks. Severe penalties could occur in the advent of fraud or gross negligence of the rules. Communication with Iowa Farm Bureau is key to successful participation.

For more information about the program or an application form, visit the Iowa Farm Bureau Web site at *www.iowafarmbureau.com*. Fill out the farm worksheet information describing the eligible acres, provide FSA farm maps and include FSA form 578 for 2004 crop year and FSA form CCC509 or CCC509B to certify your enrollment in the farm program. Forms need to be mailed to: Iowa Farm Bureau, 5400 University Ave., West Des Moines, IA, 50266. The person who makes the functional farm decisions needs to sign the contract.

University of Nebraska Cooperative Extension is not a part of this program. This story is purely informational and does not represent an endorsement of the project by Cooperative Extension. A number of farmers and landowners in Gage County are participating.

Paul Hay
Extension Educator
Gage County

Next *CropWatch*

Join our contributors as they focus on early season corn production and pest management topics.

Estimate effect of fuel price increases on operation costs

Farm delivered diesel prices increased from $0.90 per gallon in the spring of 2003 to $1.30 per gallon in spring 2004 to $1.65 in spring 2005. If you routinely track fuel use for various tractors and combines while performing farming operations, you probably already have an idea of what this increase has meant for your operation. Simply multiply your historical fuel consumption by the former price per gallon and by current price and compare.

But if you're like most folks and don't track fuel consumption by field operation, a research-based fuel use estimate can help you compute the effect of this price increase on overall production costs (*see page 27*). A good reference that lists fuel use estimates is the *Minnesota Farm Machinery Economic Cost Estimates*, which was cowritten by UNL Agricultural Economist Roger Selley.

Using the fuel consumption estimates presented in the Minnesota publication, the fuel consumption estimate per hour for power units is presented in *Table 1* and the estimate of fuel consumption per acre for field operations is presented in *Table 2*. Note: Implements that have a wider swath width require more horsepower overall, but the horsepower hours per acre and the fuel consumption per acre remain unchanged.

Tom Dorn, Extension Educator
Lancaster County

Nebraska Ag Youth Institute seeks applications

High school juniors and seniors interested in exploring agricultural issues and strengthening their leadership skills are encouraged to apply now for the 2005 Nebraska Agriculture Youth Institute (NAYI).

The event will be held July 10-14 in Lincoln. Approximately 130 students will be selected, based on their leadership skills, interest, and involvement in agriculture. The application deadline is April 15.

The program includes motivational speakers, discussions on agricultural issues and opportunities, a computer-simulated farm management program, as well as a picnic, formal banquet, and dance.

Applications are available from extension educators, guidance counselors, and ag teachers or from the Nebraska Department of Agriculture at 800-422-6692 or *http://www.agr.ne.gov to print an application.*

Fuel costs *(Continued from page 26)*

Table 1. Fuel costs per hour.[1]

	Estimated Fuel, Gal/hr	*2003 Cost/hr @$0.90/gal*	*2004 Cost/hr @$1.30/gal*	*2005 Cost/hr @$1.65/gal*	*2003-2005 Increased fuel cost, $/hr*
Tractors					
40 HP	1.8	$1.62	$2.34	$ 2.90	$ 1.28
60 HP	2.6	$2.34	$3.38	$ 4.36	$ 2.02
75 HP	3.3	$2.97	$4.29	$ 5.44	$ 2.47
105 HP MFWD	4.6	$4.14	$5.98	$ 7.62	$ 3.48
130 HP MFWD	5.7	$5.13	$7.41	$ 9.44	$ 4.31
160 HP MFWD	7.0	$6.30	$9.10	$11.55	$ 5.25
200 HP MFWD	8.8	$7.92	$11.44	$14.52	$ 6.60
225 HP MFWD	9.9	$8.91	$12.87	$16.34	$ 7.43
260 HP 4WD	11.4	$10.26	$14.82	$18.88	$ 8.62
310 HP 4 WD	13.6	$12.24	$17.68	$22.51	$10.27
360 HP 4 WD	15.8	$14.22	$20.54	$26.14	$11.92
425 HP 4 WD	18.7	$16.83	$24.31	$30.86	$14.03
Combines					
190 HP	8.4	$7.56	$10.92	$13.86	$ 6.30
220 HP	9.7	$8.73	$12.61	$15.97	$ 7.24
275 HP	12.1	$10.89	$15.73	$19.97	$ 9.08

Table 2. Fuel costs per acre for field operations.[1]

Field Operation	*Estimated Diesel gallon/ acre*	*2003 Cost/acre @ $0.90/gal*	*2004 Cost/acre @$1.30/gal*	*2005 Cost/acre @$1.65/gal*	*2003-2005 Increased fuel cost $/ac*
Tillage					
Field Cultivator	0.33	$0.30	$0.43	$0.54	$0.24
Tandem Disk	0.47	$0.42	$0.61	$0.78	$0.31
Tandem Disk (HD)	0.76	$0.68	$0.99	$1.25	$0.57
Planting Equipment					
Row Crop Planter	0.34	$0.31	$0.44	$0.56	$0.25
Minimum Till Planter	0.53	$0.48	$0.69	$0.87	$0.39
Grain Drill	0.49	$0.44	$0.64	$0.81	$0.37
Presswheel Drill	0.63	$0.57	$0.82	$1.04	$0.47
No-till Drill	0.81	$0.73	$1.05	$1.34	$0.61
Crop Maintenance Equipment					
Cultivator	0.46	$0.41	$0.60	$0.76	$0.35
Rotary Hoe	0.18	$0.16	$0.23	$0.30	$0.14
Boom Sprayer	0.11	$0.10	$0.14	$0.18	$0.08
Anhydrous Applicator	0.55	$0.50	$0.72	$0.91	$0.41
Stalk Shredder	0.74	$0.67	$0.96	$1.22	$0.55
Harvesting Equipment					
Mower conditioner	0.40	$0.36	$0.52	$0.66	$0.30
Hay Swather	0.35	$0.32	$0.46	$0.58	$0.26
Hay Baler PTO (twine)	0.40	$0.36	$0.52	$0.66	$0.30
Round Baler (1500 lb)	0.77	$0.69	$1.00	$1.27	$0.58
Combine (various heads)	2.00	$1.80	$2.60	$3.30	$1.50

[1] Fuel consumption information in Tables 1 and 2 is taken from *Minnesota Farm Machinery Economic Cost Estimates* (FO-6696), by William Lazarus, University of Minnesota, and Roger Selley, University of Nebraska. Links to the 2000, 2001, 2003, and 2004 versions of this publication can be found on the Lancaster County Extension Website - Machinery Page at *http://lancaster.unl.edu/ag/crops/machine.htm*.

IANR entomologists' discoveries laying foundation for better aphid control

For years, University of Nebraska-Lincoln entomologist Leon Higley cautioned his students against researching aphids.

Despite 50 years of research, no one had figured out how the tiny, agricultural pests harmed plants. Fortunately for Higley, one of his graduate students didn't take his advice.

Doctoral student Fikru Haile's initial findings launched Higley and several Institute of Agriculture and Natural Resources colleagues into a new line of study that is debunking old assumptions about aphids.

Smaller than a pumpkin seed, aphids attack wheat, soybeans, corn and other crops, transmit diseases and cause more crop damage than any other insect. "As a group, aphids are probably the single most important agricultural pest worldwide," Higley said.

Because aphids cause plants to yellow, scientists have long assumed they produce a toxin that affects plant cells' chloroplasts, where photosynthesis happens. But the toxin had never been found.

Normally in photosynthesis, the energy in sunlight charges, or excites, molecules inside the chloroplasts. This energy is passed along in a series of reactions and eventually leaves the chloroplast as carbohydrates. In the process, the excited molecules lose their energy.

By looking at what happens to aphid-infested plants over time, instead of after yellowing as researchers had done in the past, Higley found abnormalities before visible signs of injury emerged.

"As silly as it is, that's probably the biggest thing we did to help reveal what was going on," says Higley. "We started to see things that people hadn't seen before."

Researchers also used fluorometry, which measures plants' energy status. The combination of early inspection and fluorometry revealed that aphids block energy from leaving the chloroplasts. It is the buildup of excited molecules, not a toxin, that eventually chews up the cells and causes visible damage.

University of Nebraska-Lincoln entomologists Leon Higley and Tiffany Heng-Moss examine Russian wheat aphids on a wheat plant These Institute of Agriculture and Natural resources scientists are studying precisely how aphids damage plants when they feed and how plants defend against this injury. Their discoveries could kead to a single solution for reducing crop losses caused by various aphid species in different crops. (University of Nebraska Institute of Agriculture and Natural Resources photo.)

Though Higley hasn't determined how aphids do this -- that's the next step -- the discovery seems to hold true for most, if not all, types of aphids.

The scientific implications are exciting, he said. It suggests a single evolutionary event that may shed light on how aphids and plants adapted to each other.

He's collaborating with colleague Tiffany Heng-Moss and others who envision a single solution to agricultural losses across a variety of crops and aphid species.

Heng-Moss is studying peroxidases, enzymes plants produce to neutralize peroxides, which are created from excess energy in the chloroplast. Because aphids block energy from leaving, abnormally large amounts of peroxides are created. Most plants can't sustain peroxidase production long enough to ward off an aphid infestation and eventually perish.

But some can, and after aphids leave, these resistant plants resume normal function. Finding the gene or genes that regulate peroxidase production could be the answer to transferring resistance to other plants, Heng-Moss said.

Scientists elsewhere have sequenced the peroxidase genes. Heng-Moss is researching whether those genes are turned on in response to insect feeding, as she suspects.

(Continued on page 29)

Conservation Security Program options

Farmers and landowners interested in enrolling in the USDA Natural Resources Conservation Service's Conservation Security Program can learn more about it at several upcoming meetings.

"These meetings will focus on program eligibility, stewardship practices and record-keeping requirements that need to be met to qualify for enrollment in CSP," said University surface water management specialist Tom Franti. The program is voluntary and supports ongoing conservation stewardship of privately owned agricultural land.

"CSP recognizes farmers and ranchers who have been following good conservation practices and offers financial incentives and technical assistance to maintain and expand their conservation work," he said. More information on the NRCS program is available at *http://www.ne.nrcs.usda.gov.*

This year, all or parts of Polk, Butler, Hall, Hamilton, York, Seward, Adams, Clay, Fillmore, Saline, Lancaster, Jefferson, Gage, Pawnee, Dundy and Kimball counties in Nebraska are eligible for enrollment in CSP, he said.

Payments for enrolling in CSP will be based on a tiered system based on farm size and level of conservation and management already in practice on the land.

Payments are as high as $20,000 per year for five years for Tier 1, $35,000 per year for up to 10 years for Tier 2, and as much as $45,000 per year for up to 10 years for Tier 3.

"Qualifying for higher payments requires greater levels of conservation over the entire farming operation," said Franti.

Meetings were held this week in Wilber and York. Remaining meetings are set for:

— March 28, Aurora, 9 a.m., Ag Building, Hamilton County Fairgrounds.

— March 29, Beatrice, 7 p.m., 4-H Building, Gage County Fairgrounds.

— March 30, Geneva, 7 p.m., Ag Hall, Fillmore County Fairgrounds.

— March 31, Seward, 7 p.m., Ag Pavilion, Seward County Fairgrounds,N. 14th St.

— April 4, Clay Center, 7 p.m., 4-H Building, Clay County Fairgrounds, W. Johnson St.

— April 5, Beatrice, 7 p.m., 4-H Building, Gage County Fairgrounds.

— April 6, Osceola, 1 p.m., Exhibit Building, Polk County Fairgrounds.

— April 6, York, 7 p.m., 4-H Building, York County Fairgrounds, 2400 Nebraska Ave.

Aphids

(Continued from page 28)

"If we find more activity of those genes in the resistant plants than in the susceptible ones, then that would provide evidence that they contribute to the resistance," she said.

If so, the next step will be transferring those genes into susceptible plants.

Giving plants the ability to withstand aphids is a better solution than killing the aphids, both entomologists said. Over time, insects can develop resistance to chemical controls. But allowing aphids to feed on but not kill the plant maintains a natural balance.

Though they are years away from engineering resistant plants, Higley and Heng-Moss believe they have found a simple solution to a problem that had proved too complex to decipher for decades.

The Nebraska soybean and sorghum boards, and the USDA regional research funds support this IANR Agricultural Research Division research.

Gillian Klucas
IANR News Service

Buying or selling manure? Learn how to merchandise it

A University of Nebraska Cooperative Extension workshop will help producers place a value on their livestock manure. The March 29 workshop on manure merchandising will be 12:30-4 p.m. at the Agricultural Research and Development Center near Mead.

The workshop also will address new Nebraska Department of Environmental Quality regulations regarding manure transfers, said Phil Steinkamp, Nebraska's Comprehensive Nutrient Management Plan project coordinator at the Northeast Research and Extension Center at Norfolk.

Other topics include: calculating the value of manure, formulating a manure merchandising business plan, and discussion, questions and answers by producers already selling manure.

The workshop is geared toward livestock producers, managers and/or employees, crop and livestock consultants, government representatives and extension educators. Producers are encouraged to participate with their agronomic advisor or computer operator, Steinkamp said.

The workshop is free and includes Comprehensive Nutrient Management Plan workbooks, publications and a CD. Preregistration is required and seating is limited. For more information or a registration form, contact Steinkamp at (402) 370-4061 or e-mail psteinkamp2@unl.edu.

The workshop is sponsored by Cooperative Extension, the Nebraska Department of Environmental Quality, Nebraska Pork Producers Association and USDA Natural Resources Conservation Service.

Sandi Alswager Karstens
IANR News Service

Controlling winter annuals in winter wheat

Much of western Nebraska was blessed with good precipitation last fall. This moisture helped produce good winter wheat stands in many fields; however, it also promoted winter annual weed germination and growth. Winter annual weeds are especially troublesome because they compete with the crop throughout the growing season. Additionally, some winter annual grasses will lead to dockage and/or foreign material discounts when contaminated grain is delivered to the elevator. To minimize losses, growers must control these weeds in a timely manner.

Broadleaf weeds

Common broadleaf winter annual weeds in winter wheat include blue mustard, tansy mustard, tumble mustard, field pennycress, and shepherd's-purse. Unfortunately, many growers are not aware these weeds are present in their fields until they start blooming in the spring. By this time, control is difficult and most of the crop damage has already occurred. To be effective, winter annual broadleaf weeds need to be controlled in late winter or early spring, before the plants begin to bolt or stems elongate.

Blue mustard is perhaps the most difficult of the winter annual broadleaf weeds to control because it bolts very early. In fact, you can already see blue mustard blooming along the roadsides. To be effective, herbicides typically need to be applied to blue mustard in late February or early March. Early April applications of 2,4-D usually provide excellent control of tansy mustard and other winter annual broadleaf weeds, but only fair control of blue mustard. If timed correctly, 2,4-D (8 oz/acre of LV4 ester or 16 oz/acre of 4 lb/gal amine) provides low-cost and effective control of these weeds. Wheat should have at least four tillers before applying 2,4-D or serious crop injury may occur. Adding a sulfonylurea herbicide, such as Ally® or Amber®, to 2,4-D will improve control, particularly after these plants have bolted, but it may not help increase yield because the weeds have already used soil moisture and nutrients. If the sulfonylurea herbicide is used after bolting, but prior to seed production, it may reduce the amount of seed produced.

Grass weeds

Only in the last few years has it been possible to selectively control some of the winter annual grass weeds, such as downy brome, jointed goatgrass or feral rye, in winter wheat. Although control of these weeds is often best when herbicides are applied in the fall, some spring control is possible. Maverick® and Olympus™ herbicides provide selective control of downy brome and other *Bromus* species. Although both products provide similar control of downy brome when applied in the fall, Olympus may provide slightly better downy brome control than Maverick when applied in spring.

Apply Maverick at a rate of 2/3 ounce per acre in 5 to 20 gallons of water per acre. A non-ionic surfactant should be added at 0.5% on a volume basis. Spring applications to downy brome have been more inconsistent than fall applications, with an occasional control rating as high as 85%. More often, spring control is in the range of 35% to 70%. Usually these plants are significantly stunted, but will produce seed. Precipitation following application appears to be important for improved herbicide activity. Growers should be aware of the rotation restrictions with this product.

Olympus herbicide should be applied at a rate of 0.9 ounce per acre for downy brome control. Add a non-ionic surfactant at a rate of 0.25-0.5% on a volume basis. Olympus herbicide may be applied in spring, but downy brome control in spring is more inconsistent than fall applications and may not provide the level of control desired. Like Maverick, Olympus will control many winter annual broadleaf weeds.

Clearfield wheat

A few Nebraska growers planted Clearfield wheat varieties last fall. These fields can be treated with Beyond™ herbicide this spring to control downy brome, jointed goatgrass, and certain broadleaf weeds. Spring applications of Beyond have provided poor control of feral rye, but excellent control of jointed goatgrass and downy brome when treated with 4 ounces of product per acre. Herbicide applications should be made as soon as active spring crop growth begins. Postemergence applications require adding a surfactant at 0.25% and a nitrogen fertilizer solution of 1.0-2.5% on a volume basis. (One percent on a volume basis is one gallon in 100 gallons of spray solution.)

If winter annual weeds are a regular problem, change the crop rotation. Including a spring-seeded crop such as corn, sorghum, chickpea, oat, proso millet, or sunflower in the rotation with winter wheat-fallow provides an additional year in which to prevent seed production and allows the soil seed bank to gradually decrease.

For more information on weed control in winter wheat, visit the online *Wheat Production Systems Handbook* at: *http://wheatbook.unl.edu.*

Drew Lyon, Extension Dryland Cropping Systems Specialist
Panhandle REC, Scottsbluff