5-17-2002

CropWatch No. 2002-10, May 17, 2002

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

CROP WATCH

University of Nebraska Cooperative Extension
Institute of Agriculture and Natural Resources

No. 2002-10
May 17, 2002

Selecting the right post herbicide for corn

With improved growing conditions hopefully arriving this week, it won't be long until many producers are considering their postemergence weed management options.

Consider several factors when choosing a postemergence herbicide. First, consider the efficacy of the particular herbicide on the weed species present. Obviously, some herbicides provide better control on some weeds than others. Choose a herbicide that will provide the control you desire. Second, make sure you consider crop safety and timing of the herbicide application. For example, a certain herbicide has good activity on many grass and broadleaf weeds but shouldn't be applied to corn over 12 inches. All herbicides carry some type of timing restriction and pushing that limit can easily result in crop injury or reduced weed control.

Often, efficacy is influenced by the rate used. Choose a herbicide that allows you to use the required rate for different weed sizes. For example, a rate of 24 ounces per acre of Roundup Ultra will do well on most velvetleaf plants in the 1-3 inch stage, however, if you are dealing with 4-8 inch weeds, the rate should be increased to 1 quart per acre. Use caution when increasing herbicide rates since this can also increase the potential for crop injury.

See page 89 for a table rating efficacy of postemergence herbicides.

Finally, follow label recommendations for additives. Many labels will suggest adding crop oil or AMS to enhance herbicide uptake or movement into the plant cell. Most postemergence herbicides will call for an additive of some sort to enhance activity. As always, read and follow label recommendations and restrictions for maximum herbicide efficacy and crop safety.

Brady Kappler
Weed Science Educator

Inside

Management tips 88
Field updates 88
New publications 88
Ag profitability 91
U.S. wheat supply 91
Lawn tip 91
Farmers test planter speed ... 92
Plant uniformity 94
Irrigation system tune-up 94
Tillage & uniformity 95
Testing stands 96

Weed control timing key to limiting loss from competition

With each season the competition between crop and weeds begins again. The longer the competition exists each year, the greater the yield losses are apt to be. The level of crop yield loss will depend on environmental variables and

a) weed species composition within a given field,

b) weed density and

c) time of weed emergence relative to the crop growth stage.

To decide whether weed control is economically worthwhile, you also need to know whether a given weed infestation is likely to reduce yield if left uncontrolled. The critical period of weed control (CPWC) is the period during which weeds must be controlled to prevent yield losses. Weeds that emerge before or after this period may not affect yields. Understanding this period is essential in determining the need for and timing of weed control and achieving an efficient use of herbicides. NU research has shown that each crop has a critical period of weed control. Research has also shown that this period can vary, depending on cropping practices.

CPWC in dryland corn

Research at Mead and Concord in eastern Nebraska in 1999 and 2000 showed that the critical period in corn was affected by the level of nitrogen fertilizer. In this study the predominant weed species at both locations and in both years were

(Continued on page 90)

Updates

Field updates

Jim Schild, Extension Educator in Scotts Bluff County: The Panhandle has been extremely dry this past winter with just a little over an inch of moisture received since last September. Surprisingly the winter wheat crop is looking fairly good considering the lack of rain. Some crown rot and wheat streak mosiac can be found, but the majority of the wheat is holding its own.

Moisture in the next few weeks will be critical and without it the crop will decline rapidly. Sugarbeet replanting is complete after some of the crop was frozen out during one of two hard May freezes. Most of the corn crop is in the ground but emergence is slow. A nice rain would help ensure crop emergence. Growers are beginning to prepare ground for dry bean planting. Insects are starting to be a problem and army cutworm millers have invaded local towns.

Ralph Anderson, Extension Educator in Buffalo County: There was significant rainfall over much of Buffalo County May 10-11, with precipitation ranging from 0.8 to 2.4 inches. Areas with larger amounts probably received some of it faster than desired and runoff did occur. There also may be some concern with soil compaction and crusting. Most of the corn is in the ground and soybean planting is progressing.

Early planted corn has been up for several days but is looking very yellow due to lack of sunshine. Forecasts for May 13-18 offer hope for soils to warm and plants to improve. Pastures and grass also could use the moisture and sun. Spring is always a great time of year in Nebraska, despite some wide variations in weather conditions.

Noel Mues, Extension Educator in Furnas County: Corn planting is nearly complete and farmers have a good start on soybeans and grain sorghum. Much needed rain finally arrived last weekend with 1.5- 2 inches in most areas. Corn is beginning to emerge, but growth is slow do to cool temperatures. Things should change with sunshine and warmer temperatures.

A survey of wheat in early May (prior to the rain) indicated that lack of moisture was the biggest concern. There was evidence of soil-borne mosaic in some fields. Symptoms were yellow, stunted plants mostly associated with lower areas of the field. Drought conditions will cause the wheat to be short this year. Experience tells us that there doesn't have to be a lot of straw to have decent yields.

Management tips May 17-31

Do you irrigate corn on coarse soils? If so, Extension Specialists recommend split applying the nitrogen. The last nitrogen application should be on by blister stage.

Hot off the press

The following publications were recently released by UNL Cooperative Extension and are available from your local Cooperative Extension office.

Value of Potatoes for Feeding Livestock, EC02-152, evaluates potato's value as a feed for cattle, sheep and hogs, and describes advantages and potential problems.

Seeding Alfalfa, G1456, discusses alfalfa production, including site selection, seeding, companion crops, stand management and weed control.

A Guide to Grasshopper Control in Cropland, NF97-328, discusses grasshopper damage to cropland, how to determine when control is required, and methods of control. Reminder from the text: "Because grasshoppers move into crop production fields from hatching beds around field borders, grasshopper surveys should be conducted in adjacent untilled areas in late May to June."

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 either a printed or electronic (web) -cription 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

For more information about a particular subject, you may contact the authors:
NU Department of Entomology, 202 Plant Industry Bldg., Lincoln, NE 68583-0816
NU Department of Agronomy, 279 Plant Science Bldg., Lincoln, NE 68583-0918
NU Department of Plant Pathology, 406 Plant Science Bldg., Lincoln, NE 68583-0722
NU Department of Ag. Meteorology, 236 L.W. Chase Hall, Lincoln, NE 68583-0728

Postemergence herbicides *(Continued from page 87)*

Table 1. Postemergence corn herbicides

Herbicide	*Primary activity*	*Timing*	*Rate*	*Additive*[1]
Atrazine	Broadleaf + grass	Corn <12″, BL 2-6″, grass <1″	1.4-2.2 lb	COC 1qt
Accent	Grass	Corn up to 20″, BL <4″, grass <3″	0.67 oz	COC 1gal/100**
Accent Gold	Broadleaf + grass	Up to V6, weeds 1-3″	2.9 oz	COC 1 gal/100 gal, 28%N 1-2 qt
Aim	Broadleaf	2 leaf to 48″	1.5 oz	NIS 1 qt/100 gal, COC 1 gal/100 gal, or 28% 2-4 qt/a
Banvel	Broadleaf	Corn spike to 5″	*0.5-1.0 pt	Not common**
Basis	Broadleaf + grass	Corn spike to 2-collar, 4-leaf	0.33 oz	COC 1-2 gal/100 + UAN 1-2qt/100**
Basis Gold	Broadleaf + grass	Up to V6, weeds 1-3″	14 oz	COC 1-2 gal/100**
Beacon	Broadleaf + shatterc.	Corn 4-20″, BL <4″, grass <3″	0.38-0.76 oz	COC 1 qt**
Buctril	Broadleaf	Corn 2-leaf to V6, BL 2-6″	1.0-1.5 pt	
Callisto	Broadleaf	Corn 0 – 30″	3.0 oz	COC 1 gal/100 28% 2.5 qts/100 or AMS 1%
Celebrity	Broadleaf + grass	Corn 4-36″[a]	6.67 oz	NIS 1-2 qt/100 gal + UAN 2-4 qt/a**
Celebrity Plus	Broadleaf + grass	Corn 4-24″[a]	4.7 oz/a	NIS 0.25-0.5% + UAN 1-2 at/a**
Clarity	Broadleaf	Corn 8-24″*	0.5-1.0 pt	Not common**
Contour***	Broadleaf + grass	Corn V6, weeds to 3″	1.33 pt	COC 1.5-2 pt + UAN 1-2 qt**
Connect	Broadleaf	Corn after emergence and prior to tassel	1.25-1.87 lb/a	COC 1% v/v
Distinct	Broadleaf/ some grass	Corn 4-24″*	4-6 oz	NIS 1 qt/100gal + UAN 5 qt/100 gal**
Dual II Magnum	Broadleaf + grass	Layby	0.67-1.5 pt	
Exceed	Broadleaf	Corn 4-20″, BL 2-12″	1.0 oz	COC 1 qt**
Hornet	Broadleaf	Corn spike to 20″, BL <8″	1.6-4.0 oz	NIS 1qt/100gal COC 1gal/100gal
Hornet WDG	Broadleaf	Corn spike to 20″, BL , 8″	2.0 –5.0 oz	NIS 1qt/100gal COC 1gal/100gal
Laddock S-12	Broadleaf	Corn <12″, BL 2-4″	1.3-2.3 pt	COC 1 qt**
Liberty***	Broadleaf + grass	Weeds 1-4″	24-28 oz	AMS 3 lb
Liberty ATZ***	Broadleaf + grass	Corn <12″	40 oz	AMS 3 lb
Lightning***	Broadleaf + grass	Corn to 12″, weeds up to 4″	1.28 oz	NIS 1qt + UAN 1-2 qt
Marksman	Broadleaf	Corn before 5- leaf stage	2.0-3.5 pt	COC 1 qt**
Northstar	Broadleaf / some grass	Corn 4-20″[a]	5 oz	NIS 1 qt/100 gal**
Option	Grass	Corn 0-16″	1.5 oz	MSO 1.5 pts 28% 1.5 qts or AMS 1.5 lbs
Permit	Broadleaf	Corn spike to 20″, BL 2-6″	0.66-1.33 oz	COC 1 gal/100**
Prowl	Some broadleaf + grass unemerged	Corn spike to layby, 1.8-3.6 pt		
Pursuit	Broadleaf + grass	Weeds <4″	4 oz	COC 1.5-2 pt + UAN 1-2 qt**
Resource	Broadleaf	Corn 2-10 leaf, BL <4″	4-6 oz	COC 1 qt**
Glyphosate***	Broadleaf + grass	Corn up to 24″	24-42 oz	8.5 -17lbs AMS/100gal
Roundup Ultramax***	Broadleaf + grass	Corn up to 24″	20-40 oz	8.5 -17lbs AMS/100gal
Sencor	Broadleaf	Corn up to 8″, BL 2-4″	1.5-2 oz	28% N 2-4 qt
Spirit	Broadleaf/ some grass	Corn 4-20″	1 oz	NIS 1-2 qt/100 + 28% N .5-1 gal
Steadfast	Grass	Corn up to 12″ or < 6 collar	0.75 oz	COC 1 gal/100 gal, 28% N 2 qt
Treflan	Grass	Corn 2-leaf to layby, weeds unemerged	1.5-2.0 pt	
2,4-D amind	Broadleaf	When corn is 8″ or less	1-2 pt	

1 . Rates for additives are on a per acre basis unless noted
[a] Corn over 20″ use drop nozzles
* Corn over 8″, use drop tips
** Other additives may be used, check label
*** Requires Herbicide Resistant Corn Hybrid

Herbicide timing *(Continued from page 87)*

velvetleaf, common waterhemp and green foxtail, with densities ranging from 80 to 120 plants per square yard. Nitrogen was applied immediately prior to planting at 46-0-0 and incorporated within one hour after application

Research results indicated that reducing nitrogen fertilizer resulted in a longer CPWC. For example, at zero nitrogen level, CPWC ranged from approximately the 1st to 11th leaf stage of corn, based on a 5% acceptable yield loss (*Table 1*). This suggests that when fertilizer is not applied, weed control measures should start early in the season (at the 1st leaf stage of corn) and should be maintained through the 11th leaf stage, approximately the time of crop canopy closure.

This data implies that an increase in nitrogen fertilizer increases the corn tolerance to weed presence and delays the need for weed control. From a practical point, insufficient nitrogen can reduce corn tolerance to weeds and widen the CPWC window. Furthermore, anticipated restrictions on the level of nitrogen use in corn may require more intensive weed management programs.

Cost of delaying weed control

A common question among producers is "How much is it going to cost me if I delay weed control?" To answer this question we graphed the yield loss data against the crop growth stage at the time of weed removal (*Figure 1*). You might select, for example, a threshold of 2%, 5% or 10% yield loss to signify the beginning of the critical period. This can be adjusted depending on the risk you're willing to take. In our study, an arbitrary level of 5% yield loss was used to determine the beginning of the critical period of weed control (see the 5% yield loss line in *Figure 1*).

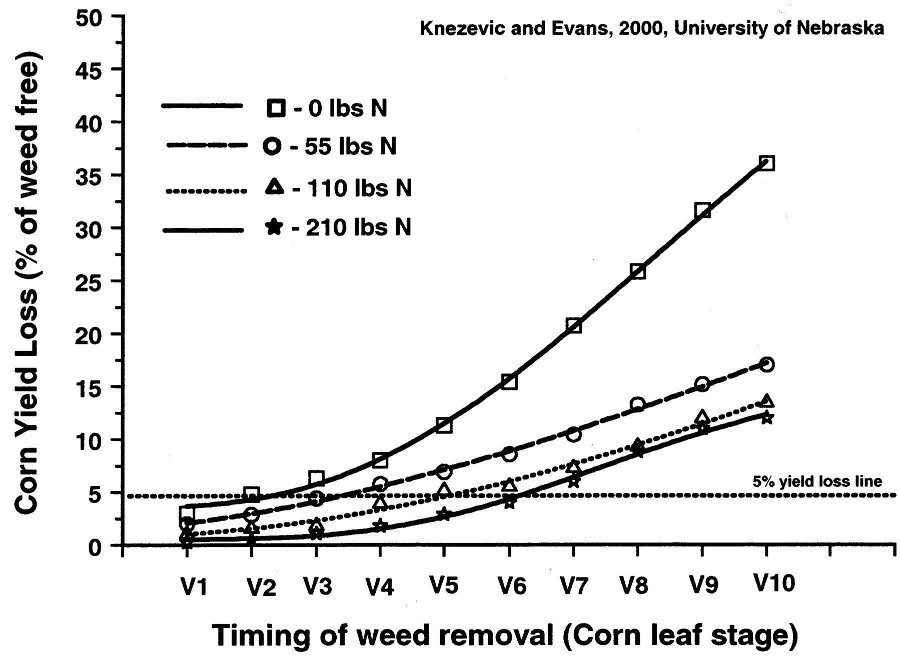


Figure 1: Corn yield loss and beginning of CPWC as influenced by the timing of weed removal and nitrogen-rate

Using the 5% point of CPWC, a 5% yield loss will occur if weeds are removed at the 2nd leaf stage in 0 nitrogen level (*Figure 1*). Delaying weed control to the 3rd leaf stage will cause about 7% yield loss, in essence costing you a 2 % yield loss. A similar trend is observed for the later leaf stages at each of the four curves (*Figure 1*).

Delaying weed removal until after the CPWC begins will cost a producer an average of 2% in yield loss at every leaf stage of delay. This applies up to canopy closure in corn (about 11 fully developed leaves).

To determine the actual cost of delaying control, calculate the percentage yield loss of the target yield for the field. For example, if the target yield is 100 bushels per acre, delaying weed control for every leaf stage of crop will cost about 2 bushels per acre (2% of 100 bushels per acre). In terms of actual economic loss, it will cost about $4 per acre for every crop leaf stage of delay, assuming a price of $2 per bushel for corn.

Weed size

Weed size at the time of weed control is another issue. In this study the weeds were about the same size as the crop when they were removed, except for the Mead site in 2000. If

(Continued on page 91)

Table 1: Critical period of weed control in corn based on 5% yield loss expressed as crop leaf stage (eg.V1) and days after crop emergence as affected by the level of nitrogen fertilizer.

Nitrogen-Level lbs / acre	*Time to control weeds Corn leaf stage*	*Time to control weeds (Approximate days after crop emergence)*
N = 0	V1 - V11	8-45
N = 55	V3 - V10	10-42
N = 110	V4 - V9	15-39
N = 210	V6 - V9	20-39

Herbicide timing

(Continued from page 87)

the weeds are taller than the corn, they will shade the crop. In this case control should be initiated four to five days (one to two leaves) prior to the beginning of the critical period of weed control. If the weeds emerge five to eight days after the crop, begin control 5-10 days (two-three leaves) after the beginning of the critical period, as is shown with the later start of the CPWC at Mead in 2000.

Practical application

A generally sound strategy, for example, in Roundup-Ready corn would be to apply Roundup tank-mixed with a residual herbicide at the beginning of the critical period. This would provide adequate weed control the entire critical period. To select appropriate herbicide mixtures for the weed spectrum on your farm, consult the herbicide efficacy tables in the *2002 Guide for Weed Management in Nebraska* (Cooperative Extension Publication, EC-130), available from NU Cooperative Extension offices or on-line at *http://www.ianr.unl.edu/pubs/fieldcrops/ec130.htm.*

Stevan Knezevic, Extension Weeds Specialist, Northeast REC

Lawn tip

In spring, lawns need to be mowed every five to six days at a height of 2 to 2.5 inches for bluegrass and 2.5 to 3 inches for tall fescue. Mowing should never remove more than one-third of the leaf length.

Start watering now. In most of Nebraska, the soil infiltration rate is about a quarter-inch per hour, so water needs to be applied slowly. Once the soil profile is recharged, turf will need about an inch of moisture perweek. To check soil moisture, try pushing a screwdriver into the soil. If you can't push it in or can only push it in a little ways, the ground needs more moisture.

Ag profitability drops 25% in 2001 for those in management program

Average profitability among participants in two Nebraska farm management programs dropped sharply in 2001, reflecting increased operating expenses and leaving federal farm program payments to spell the difference between red and black ink.

The Nebraska Farm/Ranch Business Management 2001 Annual Report includes data from 156 Nebraska farms and ranches enrolled in one of two programs coordinated by University of Nebraska Cooperative Extension and Nebraska community colleges.

Average farm profitability among the programs' participants in 2001 was $36,025, down 25% from 2000's $48,279. That compares to a 19-year average of $40,112.

Operating expenses – up 19% to an average of $293,384 – were the primary cause of the drop in net income, said Gary Bredensteiner, director of the Nebraska Farm Business Association at the University of Nebraska-Lincoln, one of the two programs whose participants were included in the data. Operating expense ratio in 2001 was 74.9% compared to 70.1% in 2000 and a 19-year average of 66.6%.

Several enterprises showed increases in production costs per unit. For example, direct costs per acre for irrigated corn on cash-rented land were $349.43 in 2001, up from $321.34 in 2000. Fertilizer, chemicals and irrigation energy accounted for $15.58 of that $28.09 increase.

The government payments received by the 156 operations averaged $52,694 in 2001, so, without those payments, the operations would have gone into the red an average of more than $16,600.

Even the top one-third performers among the programs' participants could not have made enough money to support themselves without government help. That government dependence "is really getting to weigh on folks," Bredensteiner said. "Folks would like to be able to make a living off their production."

The survey's results do not necessarily represent the average Nebraska produce, Bredensteiner said. He believes the operations included in the report are generally more profitable than statewide averages.

In addition to NFBA, the report also includes data from participants in the Nebraskaland Farm and Ranch Management Educational Program, which is coordinated by community colleges.

The 65-page Nebraska Farm/Ranch Business Management 2001 Annual Report is available for $35 plus sales tax from NFBA, 110 Mussehl Hall, University of Nebraska, Lincoln, Nebr 68583-0719.

Dan Moser, Coodinator IANR News and Publishing

U.S. wheat supply expected to decrease

This week the USDA Economic Research Service forecast the lowest U.S. wheat exports in more than 30 years for 2002-2003. Total production is projected to be down 4% from 2001/2002 to 1,886 million bushels.

Foreign wheat production in 2002-2003 is forecast up more than 17 million tons. While the United States is expected to remain the largest wheat exporter, the U.S. share of global exports is forecast at less than 23%, the lowest for which comparable data is available.

USDA Economic Research Service Wheat Outlook, May 14, 2002

Farmer trials test effect of planter speed on uniformity of corn plant spacing

In the past few years we've heard a lot about the need for accurate and uniform corn plant spacing. Researchers further east in the Corn Belt have found that for every 1 inch in variation from the targeted location, yields are reduced 2.5 bushels per acre. Other researchers report even higher losses. National yield contest winners often state that slow planter speeds improve plant spacing uniformity and are part of their formula for success.

To test this premise in Nebraska 15 farmer cooperators conducted planter speed studies in 2001 to compare grain yields with irrigation. We were interested in the effect of planter speed on plant spacing uniformity. This project was directed by Cooperative Extension educators in Clay, Fillmore, Hamilton, and York counties. Technical support was provided by the NU South Central Research and Extension Center (SCREC) near Clay Center. Each location had three to four replications of three planter speeds: 2, 4, and 6 mph.

Experimental procedures

The cooperators calibrated and used their own planters and equipment and managed the plots as they normally would. They also chose their own hybrid, tillage practices, etc, and harvested the grain. Yield data were obtained from on-combine yield monitors or weigh wagons. Plant stand uniformity was measured after emergence at all locations.

Four measures based on theoretical spacing do a good job of summarizing distributions of plant spacing for single seed planters. (See story, *Developing accurate tools for measuring plant uniformity*, page 94). Briefly these measures are as follows:

- Multiples index (D) doubles, triples, etc. Smaller values of D indicate better performance than larger values.

Table 1. Measures of plant spacing accuracy for different planter speeds averaged over 15 locations and the 15 locations averages (and range) over planter speeds. Nebraska, 2001.

Planter speed (mph)	*D* %	*C* %	*M* %	*A* %	*Yield* (bu/acre)
2	4.9 a*	10.7 a	84.42 a	18.73 a	207.1 a
4	5.0 a	10.5 a	84.49 a	20.08 b	205.6 a
6	7.6 b	12.6 b	79.85 b	23.13 c	205.5 a
15 site average (range)	5.8 (1.5 -10.6)	11.3 (4.9 - 18.4)	82.9 (71.0 - 88.1)	20.6 (16.4 - 26.1)	206 (187 -235)

* numbers within a column followed by the same letter are not different (P 0.05).

D = multiples index
C = precision
M = miss or skip index
A = quality of feed index

- Miss index (M) skips. Smaller values of M indicate better performance than larger values.
- Quality of feed index (A). Larger values of A indicate better performance than smaller values.
- Precision (C) is a measure of the variability in spacing of the plants after removing the variability due to skips and multiples. A practical upper limit is 29%. Smaller values of C indicate better performance than larger values.

Cooperator planter systems

Thirteen cooperators used John Deere planters (10 with JD 7300, 2 with JD 7100, and 1 with a JD 1700). One cooperator used a Case IH 900 and the other cooperator used a composite of the Case IH 800, 900, and 955 planters. Target planting rates ranged from about 29,000 to slightly over 30,000 seeds per acre. All but two used 30-inch rows; one of these had 34 and the other had 36-inch rows. Frequencies of plant spaces for the 13 sites with 30-inch rows are shown in *Figures 1 -3, page 93*. Spacings between the two dotted vertical lines represent spacings in the target zone (see story, *Developing accurate tools for measuring plant uniformity*, page 94). Spacings to the left of the first dotted line are considered multiples and spacings to the right of the second dotted line are considered skips.

Results and discussion

Planter speed did not affect corn grain yield but it did affect plant spacing accuracy (*Table 1*). This is reflected in all four indices. The 6 mph planter speed resulted in more 'doubles' and more skips or missing plants than the 2 and 4 mph speeds. Fewer plants were in the target spacing with 6 mph than with either the 2 or the 4 mph speeds. Precision improved with slower planter speeds. Plants in Division II were closer to the target spacing at 2 mph than with either 4 or 6 mph speeds. *Table 1* also show the averages and ranges for the 15 sites.

Grain yields were excellent at all locations (*Table 1*). Although actual stands were near the target at most locations, plant spacing accuracy varied among locations:

- Planter speed effects for both 'M' and yield were consistent across locations.
- The multiples index was not affected by planter speed at 8 of the 15 locations. At 6 locations, increas-

(Continued on page 94)

Figures 1-3. Plant spacing averaged from 13 locations over 3 planting speeds.

Fig. 1. 2 mph planting speed

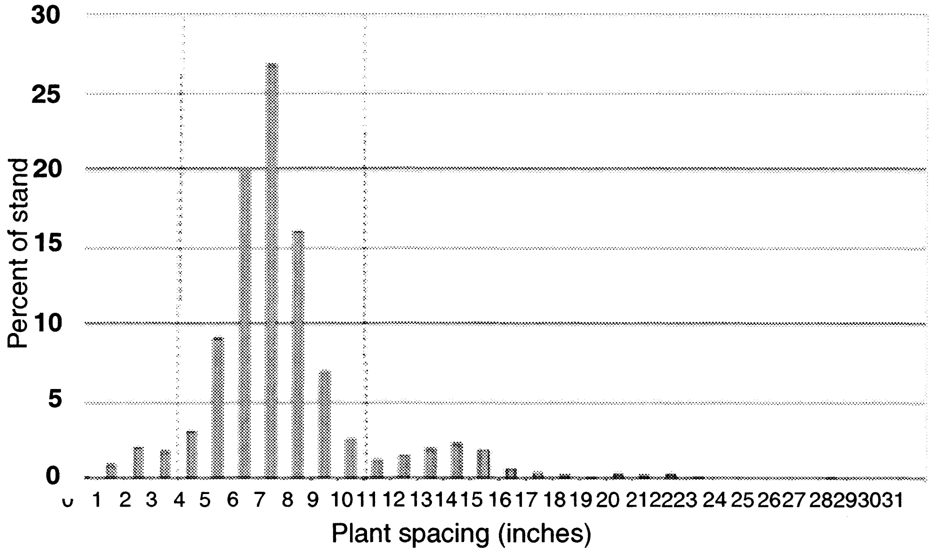


Fig. 2. 4 mph planting speed

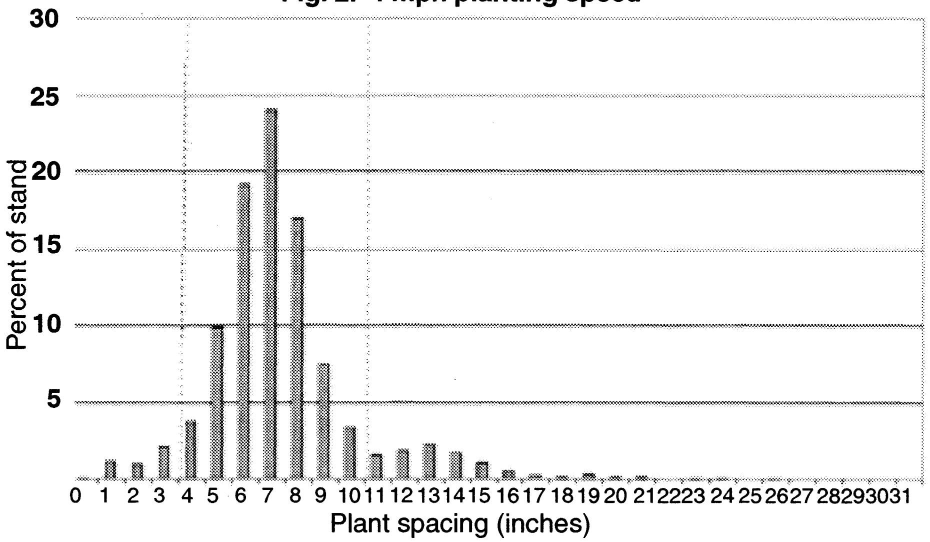
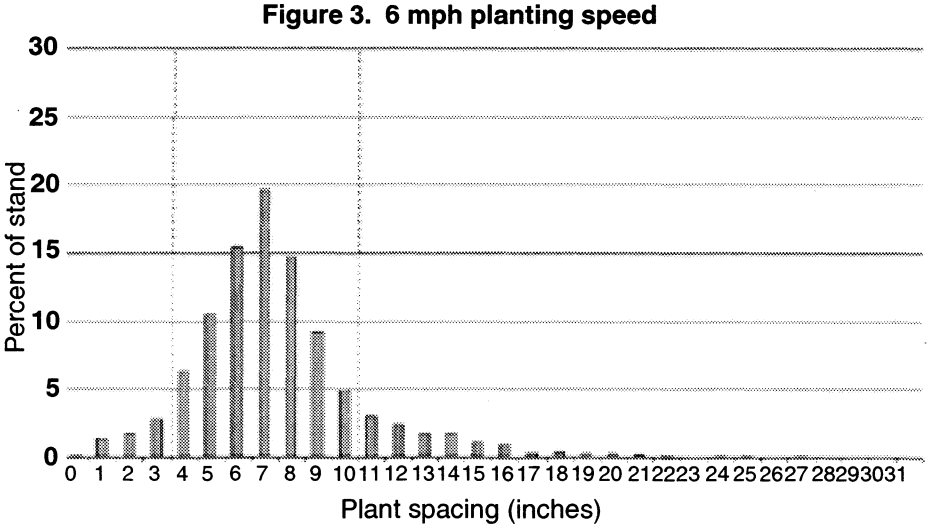


Figure 3. 6 mph planting speed



Planter speed

(Continued from page 92)

ing planter speed increased the number of doubles or multiples. Increasing planter speed reduced the "D" index at one location by nearly 50%.

• Quality of feed index was not affected by planter speed at 8 of the 15 locations. Speeds of 2 and 4 mph had similar values for quality of feed (resulted in greater plants in Division II) and thus better values than the 6 mph planter speed at six locations. Quality of feed, however, was increased 14% at the 6 mph speed compared to the 2 and 4 mph treatments at one location.

• Precision was affected by planter speed at 12 locations. Values of precision for all these locations either were similar for 2 and 4 mph and were larger (worse) for 6 mph, or small at 2 mph and greater (worse) at 4 and 6 mph. Thus, at 12 locations, faster planting speeds resulted in less precision.

Summary

1. Grain yields were excellent at the 15 on-farm sites in 2001 and reflected the excellent yields typical in south central Nebraska in 2001. Perhaps the 2001 cooperators were more conscientious about planter maintenance and repair than those not involved in the study; we have no previous data with which to compare.

2. Plant spacing accuracy was affected by planter speed. Generally the 6 mph speed resulted in less accuracy than the slower speeds.

3. Grain yield was not affected by inaccuracies in plant spacing or planter speed.

4. There was an opportunity for improved plant spacing at some locations; however, this may not improve yield potential.

Note: The on-farm trials will continue in 2002. Stay-tuned for updated information.

Roger Elmore, Extension Crops Specialist, South Central REC

Irrigation system spring clean up

Regular maintenance of your irrigation equipment should include a pre-season checkup. Component wear results in less uniform water application and increased energy use. To reduce the risk that wear and tear will result in untimely breakdowns, worn components should be identified and replaced now.

Probably the best way to identify worn components such as sprinklers, pumps or irrigation systems is to keep good records. Recording the static and pumping water levels, output pressure, flow rate and energy use on a regular basis (at least once per month) provide an excellent means of evaluating pump and motor performance.

Each irrigation system will have a number of areas to lubricate or parts to replace prior to the first irrigation. It is impossible to list them all, but following are some of the major components to check:

1) Change the engine oil and filter,

2) Replace the air and fuel filters,

3) Grease drive shafts on pump, and motor,

4) Check spark plugs,

5) Check chemigation pump and safety equipment operation,

6) Drain, flush and refill the cooling system,

7) Refill the drip oil reservoir and allow about a gallon of oil to drain into the drip line,

8) Insure that the gear drive is free moving and clean and lubricate non-reverse pins,

9) Run the motor at 1000 rpm for 45 minutes.

Each system is equipped with a number of safety switches to shut the system down in case of failure. Now is the best time to insure that all these controls function properly. Run the system through a set of conditions that would cause each of the system safety controls to function.

(Continued on page 95)

Developing accurate tools for measuring plant uniformity

Seed spacing may vary because of either planter errors or seed germination problems. Average plant spacing and standard deviation of plant spacing often are used to determine plant spacing accuracy. The average is not a good measure of plant spacing since spacing between plants is not normally distributed. The standard deviation, since it is based on squared deviations of the mean, is influenced by a few very large spacings (skips or misses). Because of these problems, Kachman and Smith, 1995, concluded that the mean and standard deviation are not appropriate for summarizing distributions of plant spacing. They compared four other measures that were based on theoretical spacing and found that they do a good job of summarizing distributions of plant spacing for single seed planters.

Theoretical spacing is the targeted distance between plants, assuming no skips and no multiples and no variability in seed drop. This is abbreviated x_{ref}. The theoretical spacing is used to divide the observed spacings into five divisions:

Division I = 0 to 0.5 x_{ref}. These are multiple seeds at the same spot or seed spacings that are closer than ½ theoretical spacing

Division II = 0.5 x_{ref} to 1.5 $x_{ref.}$ These are single plant spacings that are close to the theoretical spacing.

Division III =1.5 x_{ref} to 2.5 x_{ref}. These are single skips.

Division IV = 2.5 to 3.5 x_{ref}. These are double skips.

Division V = 3.5 x_{ref} to . These are triple skips etc.

Four measures of plant-spacing accuracy are based on the frequency of spacings that occur in the five divisions. They are as follows:

Multiples index , D (doubles, triples, etc.), is a percent of spacings that are less than or equal half to the theoretical spacing, $D = n_I / N \times 100$ where: n_I is the number of spacings in region I and N is total number of spacings. Smaller values of D indicate better performance than larger values.

Miss index , M (skips), is the percentage of spacings greater that 1.5 times the theoretical spacing: $M = (n_{III} + n_{IV} + n_V) / N \times 100$ where: n_{III}, n_{IV} and n_V are the number of spacings in regions III, IV, and V and N is total number of spacings. These skips could be due to the failure of the planter to drop a seed or the failure of a seed to produce a seedling. Smaller values of M indicate better performance than larger values.

Quality of feed index, A, the percentage of spacings that are more than half but no more than 1.5 times the theoretical spacings: $A = n_{II} / N \times 100$ where: n_{II} is the number of spacings in region II and N is total number of spacings. This is a measure of how close the spacings are to the theoretical spacing. It is another way to look at information in the other two indices since: 100 - (D + M) = A. Larger values of A indicate better performance than smaller values.

Precision , C, a measure of the variability in plant spacing after removing the variability due to skips and multiples. Precision is similar to a coefficient of variation for the spacings that are classified as singles (i.e. plants in region II): $C = s_{II} / x_{ref}$ where: s_{II} is the standard deviation of the n_2 observations in zone II and x_{ref} is the theoretical spacing. It is not affected by outliers, multiples or skips. A practical upper limit is 29%. Smaller values of C indicate better performance than larger values.

Reference

Kachman, S.D. and J.A. Smith. 1995. Alternative measures of accuracy in plant spacing for planters using singe seed metering. Transaction of the American Society of Agricultural Engineers. 38(2):379-387

Tillage not found to affect plant space uniformity

Tillage systems impact early season growth and development. We wondered if they also affect plant spacing uniformity. To determine this, plant spacing accuracy and other agronomic traits were measured on the 2001 long-term tillage study at the South Central REC to determine any effects of tillage system. Since the trial is split into continuous corn and rotated corn/soybean plots, we were also interested in the effect of crop rotation on plant spacing uniformity. Yields were estimated with a weigh wagon.

The trial

Three replicates of three irrigated tillage systems were monitored. The three tillage systems were: conventional tillage (disk-plant); ridge till; and slot plant. Each plot was subdivided into corn following corn and corn following soybeans. Two JD 7300 planters were used. Target seeding rate was 29,000 seeds/acre. Four measures based on theoretical spacing were determined for each treatment.

Table 1. Measures of plant spacing accuracy and grain yield for two tillage systems averaged over cropping sequence (for planter with Buffalo ridge cleaner attachments). Nebraska, 2001.

Tillage system	*D* %	*M* %	*A* %	*C* %	*Grain yield (bu/acre)*
Ridge till	5.9*	12.2	81.8	22.1	209
Slot plant	7.3	13.2	79.5	22.3	206
Conventional till	5.0	9.9	85.2	21.6	213

* Ridge till and slot plant means within columns of this table are not different ($P \leq 0.05$).

D = multiples index
M = miss or skip index
C = precision
A = quality of feed index

Results

Plant spacing accuracy and yields were similar between the ridge till and slot plant tillage systems (*Table 1*). The tillage system was not found to have a significant effect on yield. Crop rotation also had virtually no effect on planter accuracy or grain yield in 2001.

Summary

Plant spacing accuracy and yield were similar among tillage and crop rotation systems.

Note: The on-farm trials will continue in 2003. Stay-tuned for updated information.

Roger Elmore, Extension Crops Specialist, South Central REC

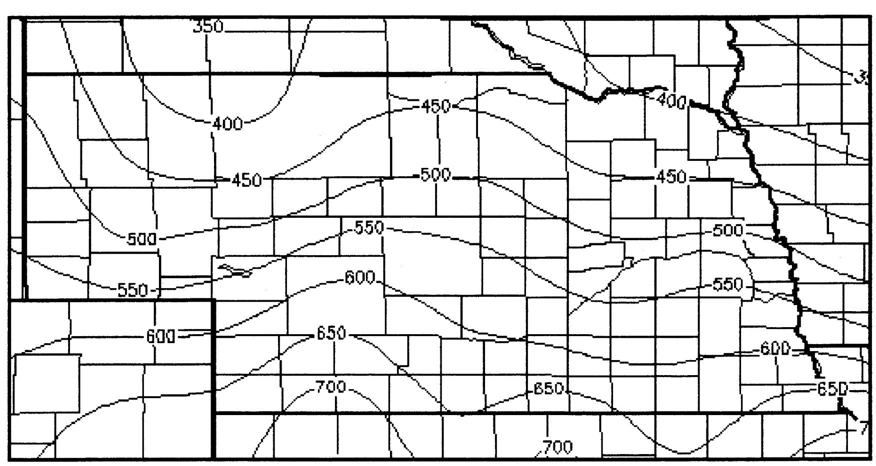
Irrigation

(Continued from page 94)

A walkby inspection of the system can identify sprinklers/nozzles that are not operating properly. Replace nozzles with those recommended by the system manufacturer. Nozzle wear depends on the quality of the water and the system operating pressure. As a rule of thumb, sprinkler replacement should be considered after approximately 10,000 hours of operation.

Check nozzle wear by inserting a drill bit into the nozzle that corresponds to the initial size of the nozzle opening. Check operating pressure at the sprinklers to insure that the sprinkler and pressure regulators are operating properly.

Bill Kranz, Extension Irrigation Specialist, Northeast REC



Alfalfa weevil scouting

Accumulated growing degree days base 48 as of May 13. All of the state now has passed the 350 GDD threshold and scouting should be underway for alfalfa weevils. (*Map prepared by Al Dutcher, state climatologist, NU School of Natural Resource Sciences.*)

Testing stand uniformity in corn

1. Choose plots in several "random" areas of the field; avoid selecting just the best or the worst of the field. Samples should characterize the field as well as you can. Locate plots areas at least 300 feet or so from field ends. If possible, determine where you intend to measure spacings before you enter the field.

2. Use at least three plots in the field for each comparison (whether it is different row units on the planter, different tillage systems, different hybrids, etc.). Count at least 1/100 of an acre for each comparison. The goal is to measure spacings of at least 250 plants per treatment comparison. Use *Table 1* in the May 10, 2002 *Crop Watch* article on replanting corn to determine the length of row necessary to achieve 1/100 of an acre. Divide that number by the number of sampling locations to determine how many feet of plants to count in each sampling location. You could do this on 10 sampling locations (plots) in the field each with 1/1000 of an acre. Taking time to determine why the plants are missing in the 'skip' areas may help you decide what to work on next year.

3. At each sampling site within a treatment:

- Mark off (flag) either 17ft. 5 inch (for 30 inch rows) or 14 ft. 6 inch (for 36 inch rows) in each plot. Record data from the same planter unit (unless you intend to check variability in planter unit performance). Using one or both of the two center rows of the planter makes that relatively easy to insure.
- Lay a measuring tape beside the plants with the zero point of the tape on the first flag.
- Record plant spacings in inches. Round the measurements to the nearest inch.
- Record the distance from the first plant outside the plot area as distance from that plant to the first flag. Also record the distance in inches of the first plant beyond the second flag at the other end of the plot.

Roger Elmore, Extension Crops Specialist
South Central REC

First cutting of alfalfa near

After planting corn and soybean, there likely won't be much rest for eastern Nebraska farmers growing alfalfa. Timing of hay harvest is important whether your needs are for high quality or for high yield.

Growers in eastern Nebraska may begin taking their first cutting of alfalfa this weekend. In fact, folks that need high quality alfalfa for their dairy cows or for a cash crop already may have started cutting, and others should be looking for the first available good weather period.

Being aggressive on the first cutting is critical if high relative feed value is needed. Alfalfa's forage quality changes faster during the first growth than at any other time of the year. Plants are maturing and temperatures are increasing; both cause quality to decline.

But what about alfalfa for beef stock cows? Under dry conditions, we normally get our highest yield by waiting until alfalfa is near full bloom. This uses what little soil moisture is available for most efficient alfalfa growth and you should at least have a good first cut to feed beef cows next winter.

Bruce Anderson
Extension Forage Specialist

Toss a hoop to count plants in drilled fields

The May 10 *Crop Watch* featured a procedure for determining population by counting the number of plants in a known length of row. With drilled crops, however, the length of row to equal 1/1000 of an acre gets to be quite long (ie: 69 feet 8 inches for 7.5-inch rows) and it is sometimes difficult to identify the row. To avoid these problems, producers can use a population hoop to define the known area rather than row length when counting plants in drilled fields.

A hoop with an **inside diameter** of 40 inches will encircle 1/5,000 of an acre. By tossing the hoop and counting the plants within the 40-inch circle at five random locations in the field, a total of 1/1,000 of an acre will be counted. The five separate counts reduce the variability of the sample, providing an average population.

A 40-inch hoop (inside diameter) easily can be made from a 10-foot 9-inch length of 1/2-inch black plastic water pipe and a double male hose barb connector (trim hose length depending on connector style). This will make a fairly rigid "oversized hula-hoop" which encircles 1/5,000 of an acre. A "fold-up" portable version can be made from a 10-foot 7.5-inch length of 3/8-inch EVA plastic hose (anhydrous ammonia hose) and the appropriate barbed connector.

This flexible hoop can be "folded" by grasping opposite sides of the hoop and curling it up with a twist of the wrist. A three-coiled hoop is formed (similar to a folded V-belt) which will easily fit under the pickup seat.

Paul Jasa
Extension Engineer