6-12-1998

CropWatch No. 98-12, June 12, 1998

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CROP WATCH

University of Nebraska Cooperative Extension
Institute of Agriculture and Natural Resources

No. 98-12
June 12, 1998

When frost strikes corn

Doing nothing may equal replanting

When low temperatures and light frost injure corn, as occurred last weekend in the Panhandle and southwestern Nebraska, producers need to carefully weigh their options apart from the immediate and discouraging appearance of the plant. In many cases, the best response may be no response or at least a slightly delayed response, based on research conducted during a similar frost situation in south central Nebraska in 1992.

In late May 1992, an early season frost injured thousands of acres of corn in the three- to four-leaf stage in south central Nebraska. Damage ranged from slight to complete defoliation. Growing points, which are below the surface until the seven-leaf stage, were not directly injured at first.

The late Ben Doupnik, Jr., Extension plant pathologist, and I examined the ramifications of three management choices for the injured crop. Three field sites northeast of Minden with different levels of defoliation (55%, 70%, 100%) were selected for the research. The three treatments applied to corn at each

(Continued on page 111)

Left: The stalk of a corn seedling is split to show the growing point, the twisted whorl of leaves, and the bacterial soft rot infection (the brown discoloration running vertically in the stem center).

Inside

Too early to assess wheat damage from frost

It's still too soon after the recent frost to determine the degree of damage to the state's wheat crop.

Most of the wheat was flowering or just past flowering when the frost hit. Wheat damage is not easily identified at this stage.

The exposed anthers are most susceptible to the freeze. In general it is only possible to evaluate seed fill by dissecting heads 10-14 days after the frost. If there are many blank glumes or kernels are not developing, damage is indicated. Thankfully, this freeze was not severe enough to kill any of the wheat heads that we observed.

Sometimes we see stems that have ruptured during a freeze and the head turns white on the next hot dry day, but we have seen very few split stems from this freeze. Some hail storms in late May may have caused this symptom.We can be optimistic that wheat is an extremely tough plant and more than likely we lost more yield potential to the hot dry winds on Saturday May 31 than we did to the cold temperatures this past week.

David Baltensperger
Extension Crop Breeding Specialist
Panhandle REC, Scottsbluff

UNIVERSITY OF NEBRASKA-LINCOLN, COOPERATING WITH THE COUNTIES AND THE U.S. DEPARTMENT OF AGRICULTURE

Field updates

John Wilson, Extension Educator in Burt County: Too wet... even the frogs have mildew! This is preventing planting the last 20% of soybeans and replanting corn and soybeans in a relatively small area that was hailed out a couple weeks ago. Crop condition for both corn and soybeans is deteriorating due to waterlogged soils.

Ralph Kulm, Extension Educator in Holt and Boyd counties: Having received close to 2 inches of rain in the past 10 days, moisture is no longer a problem. Wet and cold conditions have resulted in much alfalfa hay still being in the windrow after being cut a week or more ago. Alfalfa weevils are still the main insect concern in the area.

Jim Schild, Extension Educator in Scotts Bluff and Morrill counties: Preliminary reports indicated most of the frost damage in the Panhandle was north of the North Platte River from Torrington, Wyo. to Angora Hill north of Bridgeport. There also were isolated cases in lowland areas.

Steve Pritchard, Extension Educator in Platte County: Storm damage has not been a problem to a great degree in Platte County. Widespread rains will delay any field work at least four to five days. Several alfalfa fields have been cut, although it will be a few days before it's dry enough for baling. There are reports of European corn borer moths in the area this week.

Ralph Anderson, Extension Educator in Buffalo County: On June 1, crops looked as good as they have any time in recent years. By June 8, that had changed although no serious problems have developed yet; however, with each cold day the crop showed more yellow color and slowed growth. We expect that a few warm days and maybe a cultivation or side dressing, will correct most of that.

Corn borer moth counts will be interesting. An apparent early peak occurred about June 1 and then dropped off drastically with the cool weather. It will be interesting to see if the flight resumes with warm weather.

Del Hemsath, Extension Educator in Frontier County: The frost that hit the area June 5 is the biggest concern. Those fields which were cultivated or disturbed sustained the most frost damage. Most corn was in the eight-leaf stage and it looks like those leaves will be lost. The growing point doesn't appear to be damaged and the corn should recover. Scattered hail in the area has hurt some wheat fields.

Don Lydic, Extension Educator in Custer County: Some frost damage was reported in the Ansley and Calloway areas and north of Gothenburg, with those farmers who had just cultivated reporting the worst damage. Cultivation exposes the soil to the cold, causing it to lose radiant heat.

Alfalfa weevils are still being found and spraying is being recommended in some fields. Assess each field situation to determine the potential for damage.

CROP WATCH

1998 University of Nebraska

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*

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Frosted corn (Continued from page 109)

location were: 1) leave the field as it is (control), 2) replant with corn or another crop, and 3) clip the corn plants above the soil surface. A randomized complete block pattern with six replications was used for this study. Frost damage at each site was relatively uniform within the plot area. All three sites were irrigated, but irrigation applications were minimal in 1992 due to abnormally wet conditions. All three sites had been cultivated prior to the frost.

Yields from the control and clip treatments were inversely proportional to the extent of frost-induced defoliation and directly related to stand survival. Clipping did not affect yields at the 55% defoliated site, but reduced yield at the 37% and 100% defoliation sites. Clipping also seemed to spread a bacterium from which developed a bacterial soft rot that reduced stands. Clipping may comfort the producer who is trying to remedy the situation, but clipping proved to be an unreliable solution.

Replanting corn increased yield by 22% to 92% at the 100% defoliation site, decreased yield by nearly 30% at the 55% defoliation site, and was equal to other treatments at the 70% defoliation site.

Recovery from a moderate freeze when the growing point is below ground usually is rapid and almost complete. The long-term effects on yield of losing the first four to five leaves is usually minimal.

In the 1992 study plant recovery was complicated when daily low and high temperatures were below normal for 10 days following the low temperature period. The unexpected development of bacterial soft rot at the 100% and 70% defoliation sites contributed to stand declines and played a significant role in the final results. For several weeks after the frost, injured plants continued to die from soft rot at or just above the growing point. The development of the soft rot was closely associated with the weather following the frost. Under more normal weather, we would expect clear skies and slight-to-moderate wind speeds, which dry the damaged foliage and aid in rapid regrowth.

To check for soft rot, split the seedling and look for dark, water-soaked tissue. If this condition is evident and widespread, replanting may be necessary.

Yield (bu/acre) of corn following early-season frost at three sites near Minden Ne. 1992

Site % defoliated	*Control*	*Clipped*	*Replant*	*LSD*
100	101	64	123	22
70	153	146	162	n.s
55	202	195	143	20

(Corn recovery from early-season frost. R. W. Elmore and B. Doupnik Jr., 1995. Journal of Production Agriculture 8: 199-203)

Recommendations

Make a field-by-field assessment of final stand potential before deciding whether to replant. Depending on extent of frost damage, either leaving the plants alone or replanting will provide the best opportunity for corn recovery and maximum yields. If weather conditions are beneficial to recovery, a new leaf should develop three to four days after the frost. In the 1992 study, the most economical solution at the 55% and 70% defoliation levels was to leave the field alone and not replant. At the 100% defoliation level, replanting proved beneficial.

What can a producer do to reduce frost damage potential?

Cultural practices used by farmers prior to frost created visible differences in the extent of frost damage and plant responses because the microclimates around plants differed. For example, corn cultivated just prior to the frost sustained more damage than uncultivated corn. Corn without spring-applied irrigation was damaged more than corn with irrigation. Unfortunately, sprinkler irrigation systems do not have the speed or capacity to apply water to large areas quickly. Since plants at different growth stages are affected differently by frost, varying planting dates and hybrids would reduce risk. Crop rotations make a difference too. For example, corn following corn was more affected by frost than corn following soybeans. Row orientation affected the extent of corn injury. Corn in north-south rows was harmed more than corn in east-west rows. Obviously, the opposite could occur during the next environmental crisis, but, planting in different row orientations would spread risk of extensive crop losses to any one environmental event.

Roger Elmore, Extension Crops Specialist, South Central REC

Yellow corn fields signal stress from cool temps, herbicides

Yellow corn fields and discolored corn leaves are indicative of the slowed plant growth, crop stress and possible herbicide injury caused by recent below normal temperatures. While the appearance may be disheartening, most plants will recover and green-up when temperatures warm.

Temporary crop discoloration may result when the cooler temperatures affect plant functions such as photosynthesis, respiration, absorption of water and nutrients, and transpiration. It also may occur when herbicides are applied under cool conditions.

With the warmer weather in late April and May, most corn was planted by early May. As producers prepared for postemergence herbicide applications, temperatures turned cooler in late May, slowing corn plant growth and lowering its herbicide tolerance. Producers with many acres had to decide whether to proceed and risk some crop injury if temperatures remained cool, or wait and risk not being able to treat at all because the crop and weeds had gotten too tall.

Injury resulting from applying herbicides during the cooler temperatures usually causes temporary discoloration or stunting, which typically disappears with the return of warmer weather. If symptoms persist, however, yields may be reduced.

In some areas, corn leaves are showing symptoms of "sun scald" or "cold banding." This occurs when temperatures drop to 40 F and clear nights with dew are followed by clear sunny mornings. Irregular, light gray to silvery blotches apear on both leaf surfaces of corn. Plants affect are usually 10 to 18 inches tall. Another symptom is the appearance of yellow bands across one or more leaves.

New leaves should be normal and there should be little effect on yield or plant health. Unfortunately, this week's cool wet weather slowed corn development so some symptoms may persist longer than is usual.

Alex Martin
Extension Weeds Specialist

How low did it go?

Following is a list of weather stations posting temperatures at or below 40 F June 1-7 and the day of the temperature. Temperatures in lowland field areas likely were lower than the posted temperatures.

	Hi/Day	*Lo/Day*
Ainsworth	82/2	36/4
Alliance	84/2	33/7
Arapahoe	82/2	34/7
Cedar Point	82/2	38/5
Clay Center	91/2	39/7
Curtis	86/2	33/7
Elgin	86/2	40/4
Grand Island	90/2	40/4
SandhillsLab	81/2	32/7
Halsey	82/2	36/7
Holdrege	88/2	35/7
Kearney	89/2	41/4
Lexington	88/2	38/7
McCook	90/2	34/7
Mead	90/2	41/4
Minden	89/2	40/7
North Platte	84/2	33/7
O'Neill	85/2	38/4
Ord	87/2	39/7
Red Cloud	93/2	40/7
Scottsbluff	88/2	33/7
Sidney	83/2	34/7

The weather, then and now, in a nutshell

Nebraska experienced a myriad of weather events during May and early June that had the potential to be both beneficial and harmful to crop development.

The first three weeks of April brought wet-cool conditions to the eastern half of the state, raising serious concerns about planting delays. Western Nebraska received below normal precipitation during the same time. By late April, above normal temperatures coupled with below normal precipitation allowed producers to not only catch up, but nearly complete corn planting well ahead of the five-year average.

Cool temperatures and above normal precipitation returned the last week of May and first week of June. Freezing temperatures were reported in isolated low-lying areas across the western third of the state June 4-6.

Lowland flooding has been a problem on occasion during the last five weeks. Severe thunderstorms have dropped heavy rains in excess of two inches per hour. Storm totals in excess of three inches and up to six inches were observed in central, east central, and southeast Nebraska during the middle of May.

Even though temperatures have struggled to reach the 70s during the last week, crop development is ahead of last year and the five-year average for anything that emerged before the third week of May. Even crops that emerged during the last two weeks are ahead of last year, but trail the five-year average.

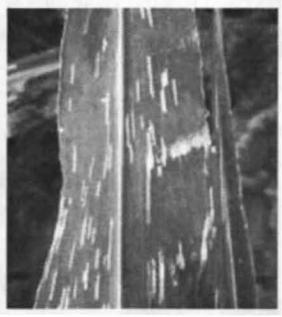
Based upon Growing Degree Days (GDD's), the state corn crop is four days ahead of the five-year average and eight days ahead of last year. The soybean crop is three days ahead of last year, while the sor-

(Continued on page 113)

Row crop diseases developing

Corn

Gray leaf spot was detected in one of our corn demonstration plots at the ARDC site near Mead. Growers and agricultural consultants scouting corn fields in central and eastern Nebraska should watch for its presence. Early symptoms may not show the long linear lesions typical of those present on infected leaves at midseason; instead these early, young lesions may resemble those of other diseases such as eyespot. Weather conditions in late May and early June were favorable for gray leaf spot. Continuous corn planted into last year's corn stubble is a prime site for early gray leaf spot development, particularly, if last year's field was infected.



Gray leaf spot of corn

If you suspect that gray leaf spot is present and want a confirmation, send the sample to the Plant and Pest Diagnostic Clinic. Samples can be sent directly or through the county extension office. There is a charge for samples submitted to the clinic.

Soybean

Heavy rains these past couple of weeks have caused some problems with Pythium seedling blight of soybeans. The Pythium fungus is present in most fields, and when the soils in these fields become saturated, seedling roots are infected. Low areas and terrace channels are most often affected. Symptoms of Pythium seedling blight range from seeds rotting in the soil to roots with brown lesions on the hypocotyl or at the junction of the hypocotyl and the primary root. Seed treatments and/or soil-applied fungicides that contain the active ingredient metalaxyl, such as Apron or Ridomil, provide some defense against early stand loss. If a stand is to be replanted to soybeans, a metalaxyl seed treatment is a sound investment to a good stand.

John E. Watkins
Extension Plant Pathologist

The weather

(Continued from page 112)

ghum crop is one day ahead of last year. The soybean crop trails the five-year average by two days, while the sorghum crop is two days behind the five-year average.

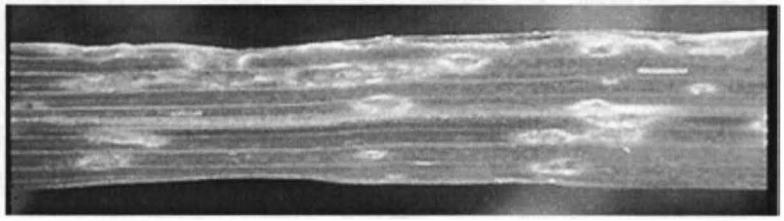
It appears that the next two weeks will bring normal temperatures, with normal to above normal precipitation. The greatest likelihood of above normal precipitation will be across the eastern half of the state. Normal GDD accumulations would keep the corn crop ahead of last year and the five-year average.

Very hot temperatures have occurred across the southern Great Plains during the last six weeks. If this area continues to remain dry, Nebraska is likely to experience above normal temperatures as southerly winds transport the heat northward. As long as normal precipitation continues, the heat should not be a major concern prior to pollination.

Al Dutcher, State Climatologist
Agricultural Meteorology

Leaf rust and tan spot identified in many wheat fields

Leaf rust and tan spot are present in many fields in eastern and central Nebraska. Tan spot is the most prevalent and most severe of the two diseases. Leaf rust severities ranged from light to moderately severe. Neither disease will probably have much of an impact on yields since the wheat is generally 7 to 14 days early. Stages of development range from one half berry to medium dough with some fields in southeast Nebraska starting to mature.



Leaf rust of wheat

Early maturing wheat and late developing leaf diseases usually are to the benefit of the host rather than the disease.

A survey of approximately 20 fields in southeast Nebraska showed no major developing disease situations other than tan spot and leaf rust. Scab, take-all and Cephalosporium stripe were not found in any of the fields. A few samples of plants with small heads were sent to the disease clinic last week. These were determined to have either crown and root rot or Cephalosporium stripe, or in one case, both diseases. Both diseases will cause infected plants to mature early, often with small poorly filled heads.

John E. Watkins
Extension Plant Pathologist

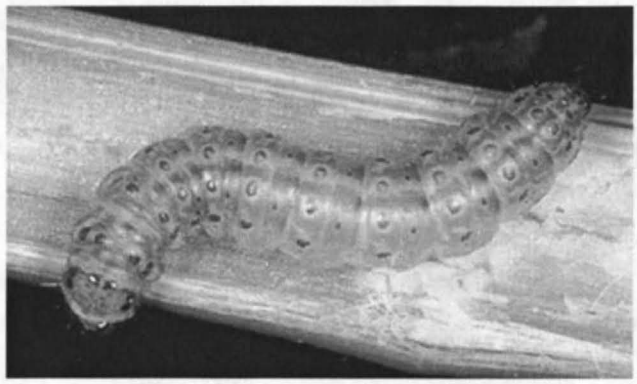
Check early planted fields first for European corn borer damage

The recent cold night temperatures are affecting the pests as well as the crops.

European corn borer moth flight began on May 14 at Aurora and Clay Center, based on black light traps. Moths were first seen at Concord on May 17. Low levels of moths were caught initially, but since Memorial Day moth numbers have been increasing at Aurora and Clay Center until the recent cooler temperatures. Activity will increase again as temperatures warm.

Larvae hatching from eggs laid on plants at less than the six-leaf stage will not survive well, due to the natural resistance factor DIMBOA found in smaller corn plants. As plants get larger (8-12 leaf stage) survival will increase as the DIMBOA level decreases within the plant. Moths prefer to lay eggs on taller plants (earlier planted fields) in an area. Because of this and the poor survival of borers on smaller plants, scouting should begin on earlier planted fields.

Now that B.t. corn is being planted widely, be sure you know whether the field you are scouting was planted to B.t. corn. Normally in B.t. corn, the most damage from corn borers in whorl stage corn should be a few tiny pin holes, where larvae initially fed before they ingested a lethal dose of B.t. toxin. Seed lots, however, may contain a small percentage of off-type seed (typically less than 4%) which does not produce sufficient toxin levels to kill corn borer larvae. If more than 4% of the plants show significant leaf feeding damage in a B.t. corn field, first check to confirm it is corn borer causing the damage (other caterpillars such as corn earworms, or common stalk borer are not controlled by B.t. corns),



European corn borer (*Photo by Frank Peairs*)

then contact a representative of the company who sold the seed to investigate the situation more completely.

To determine whether to treat for corn borers, survey fields for plants showing leaf feeding injury and count the number of live corn borers present. Check at least 25 plants in each of four areas of a field (100 plants total). Record the percentage of plants with shot-hole damage. Unroll two or more damaged plants at each site and record the number of live larvae per damaged plant. This will provide an estimate of the maximum number of borers that might survive to enter the stalk. Remember that natural mortality of corn borers is often high, due to insect natural enemies, diseases and weather. Avoid making treatment decisions until most borers are second instar, to take full advantage of this natural control.

Enter field scouting information into the accompanying worksheet. This takes you through the calculations needed to estimate the potential yield loss if all these corn borers survive to bore into the stalk, the preventable loss if an insecticide is used, and the control costs. An interactive version of the worksheet is available at *http://www.ianr.unl.edu/forms/forms.skp/ecb_1st.html*

Treatments will be effective only if borers are still feeding in the whorl. Treatments made after corn borers begin to bore into the stalk (when they are about half grown) will not be effective. Based on research data, the best control is achieved with granular formulations aerially or ground applied or applications through sprinkler irrigation systems, which provide the best penetration of insecticide into the whorl where the corn borer larvae feed.

Consider the use of products containing *Bacillus thuringiensis* (Dipel, Biobit, Thuricide, M-Peril, Condor, and others). These products effectively control first generation European corn borers without reducing the populations of insect natural enemies, and offer reduced risk to applicators.

Refer to *http://www.ianr.unl.edu/ianr/entomol/instabls/ecb1st.htm* for a list of suggested insecticides, rates and restrictions.

Additional information on scouting and treatment thresholds for first generation corn borer is available in NebFact 98-364, available from your local cooperative Extension office or at *http://www.ianr.unl.edu/ianr/entomol/ecb/ecb1.htm*

Bob Wright
Extension Entomologist
South Central REC, Clay Center

Management worksheet for first generation European corn borer larvae

An interactive version of this worksheet is available on the web and will calculate the findings for you. It is available at *http://www.ianr.unl.edu/forms/forms.skp/ecb_1st.html*

	Example field	Your estimate
1. Yield potential for this field	_____ bu/acre	_____ bu/acre
2. Number of larvae/infested plant = average live larvae/infested plant x average percent infestation (4 larvae x 50% infestation = 2 larvae/plant)	_____ larvae/plant	_____ larvae/plant
3. Potential yield loss (2 larvae/plant x 5% loss/larva = 10% loss in yield, 10% x 150 bu/acre = 15 bu/acre loss)	_____	_____
4. Dollar loss/acre (15 bu/a x $3.50 per bu = $52.50/acre loss)	_____	_____
5. Preventable loss (if chemical is 75% effective = $52.50 x 75% = $39.37)	_____	_____
6. Cost of chemical (ex. $8.00/acre) and cost of application (ex. $4.50/acre) Your estimate	_____	_____
7. Compare preventable loss ($39.37/acre) with total cost of treatment ($8.00 + $4.50/acre = $12.50/acre) or $39.37/acre - $12.50/a = $26.87 saved by the treatment	_____	_____

Crops update

Cool, wet conditions slowed crop development, as soybean and sorghum planting neared completion, according to the Nebraska Agricultural Statistics Service.

Freezing temperatures were recorded in various western locations Saturday morning, June 6. Low-lying areas and newly cultivated fields were most affected.

Winter wheat condition rated 2% very poor, 10% poor, 24% fair, 55% good and 9% excellent. Wheat heading advanced to 89%, ahead of 82% last year. Wheat beyond pollination likely escaped injury from cold temperatures.

Corn condition rated 2% poor, 14% fair, 67% good, and 17% excellent.

Soybean planting progressed to 96% complete, ahead of 95% last year and 76% average. The crop was 82% emerged compared with 70% last year and 50% average. Soybean condition rated 2% poor, 16% fair, 68% good, and 14% excellent. Reports in the central and eastern

(Continued on page 117)

Select and use nozzles to minimize drift

Spray drift is a potential problem with any pesticide application. Producers can reduce spray particle drift by managing droplet size, application method and conditions. New nozzle designs and spray additives are being developed to help reduce the number of driftable spray particles — those below 200 microns in size — and improve coverage by providing more uniform sized droplets (*see related story, page 117, on droplet sizes*).

The nozzle design, flow rate through the nozzle, operating pressure, and the properties of the spray solution determine the droplet sizes and distribution of droplet sizes formed by an individual nozzle. Producers can change any of these to change the size of the droplets, affecting coverage and the potential for drift. The following illustration of possible changes uses information from Spraying Systems Company* and their nozzle product line and droplet size analysis from University of Tennessee research.

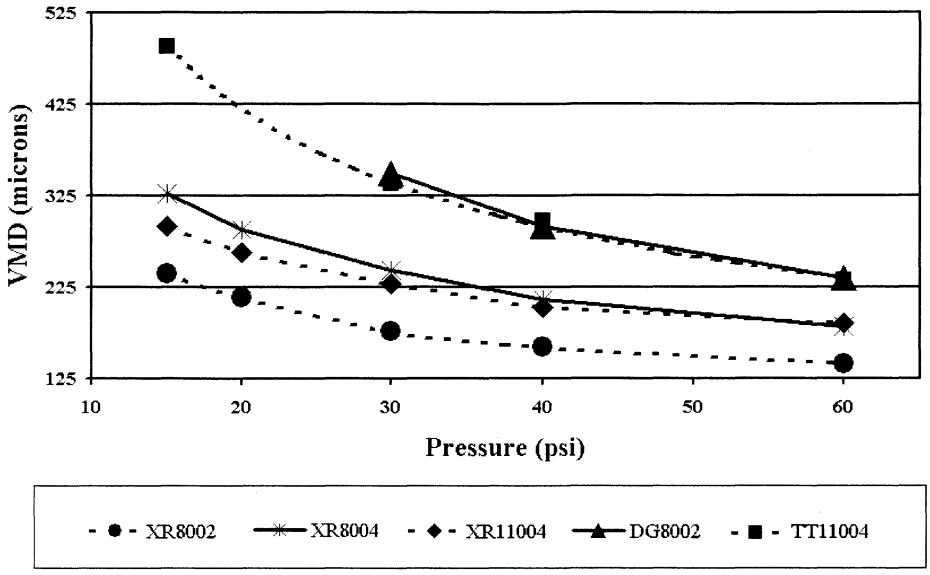
As an example, consider a producer using a "ten gallon tip" to apply a pesticide mixed in water. While the label "ten gallon tip" has been around for years, this example will show several different tips could be used. TeeJet XR8002 nozzles on 20-inch spacings operated at 40 psi and 6 mph will apply 9.9 gpa. Drift would be a concern since the Tennessee research indicates that the volume median diameter (VMD) would be 159 microns when operated under these conditions (*see figure*). By reducing the operating pressure to 20 psi, the output drops to 6.9 gpa and the drift potential decreases as the VMD increases to 214 microns. Reduced pressure decreases drift potential.

The producer could switch to TeeJet XR8004 nozzles on 20-inch spacings operated at 15 psi and 7 mph to apply 10.2 gpa. The larger nozzle produces larger droplets with a VMD of 327 microns, which are less prone to drift. This change allows a slightly higher operating speed while still maintaining about a 10 gpa application rate. Another option would be for the producer to use TeeJet XR11004 nozzles which allow the spray boom to be lowered while still maintaining proper overlap. This reduces drift by reducing the amount of time that the spray droplets are in the air and exposed to the wind. These nozzles at 15 psi and 7 mph on a 20-inch spacing also put out 10.2 gpa with droplets having a VMD of 292 microns. A larger nozzle or a lower boom height reduces drift potential.

The producer may consider some of the new nozzle designs which include a pre-orifice and a turbulence chamber. These nozzles meter the spray before it reaches the nozzle orifice, forming larger droplets since the pressure is reduced at the pre-orifice. A Drift Guard DG8002 on 20-inch spacings operated at 40 psi and 6 mph puts out 9.9 gpa — the same as the original nozzle — and provides droplets with a VMD of 292 microns. Unlike the XR nozzles, this nozzle must be operated above 30 psi to achieve uniform spray distribution.

Or another new design, a Turbo TeeJet TT11004 on 20-inch spacings operated at 15 psi at 7 mph puts out 10.2 gpa, at the lower boom height, and provides droplets with a VMD of 488 microns. While this droplet size is the most drift resistant of the

(Continued on page 117)



Volume median diameter (VMD) for several nozzle types at various pressures. (Figure is drawn from data presented in *Tip Selection for Precision Application of Herbicides — A Look-up Table of Drop Sizes to Assist in the Selection of Nozzles* by Alvin Womac, Jill Goodwin, and William Hart. University of Tennessee Agricultural Experiment Station Bulletin 695.)

*Mention of brand and product names is for identification purposes only. Additional brands and products are available to reduce drift potential and improve spray coverage.

Spray droplet size defined

Sprayer nozzles are designed to meter the spray solution and distribute it uniformly for the desired coverage. Atomizing the spray solution into very small droplets increases the coverage, but also increases the potential for drift or evaporation of the spray. Droplets less than 100 microns in size (about the diameter of a human hair) lack the weight necessary to fall quickly and often evaporate before they hit their target. On the other extreme, spraying with droplets larger than 1000 microns requires a great carrier volume in order to get complete coverage since the individual droplets are so large. The key then is selecting and operating a nozzle to obtain the desired coverage while minimizing drift (*see related story, page 116, on nozzle selection*).

Droplet size is expressed in volume median diameter (VMD, sometimes labeled $Dv_{50\%}$) representing the drop diameter such that 50% of the spray volume is in smaller droplets. A nozzle, such as a flood nozzle, may have a VMD of 200 microns with a range of droplet sizes from 90 to 700 microns ($Dv_{10\%}$ to $Dv_{90\%}$). There are many small, driftable droplets from this nozzle because it takes many small droplets to volumetrically equal a few large ones. In contrast, some of the new nozzle designs also may have a VMD of 200 microns but a range of droplet sizes from 100 to 375 microns, for more thorough coverage with more uniform sized droplets.

In reality, you want a range of droplet sizes to effectively deposit pesticides on the wide variety of

(Continued on page 118)

Nozzles *(Continued from page 116)*

examples given, it may be getting too large for proper coverage with contact herbicides. This nozzle has an operating range of pressures from 15 psi to 90 psi, making it suitable for systemic herbicides at low pressures, contact herbicides at medium pressures, and insecticides or fungicides at high pressures.

Another new design offered by several companies is the air induction nozzle which entraps air in the spray particles to make them larger and less driftable. They are "so new" that VMD data is not available, but they have been used in Europe for many years. Their added cost may be offset by fewer drift problems.

Before selecting a nozzle, consult the manufacturer's catalogues for information on the various nozzle types and their recommended applications. While uniform coverage is important, the key things to remember are that the smaller the spray particles are and the longer they are in the air before striking the target, the greater the potential for drift.

Paul Jasa
Extension Engineer
Robert Grisso
Extension Machinery Specialist

Herbicide injury or response? Replanting rarely justified

Postemergence herbicides occasionally cause crop injury or crop response, depending on your perspective. The question that follows is whether the effect will reduce crop yield.

This question is difficult to answer in a quanitative manner. Usually the symptoms and effects are temporary and with reasonable growing conditions the plant quickly recovers. This is particularly true with contact herbicides such as Buctril in corn and sorghum or Cobra, Blazer, and Reflex in soybeans. Recovery is slower under adverse growing conditions.

Translocated herbicides that move to the meristematic regions **may** produce longer lasting effects. Long lasting effects have a greater potential to influence crop yield than temporary responses.

Crop injury that occurs at a crucial stage of plant development (ear size determination in corn or pollination in any crop) has a greater likelihood of producing a yield effect than injury occurring at other stages. Soybeans in particular often recover from early season injury and produce a full yield. Generally, significant stand reduction is required to reduce crop yield enough to justify replanting. Remember the replant crop does not have a full yield potential because of the late planting date. Few cases of herbicide injury justify replanting.

Alex Martin
Extension Weed Specialist

Crop update

(Continued from page 116)

parts of the state indicated bean leaf beetle damage in some fields.

Sorghum planting was near completion and advanced to 97%, ahead of 92% last year and 69% average. The crop was 77% emerged compared with 55% last year and 41% average. Crop condition rated 1% very poor, 7% poor, 30% fair, 50% good, and 12% excellent.

Why soil test recommendations differ

It happens to many producers and consultants. Soil samples are taken and sent to various laboratories. Although the laboratories may have similar laboratory results, the recommendations based on those results do not correspond at all. Many consultants, farmers, and agribusiness people wonder about these differences and why they exist.

Agricultural production always includes unknowns. Crop fertilization recommendations are based on interpretation of data and experience. Reasonable scientists have come to different conclusions on the general principles of fertility.

Today, there are three crop nutrition concepts commonly used. These include the deficiency correction approach, the maintenance approach, and the nutrient removal approach. Following is a look at each of these.

The **deficiency correction approach**, favored by the University of Nebraska as well as several other land grant colleges, states that a nutrient should be applied only if there is a reasonable expectation of a crop response. It requires a soil test be developed that indicates when a specific nutrient is yield-limiting in a field. Correlation research is conducted to determine crop yields at different soil test levels for a given nutrient. From there, calibration data is used to determine how much fertilizer is required for optimum yields at different soil test levels.

This approach requires the most intensive research because the soil test needs to be responsive to changes in soil levels and correlated with crop response.

The advantage of this method is that the only fertilizers applied will increase yields, and these will be applied at optimum rates. This has been called "fertilizing the crop" since emphasis is placed on achieving crop response. The method is both economical and environmentally sound.

The **maintenance approach**, favored by many in industry and some land grant colleges, sets a soil test level goal and recommends fertilizer to build the soil to the specific nutrient level that has been determined to be ideal. Soil test levels are used to determine when to fertilize. Soil tests for this approach still have to be correlated. The difference is that emphasis is placed on maintaining the soil fertility level at or above the point of economic maximum yield. This has been called the "fertilizing the soil" approach since emphasis is placed on achieving a specific nutrient level in the soil.

A third approach which is still widely used is **nutrient removal.** Before the advent of soil testing, the nutrient removal approach to crop fertilization was the best science had to offer. Early agricultural scientists realized that crops obtained their nutrition from the soil and to maintain good production, nutrients had to be returned to the soil. This was accomplished through crop residues, wood ashes, and manures. The theoretical advantage of returning to the soil what is removed is that productivity is maintained and depletion avoided.

The disadvantage of this approach is that it does not account for the soils' ability to supply many essential nutrients. Nutrient removal does not recognize that all nutrients are not used at 100 percent efficiency. A producer may under-or over-fertilize by following the nutrient removal approach. Soil testing is unnecessary since nutrients are added based on what is harvested.

Why recommendations vary

Fertilizer recommendations can vary a great deal depending on the crop fertility approach. The deficiency correction approach will provide the least costly, most efficient fertilizer program. There is, however, greater risk of under fertilizing with this method. Risk is reduced with the maintenance and nutrient removal approach; however, fertilizer programs using these systems are much more extensive and costly than the deficiency correction approach.

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Droplet size

(Continued from page 117)

targets you may be spraying. Very fine droplets (less than 120 microns) are effective for insecticide and fungicide applications where drift is an aid in depositing the pesticides on the underside of leaves. Fine and medium size droplets (120 to 350 microns) deposit more efficiently on stems and narrow vertical leaves such as grasses and are desired for contact herbicides. Coarse and very coarse droplets (over 350 microns) deposit most efficiently on large flat surfaces such as broadleaf weeds or the soil and work well for translocated herbicides which move in the plant.

With any pesticide application, check the label for recommendations on the proper nozzles, operating pressures, and carrier volume before filling the sprayer. For the wide variety of pesticides and rates applied on the farm, a producer may have to have several types and sizes of nozzles for the sprayer.

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