FOCUS on South Plains Agriculture

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Wheat Insects

The season is starting off with a bang. Area wheat is experiencing heavy infestations of Russian wheat aphid, greenbugs or army cutworm, or combinations of these depending on location.

Let's deal with the aphids first. Russian wheat aphid injects a toxin while feeding, and the toxin causes purple streaks on leaves. Greenbugs also inject a toxin while feeding, but this usually just results in yellow or brown plants and not the purpling associated with Russian wheat aphid. Additionally, heavy infestations of Russian wheat aphid cause leaf edges to roll inward, thus giving the leaf a tube-like appearance. Each of these species causes direct damage to the plant and each species can vector viral diseases.

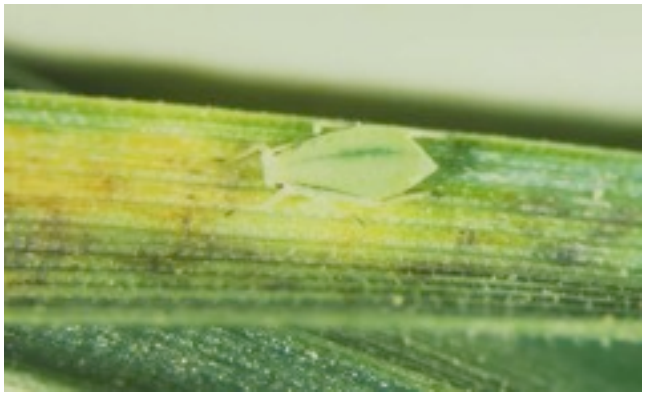
It is easy to differentiate between greenbugs and Russian wheat aphids. Basically, greenbugs have a dark stripe down the middle of the body and have prominent cornicles (also called tailpipes) on the back of the body. Russian wheat aphids don't have a green strip on the back and don't have cornicles. I have reprinted a diagram from Managing Insect and Mite Pests of Texas Small Grains that shows how to tell these pests apart.

Army cutworm numbers are high in many places. Monti Vandiver is reporting large populations in the Parmer and Bailey county area, and I have had calls from as far north as Stinnet. Army cutworms can defoliate plants and feed on parts of the root system. The good news is that they don't vector viruses. The action threshold is four to five larvae per square foot.

It is important to determine whether a field is infested with Russian wheat aphid or greenbugs or both. The Russian wheat aphid

economic threshold is as low as 4 percent of tillers infested. A ballpark threshold for greenbugs this year is on the order of 4 greenbugs per tiller, but of course both of these threshold statements are generalities. One should consult Managing Insect and Mite Pests of Texas Small Grains for scouting procedures, economic thresholds and insecticide suggestions. I should note that Dow AgroSciences' Cobalt insecticide is a mixture of gamma-cyhalothrin (a pyrethroid) and chlorpyrifos (same ingredient as Lorsban) and was not on the market the last time we revised the small grains guide. Cobalt lists Russian wheat aphid, greenbug and army cutworms on the label. Our guide does list Lorsban and gamma-cyhalothrin individually for control of aphids.

We have also reprinted Monti Vandiver's recent newsletter because it provides an excellent summary of the current situation.



Greenbug

Russian wheat aphid

Army cutworm

Cotton Insects

Thrips: Preventive or foliar treatments

Deciding on whether or not to use a preventive thrips control product, and which one to use can be a difficult decision, and the benefit of these treatments is dependent on the weather and thrips pressure. Neither of which is predictable. However, you can make reasonable assumptions and guesses based on historical data and long-range forecasts.

Thrips build up populations primarily in small grains, flowering weeds and wild grasses; with wheat being the largest source of thrips, particularly during dry conditions. Once the wheat begins to mature and dry down, thrips will disperse out of the wheat in extremely high numbers, and will go to pretty much whatever is green in the area; notably newly emerging cotton. Thus, if you are growing cotton in area where a lot of small grains are produced, using preventive thrips treatments may be justified.

Another consideration when deciding on whether or not to use a preventive treatment for thrips is the weather. In 2007 we had a thrips test where cotton treated with Temik at 3.5 lbs/ac yielded 350 lbs-lint/ac more than an untreated check, but in 2008 similar studies saw no benefit from using Temik. Why the difference? Primarily temperature. During the 21 days post emergence in 2007, the average daily high and low was 82 and 54 °F, respectively; while in 2008 the average daily

high and low was 94 and 58 °F, respectively. At the 2008 test location, we noticed that area cotton that had been planted 10 to 14 days earlier appeared to suffer significant thrips damage when growing under cooler conditions. Under warmer conditions, the cotton is simply able to outgrow some thrips damage. Thus, if you are growing cotton in an area that typically experiences cool temperatures and thrips commonly exist, then using a preventive treatment may be justified. However, if you are in an area where thrips populations are not normally severe and temperatures are relatively warm, you may opt for foregoing preventive thrips treatments and use curative foliar sprays as needed instead.

If you have decided that a preventive thrips treatment is a good option for you, there are a number of preventive thrips treatments to choose from including seed treatments and in-furrow insecticides.

Thrips damaged plants

Seed treatments for thrips

The good thing about seed treatments is that they are easy to use, require no special equipment, and are fairly safe to handle. Seed treatment options for thrips control include Orthene, Gaucho Grande, Cruiser, Avicta Complete Cotton, Avicta Duo Cotton, and Aeris. The length of thrips control will vary by product, soil moisture, precipitation, and thrips pressure. Additionally, your choice of a seed treatment should consider nematode and disease potential as well.

Prior to the release of the newer seed treatments, Orthene was the standard base seed treatment targeting thrips, but this treatment performs erratically, and is usually short lived; typically provides only 3 to 5 days post emergence thrips suppression. Gaucho Grande is a widely used thrips control product in many parts of the cotton belt, but tends to be weak against western flower thrips which is the predominant thrips in the Texas High Plains. For us, Gaucho Grande will usually provide about 7 days post emergence thrips control.

For us, the better thrips control seed treatments include the Cruiser, the Avicta products and Aeris. Cruiser contains the single active ingredient thiamethoxam, and is in the same insecticide class imidacloprid. However, Cruiser is more active towards western flower thrips than Gaucho Grande and will provide 21 to 24 days post emergence thrips control.

Aeris is a combination of imidacloprid and thiodicarb. Imidacloprid is the same active ingredient as Gaucho Grande, but the inclusion of thiodicard significantly increases the length of control of Aeris over Gaucho Grande to 21 to 24 days post emergence control. Thiodicarb also has some nematode activity (see nematode section for details). Prior to 2009, Aeris seed treatments automatically included the inclusion of the premium fungicide Trilex Advanced, but now Aeris can be applied separately.

Avitca seed treatments are available in two options, Avicta Complete Cotton and Avicta Duo Cotton. As far as thrips are concerned, these products are identical and are the same as Cruiser. They have the same active ingredient as Cruiser for thrips (thiamethoxam), and like Cruiser, will provide 21 to 24 days of post emergence thrips control. The

differences among Cruiser, Avicta Complete Cotton and Avicta Duo Cotton are the other active ingredients. Both of the Avicta products, in addition to thiamethoxam, include abamectin for nematode management (see nematode section for details), and Avicta Complete Cotton also includes the premium fungicide treatment Dynasty CST (see disease section for details).

Regardless of the seed treatment utilized, keep in mind that effective control will usually not last more than 24 days under constant thrips pressure, and follow-up foliar sprays may be necessary to protect the crop once these treatments wear off.

Temik in-furrow for thrips

In addition to the seed treatments as a preventive approach to thrips management, an in-furrow application of Temik is an option. Temik is the "Cadillac" treatment when it comes to preventing thrips damage in cotton. For thrips control no more than 3.5 lbs/ac of Temik should be required to control western flower thrips. None of the data we have collected over the years shows a benefit from using 5 lbs/ac of Temik over the 3.5 lbs rate. However, the 5 lbs rate may be considered when trying to manage nematodes (see nematode section). Temik at 3.5 lbs/ac will generally provide 28 to 32 days thrips control post emergence. Similarly to the seed treatments, the length of control achieved with Temik is dependent on soil moisture, precipitation, and thrips pressure. And like the seed treatments, follow-up foliar sprays may be necessary to protect the crop once the treatment wears off.

Where Temik outperforms the seed treatments in length of control, it does tend to be less convenient than the seed treatments and is highly toxic. Fortunately, the added safety provided by "Lock-and-Load" application system does alleviate some of the concerns of handling this product.

We have included a summary of commonly used preventive thrips control options in cotton. Other preventive treatment choices do exist, including Thimet and Orthene applied using a seed box option, the treatments described in this text tend to be the ones most commonly used.

Wireworms

Coming into this season there maybe concern regarding the potential for wireworm problems when planting into fields with high residues of wheat, corn and primarily sorghum. Wireworms have been occasionally troublesome in cotton north of Lubbock where more grain crops are produced.

Large false wireworm larvae Photo: QDPI

False wireworm larvae

When we are discussing wireworms, we are usually talking about the larvae of both true wireworms and false wireworms; however, false wireworms tend to be more of a problem in our area. The larvae of these beetles typically feed on the roots and/or the hypocotyl of germinating cotton and result in stand loss. Conditions that adversely affect wireworms are cold winters, irrigations or rainfall during the winter or early spring that flood fields. Prevention of damage is the best method for controlling this pest. Planting shallow and under warm conditions often will allow seeds to germinate rapidly and for plants to outgrow wireworms. Currently, there is no recognized action threshold for wireworms in cotton, and we have no efficacy data to support the recommendation of various insecticide treatments. However, there is substantial evidence based on observations, that some insecticides can effectively manage wireworms. Seeds treated with Cruiser, Avicta Complete Cotton or Avicta Duo Cotton should be protected from

substantial damage. Other seed treatments may also be effective. Gaucho Grande and Aeris, although wireworms are not listed on the labels for cotton, appear to be effective. The active ingredient in these products, imidacloprid, is labeled for use against wireworms in other crops. Temik does not have wireworms on its label and based on observations appears to not be all that effective.

2008 Insecticide Tests and Disease Management Report

The Applied Cotton Insect and Disease Pest management Evaluations in the Texas High Plains 2008 Report (1.9 MB) is available for download. This report contains 2008 insecticide efficacy data for thrips, cotton fleahoppers, aphids, Lygus, beet armyworms, bollworms, and cotton variety susceptibility information to Fusarium and Verticillium wilts. DLK

Cotton Agronomy

Recap of 2008 Crop

According to recent National Agricultural Statistics Service data (NASS), cotton producers in the High Plains region planted around 3.37 million acres in 2008. About 630,000 acres were in District 1N and 2.74 million acres were in District 1S. The early part of the year was very dry, with some rainfall obtained in early May. Cotton planting was delayed by the rainfall and was somewhat behind normal. In late May and early June, high temperatures and high wind velocities resulted in substantial losses of dryland cotton. Approximately one million acres were lost due to these conditions. Many dryland fields in sandy western and southwestern counties blew out or were badly damaged. Significant numbers of dryland fields lost sufficient moisture to be released based on non-emergence. Blowing dryland fields on south and southwest sides of irrigated fields sifted onto the irrigated and caused some damage. Many subsurface drip acres had difficulty with stand establishment. Overall cotton heat unit accumulation by month for Lubbock was as follows: May 14% above normal; June 22% above normal; July 4% below normal; August 3% below normal; and September 22% below normal. September and early October delivered excessive rainfall, causing difficulty maturing the crop and triggered low micronaire problems, especially in District 1N. On October 23rd a freeze occurred across most of region. These late environmental conditions resulted in highest bark contamination since 1991. The NASS estimates indicate that we harvested about 2 million acres, so a loss of about 1.37 million acres occurred. Most of the failed acres were dryland.

Estimates indicate we harvested about 3.12 million bales in 1N and 1S, which was the smallest crop since 2003 (at 2.15 million bales). Based on combined Lamesa and Lubbock Classing Office data, only 40% of the bales were color grades 11 or 21, which was significantly lower than 2007 (at 83%). Average leaf was somewhat higher than in the past several years. Record length was obtained, which was somewhat above 2007 data. The average staple was 36.8 32nds inch, and about 67% of the bales were 37 or longer, which is over 20% more for the 2008 crop compared to 2007. Another record for strength was noted at 29.73 g/tex, a slight improvement over 2007. Micronaire continues to be a major challenge, with all bales averaging about 3.63. The 2008 crop had about 40% at 3.4 or lower, and about 25% 3.2 or lower. The cool, wet September and early October reduced crop maturity, and the somewhat early October 23rd freeze slammed the door. These factors also impacted bark contamination which averaged about 60% of the bales, which was the highest amount since 1991.

With that said, producers need to be aware especially in District 1N that managing for earliness should be the major focus during the growing season. For several years now we have produced crops with substantial amounts of long, immature fiber for which is difficult to obtain good prices in the global market. Although we cannot control weather impacts, selection of varieties which tend to be some-

what earlier in maturity and managing those varieties for earliness should help. Excessive irrigation amounts, especially late (and in the case of 2008 excessive late rainfall), can push a lot of late set bolls (which contain much immature fiber with poor length distribution) to the point of providing some pounds of yield at the sacrifice of overall maturity. This is a difficult box that we need to find a way out of in order to improve crop quality for global markets.

Variety Selection Process

Selecting productive cotton varieties is not an easy task especially in the Texas High Plains, an area where weather can literally "make or break" a crop. Producers need to do their homework by comparing several characteristics among many different varieties, and then keying these characteristics to typical growing conditions. We can't control our growing environment from year to year, but we can select the varieties we plant based on desired attributes. It is very important to select and plant varieties that fit specific fields on your operation. Don't plant the farm to a single variety, but try relatively small acreages of new ones before extensive planting.

Variety Testing Publications

If disease issues are not concerning, then scrutinize all possible university trial data that are available to see how a specific variety has performed across a series of environments, and if possible, across years. It is best to consider multi-year and multi-site performance averages when they are available. However, due to the rate of varietal release, many new varieties are sold which have not undergone multi-year university testing, or perhaps no university testing at all.

Dr. Jane Dever has published the Cotton Performance Tests in the Texas High Plains and Trans Pecos Areas of Texas 2008 report. This report contains data on numerous entries in some 21 small plot trials. Small plot trials enable producers to observe results from a large number of entries at multiple locations. Dr. Dever has included summaries over location and water levels for some sets of trials. This is an outstanding resource and provides much information on variety performance, including lint turnout, fiber quality, earliness, plant height, and storm resistance.

The Extension 2008 Systems Agronomic and Economic Evaluation of Cotton Varieties Report is also available. This report contains 17 locations of replicated cotton demonstrations conducted by Extension agents in producer-cooperator fields across the region. Since these trials are planted and harvested with cooperator equipment, the number of entries per site is generally less than 15, and many times less than 10. However, these trials reflect a wide range of cultural practices, locations, irrigation types, etc. Also included in this report are results from the 2007 and 2008 picker vs. stripper harvester comparisons. These projects were conducted somewhat differently in 2007 as compared to 2008.

When it comes to variety selection in the High Plains, several factors are important to consider.

Maturity (Earliness)

We can't predict the weather, but producers should recognize that 2001, 2002, and 2003 were record high micronaire years in the High Plains and things have changed a lot since then. More recently, we have experienced higher yielding crops with lower maturity as seen in lower average micronaire. Producers should be looking very hard at the micronaire values of the new varieties. Many longer season cotton varieties are better adapted to areas with longer growing seasons, although significant gains in yield may sometimes be obtained in years with warm September and October temperatures. In years such as 2008, with a truncated season with few heat units at the end, many fields planted to some of these varieties had somewhat lower yield and more immature fiber resulting in lower micronaire. Dr. Dever's cotton performance test report contains an earliness evaluation (expressed as percent open bolls on a given date).

Pounds

Yield potential is probably the single most important agronomic characteristic, because pounds do drive profitability and provides for the safety net of higher actual production history (APH) in case of catastrophic loss of acres. The benefit this can provide from the crop insurance perspective is important in our high risk area. Yield stability across environments is going to be important, and basically what we want to find is a variety that has the ability to provide high yield across varying water inputs.

Fiber Quality

Producers should also consider lint quality. We have made a lot of progress in terms of fiber quality over the last several years, but we still have a long way to go to address maturity. A lot of things can affect crop micronaire. These factors can include overall environment, variety, early season fruit loss with later compensation, excessive late season irrigation or rainfall, disease, early season set backs due to hail damage, blowing sand, thrips, etc. Verticillium wilt disease incidence can also be a contributing factor. This in turn can be aggravated by excessive nitrogen fertilization and/or soil residual. There are comments below concerning testing for residual nitrogen.

Storm Resistance

Storm resistance is still a concern for growers in our area. Even though we have adopted less storm resistant cotton varieties over the last several years, and generally done well with those, the overall management system the producer adopts can be important. Producers planning to execute a sound harvest aid program as soon as the crop is mature can probably grow some fields of less storm resistant cotton. However, having large acreages of low storm resistant varieties might be a prescription for disaster if the right environmental conditions align at harvest. Do not plan to leave looser open-boll cottons in the field until a freeze conditions the plants for harvest. Unacceptable pre-harvest lint loss is likely to result. More storm resistant varieties are better adapted to our harvesting conditions and they are more likely to survive damaging weather prior to harvest without considerable lint loss. Inquire about the storm resistance of any variety on your potential planting list. If you do choose an open-boll variety, plan and budget ahead for a good harvest aid program that will let you achieve an early harvest. Good storm resistance data are now being provided by most companies and results from Dr. Dever's cotton performance testing program are valuable for looking at several varieties across location. With some growing interest in picker harvesting, excessive storm resistance can be a negative and result in reduced picker harvesting efficiency.

Disease and Nematode Resistance/ Tolerance

Producers should likely not plant the farm with with one variety of cotton. One question should be "do I have plant diseases or nematodes in this specific field?" One thing to consider is whether you know which disease is present. If you have a problem with a wilt disease and don't know what it is, then you need to have the problem identified. If known Verticillium wilt pressure is present, then take a look at Dr. Terry Wheeler and Dr. Jason Woodward's data from several locations investigating variety performance under constraints from this particular disease. The same thing should be considered for Fusarium wilt/root-knot nematodes. Many times varieties which do well under Verticillium wilt pressure may not be the same ones which rise to the top with Fusarium or root-knot nematodes. Bacterial blight is an occasional problem in the region. There are several varieties out there that can provide high levels of resistance/ immunity.

Biotech Trait Types

Producers need to ask themselves several questions. Do I want a herbicide-tolerant

variety, if so, which system? Weed control has been catapulted forward by the advent of transgenic Roundup Ready Flex and Liberty Link cotton varieties. The agronomic capabilities of Roundup Ready Flex cotton varieties continue to improve. The Liberty Link system has been more widely adopted in other areas, perhaps due to our tough early season environment in some years. Good to excellent varieties with these herbicide traits are out there. As for insect protection, the Bollgard 2 and Widestrike technologies have provided outstanding lepidopteran pest control. Based on our local pricing, these technologies should be considered, especially for irrigated farms.

We have a large number of commercial varieties from several companies being sold in our region in 2009. About 110 varieties are available for 2009. Many of these contain Roundup Ready Flex technology, many contain Bollgard 2/Roundup Ready stacked traits, some with Liberty Link and Liberty Link/ Bollgard 2 stacked, some with Widestrike /Roundup Ready Flex stacked, etc. There is still some overlap of Bollgard 2/Roundup Ready out there, but with the recent producer gravitation to Roundup Ready Flex technology, these varieties are diminishing. 2009 will be the last year that the older first generation Bollgard trait containing varieties can be sold. Some carryover into the 2010 planting season will be allowed for varieties containing Bollgard will be permitted, but the seed and technology fees will have to be paid in 2009 based on what I have been told.

Conventional Varieties

Some offerings of conventional varieties are still being made by a few seed companies. The companies of which I am aware include All-Tex Seed in Levelland. They are selling a new conventional variety in 2009, identified as ATX1203. Additional conventional varieties are being sold by Seed Source Genetics located in Bishop, TX. Some of these varieties have been tested in Dr. Jane Dever's performance trials.

Ease of Management

Plant type should be considered because substantial variation in available water input across the region. Under high water inputs, some varieties can get "growthy" and require diligence with regard to plant growth regulator (mepiquat chloride) application. Other varieties may not be as large. Some growers like the challenge of managing some of these "growthy" types, and some do not. Smaller plant types are generally easier to manage and require less plant growth regulator expense for growth control.

Seed and Technology Cost

Cost should not necessarily be the primary reason for selecting a variety, but it is important. The value of a high yielding cotton variety with biotech traits to ease management requirements across a large number of acres is a serious consideration. According to USDA-AMS Cotton Varieties Planted - 2008 Crop report, Lubbock Classing Office producers planted about 75% of the acreage to Roundup Ready Flex varieties, and nearly one-half to Bollgard 2 technologies. The Lamesa Classing Office reported about one-half Roundup Ready Flex acres and about 40% Bollgard 2 acres. We still see some acreage of conventional cotton planted according to the survey. Whether a producer chooses to plant a conventional or a transgenic variety, the Plains Cotton Growers 2009 Seed Cost Comparison Worksheet can certainly be useful. Shawn Wade developed the Microsoft Excel spreadsheet which can be used within your Web browser, or downloaded and saved to your computer. There are about 112 varieties of many types in the spreadsheet. The user can select up to 10 varieties to simultaneously compare total seed and technology fee costs based on a specific seeding rate. The row spacing and seed per row-ft can be entered by the user. This then calculates a seed drop on a per acre basis. Then, based on published pricing for the various seed varieties and technology fees, the cost per acre is automatically cal-

culated. The Seed Cost Comparison Worksheet is available at Plains Cotton Growers.

Deep Soil Sampling for Residual Nitrates

With fertilizer prices skyrocketing last year, special emphasis is being placed on reminding producers about proper soil sampling and testing techniques. One of the most costly fertilizers is nitrogen (N). Nitrogen is important for producing protein in plants and crop demand is very much yield driven. Establishing a realistic yield goal is the first task. Producers shouldn't take the attitude that cotton is like a grain crop. The more nitrogen applied when given high water doesn't necessarily translate into higher yield. Many times we can retain the fruit in a high water input field but not have time to mature that fruit. This results in a large number of pounds of lint, but can significantly reduce maturity because the late-set bolls do not have adequate time to mature. Excess N can aggravate the problem by delaying crop maturity, especially if excessive late season irrigation or rainfall occurs, as did in many fields in 2008. There is a fine line between obtaining an adequate yield and having good maturity in the crop, especially north of Lubbock. Excessive N can result in 1) Unwanted crop growth which in turn will require plant growth regulator (such as mepiquat chloride) application - especially on varieties that are inherently "growthy", 2) Increased Verticillium wilt problems, 3) Increased aphid problems, and 4) More harvest aid challenges at the end of the season.

Over the last several years agronomists across the state working in cotton have been surveying residual N in the soil profile in producer fields. What many fields are exhibiting is a considerable amount of N that should be accounted for when determining how much N fertilizer to apply. In our region, many fields may encounter this deep N somewhat later in the season resulting in a surge of green at a time when we would like for the fields to become more N deficient. Based on Dr. Kevin Bronson's N fertility projects this could be a contributing factor to lower micronaire in some fields in years with cool, wet fall conditions.

The basic formula for success is this: 1) Determine the yield goal in bales per acre for the field based on irrigation capacity, varietal performance, early season profile moisture, etc. 2) Multiply this yield goal times 50 pounds of N per bale of production. 3) Deep sample for residual soil N down to 18-24 inches. 4) Submit the samples to a soil testing laboratory, fully recognizing the depth that the sample represents. 5) Use the appropriate conversion factor based on the depth of sampling to convert the nitrate-N test results from the laboratory to pounds of N per acre IF the laboratory does not provide this service. 6) Subtract the amount of residual N found from the N fertilizer needed based on the yield goal. If high nitrate-N irrigation water is used, then additional steps must be made to compensate for N delivery during the growing season. Based on 10 ppm nitrate-N concentration in irrigation water, application of an acre-ft (12 acre-inches) during the growing season will result in about 27 pounds of N being simultaneously applied. Few High Plains wells will have nitrate-N concentrations of that magnitude. However, with high fertilizer prices, the water should be checked and credits made for this against overall N fertilizer application.

There are several publications which deal with these issues (click on each title to view), one entitled Nitrogen Management in Cotton - SCS-2009-2 was recently generated and discusses much in the previous paragraph. Others include 1) Deep Soil Sampling Equipment, 2) Nutrient Management in High Plains Cotton, 3) Sweatless Soil Sampler (from Oklahoma State Extension - using a cordless drill with an auger bit), and 4) Testing Your Soil. RKB

Preplant Weed Control in Cotton

Much has been written and spoken over the past few years on the development of Roundup-resistant weeds, namely Palmer

amaranth (carelessweed). To date, there are 15 different weeds worldwide that have been confirmed to be resistant to Roundup. One of the main reasons for the selection of herbicide-resistant weeds is the sole reliance on a single herbicide to control weeds over the course of several years.

Marestail (top) and Palmer amaranth have developed resistance to Roundup in other portions of the cotton belt

Growers on the Texas High Plains have done a good job of using several weed management strategies to control weeds and not relying on Roundup as the only tool. Although the amount of cultivation has declined for understandable reasons, we still see plowing and cultivation as an effective strategy against the development of herbicide resistant weeds. We also see the benefit of using other "mode-of-action" herbicides as an important part of successful weed management and as an effective weed-resistance strategy. One of the key herbicide timings with an alternative mode-of-action is the use of preplant herbicides. Effective preplant weed control will conserve soil moisture, allow planting operations to occur without the interference of weeds, and help to provide the critical weed free periods for the first six to eight weeks after crop emergence. One of the major challenges of using herbicides preplant is to ensure that herbicide activity in soil will not reduce crop germination and emergence. A second challenge is to select the proper herbicide(s) for the weeds that need to be controlled.

The use of Prowl (pendimethalin) or Treflan (trifluralin) is the first step towards successful weed management programs in cotton. The strength of these dinitroaniline (DNA) herbicides is annual grass control (barnyardgrass, crabgrass, foxtails, panicums, etc.) and control of small-seeded broadleaf weeds such as Palmer amaranth (carelessweed and other pigweed species), Russian thistle (tumbleweed), and kochia (ironweed). Most larger-seeded broadleaf weeds, like annual morningglories, cocklebur, and sunflowers, and perennial weeds are not controlled by these herbicides.

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In addition to annual grasses, DNA herbicides effectively control Palmer amaranth (top), kochia (middle) and Russian thistle (bottom)

The rate of each DNA herbicide is dependent on soil type. The sandier the soil, the lower the recommended rate. If soil conditions are dry and large clods are present during mechanical incorporation, herbicide performance will be less effective. Keep in mind that when Treflan was first used over 35 years ago, farmers were diligent with two-pass incorporation prior to bedding and planting. This resulted in thorough mixing of the herbicide and excellent weed control. In recent years many farmers have cut back on incorporation to save time and money. Some have still achieved adequate weed control while others have observed that poor incorporation caused herbicide failures. In cotton, Prowl EC rates range from 1.2 to 3.6 pints per acre in conventional or minimal tillage and from 1.8 to 4.8 pints per acre in no-tillage. Rates for Treflan and other trifluralin products (formulated at 4 pounds per gallon) range from 1/2 to 1 pint per acre for sandy soils, and up to 2 pints per acre on other soils.

The DNA herbicides may be incorporated by mechanical means or by irrigation. Incorporation methods vary widely across the High Plains and state. A double-pass method of incorporation is recommended and is most commonly used. Mechanical implements used to incorporate these herbicides include a springtooth harrow, a disk, a double or single stalkcutter, and a rolling cultivator to name a few. The better the implement mixes and uniformly distributes the herbicide in the upper 1- to 2-inches of soil, the better the weed control. Treflan should be incorporated within 24 hours after application. Prowl must be incorporated within 7 days after application, but the sooner the better.

Prowl EC may be surface applied and then incorporated by rainfall or irrigation. Three-quarters to one-inch of irrigation is necessary to incorporate (activate) these herbicides. Both Prowl EC and Treflan may be chemigated into the soil. These applications may not be the best way to incorporate Prowl or Treflan, but may be the only way to use these herbicides in a reduced tillage or no-tillage crop production system. When surface applications followed by irrigation or chemigation methods are used, herbicide rates are generally higher when compared to mechanically incorporated methods. Research conducted at the AG-CARES farm north of Lamesa by researchers with Texas *Agri*LIFE Research suggested that Prowl EC provided more con-

sistent weed control when compared to Treflan when surface applied and watered in, but Treflan performed better than Prowl EC when chemigated.

Prowl H20 is the newest formulation of pendimethalin. One gallon of Prowl H20 contains 3.8 pounds of pendimethalin formulated as an aqueous capsule suspension. Since it formulated at a higher concentration than Prowl 3.3 EC, less product is needed on a per acre basis in general. In cotton, Prowl H20 may be applied in conventional, minimum, stale seedbed, or no-till systems as a preplant surface, preplant incorporated, preeemergence, or at layby. It may be applied by ground, air, or chemigation. Use rates vary from 1 to 3 pints per acre in conventional or minimal tillage and 2 to 4 pints in no-till depending on soil texture.

Valor is a new burndown option for use preplant in cotton. Valor may be used at 1 to 2 ounces per acre with labeled burndown herbicides like Roundup and 2,4-D to enhance the speed of burndown, widen the spectrum of weed control, and provide residual weed control. Do not till after application or the residual weed control may be reduced. A minimum of 30 days and 1 inch of rainfall/irrigation must pass between application and planting in conventionally tilled cotton. In no-till or strip-till cotton, a minimum of 14 days plus 1 inch of rainfall/irrigation must occur between application and planting when 1 ounce of Valor is used or 21 days must occur between application and planting when 1.5 to 2 ounces is used. Valor has soil residual activity on several broadleaf weeds including chickweed, dandelion, henbit, marestail, pigweed, primrose, mustard, and sheperdspurse.

DuPont FirstShot may be applied as a burndown treatment to control emerged weeds prior to planting. FirstShot at 0.5 to 0.6 ounces per acre may be applied in tank mix with other registered burndown herbicides (Roundup, 2,4-D, Ignite, paraquat) or may be applied at 0.5 to 0.8 ounces alone. Sequential treatments not to exceed 1 ounce per acre may be made during one pre-plant cropping season and allow at least 30 days between applications. FirstShot has good activity on several weeds including cutleaf eveingprimrose, marestail, and prickly lettuce. There is a 14 day preplant interval between application and planting.

Always carefully read and follow label recommendations. PD and WK

Cotton Disease

The seedling disease complex

Several pathogens, including *Rhizoctonia solani*, *Thielaviopsis basicola,* and *Pythium* spp. are capable of causing seedling diseases of cotton. In West Texas, losses associated with seedling diseases are generally low (<5%); however, increased losses may be experienced conducive environmental conditions. Although it is difficult to distinguish seedling disease pathogens from one another in the field, subtle differences in symptoms and environmental conditions can be used in diagnosis. For example, *Rhizoctonia solani* typically kills seedlings after they emerge.

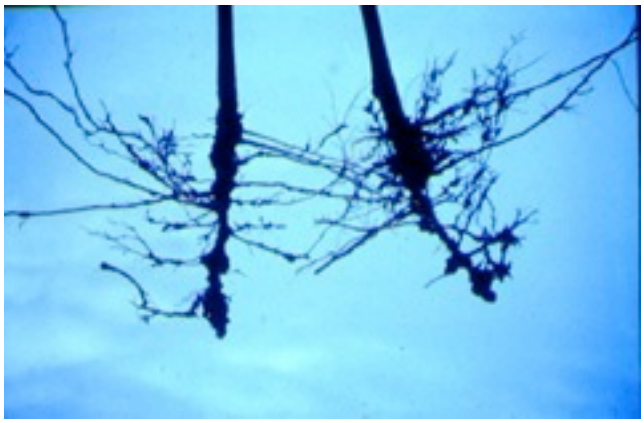
Seedling disease often appear similar, but can be distinguished

Rhizoctonia solani *usually kills seedlings after they emerge*

Sunken, black lesions which girdle the stem are visible at the soil line. Infections can occur over a wide range of soil conditions; however, cool wet conditions are most conducive for disease development. *Pythium* spp. can attack the seed, radical, or stem resulting in a seed rot, pre-emergence damping off, and post-emergence damping off, respectively. Plants infected with *Pythium* spp. may have more of a water-soaked appearance. *Pythium* spp. are more severe in areas with poor drainage and the soil has remained saturated for several days. *Thielaviopsis basicola* infections occur on portions of the stem (hypocotyl) below the soil surface and on roots, resulting in a blackened root system (which gives rise to the common name of the disease Black root rot). This disease is most commonly found in heavier soils and may be more severe in the presence of the root-knot nematode. Black root rot development is most severe under cool, wet conditions. Fungicide seed treatments are effective at minimizing losses associated with these diseases, and aiding in initial stand establishment. All commercially available cotton varieties contain a standard or base fungicide treatment. Ideally these treatments are comprised of fungicides with activity against the aforementioned pathogens. The most common fungicide seed treatments and their spectrum of activity are listed in Table 1.

Cotton nematodes

Several species of nematodes are capable of infecting cotton roots. For our region, the root-knot nematode (*Meloidogyne incognita*) is the most prevalent. Symptoms associated with root-knot damage include stunting, poor vigor, yellowing of leaves, and wilting, which may be confused with a nutrient disorder or deficiency. One characteristic that can be used to identify root-knot nematode is the formation of small galls that form on the root after the female nematode initiates a feeding site.



Cotton roots heavily infested with root-knot nematodes

The amount of damage observed in the field is more severe when there are higher populations of the nematode in the soil. Nematode damage is often enhanced when plants are experiencing other stresses (such as dry environmental conditions, or herbicide damage). Several management options are currently available; however, specific recommendations depend on soil populations. The standard nematicide treatment of choice is Temik 15G applied at a rate of 3 lb/A for low to moderate risk situations, or 7 lb/A in fields with high nematode populations. Performance of the seed applied nematicides such as Avicta Complete Cotton, and the Aeris Seed Applied System are more variable and are only recommended in low to moderate risk fields. Other products that are labeled for cotton include Vydate (the only in-season, foliar applied product), and Telone II fumigant. Additional

products are available; however, efficacy data is limited. The nematode population and corresponding risk level is listed in Table 2.

Variety selection and diseases

Variety selection can be key for minimizing the impact of cotton disease, particularly Verticillium wilt, Fusarium wilt, and bacterial blight. In fields with histories of one of these diseases, you should consider planting a tolerant variety. To view evaluation data on varieties exposed to these pathogens, follow the appropriate link: Verticillium wilt, Fusarium wilt, Bacterial blight. JW

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