Mid-Atlantic Regional Agronomist Quarterly Newsletter

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To subscribe or unsubscribe, please send your request to the editor at rtaylor@udel.edu
Comments, suggestions, and articles will be much appreciated and should be submitted at your earliest convenience or at least two weeks before the following dates: February 28, May 30, August 30, and November 30. The editor would like to acknowledge the kindness of Mr. Todd White who has granted us permission to use his scenic photographs seen on the front cover page. Please go to www.scenicbuckscounty.com to view more photographs.

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Fusarium Head Blight Occurrence and Control in Virginia Wheat

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Fusarium head blight (FHB), or head scab is caused primarily by a fungus, *Fusarium graminearum* (also known as *Gibberella zeae*) that infects and colonizes the growing grains and awns of wheat. Symptoms of premature whitening or bleaching on wheat heads (Figure 1) may be seen within days following infection. Heads are considered most susceptible during flowering although late infections can occur. An easily observed phenomena that indicates that flowering has occurred is when anthers are pushed out of the glumes. These are small yellow structures that will cling to the head, awns, and leaves. Often one-third to one-half of the head is affected, and in some cases the entire head may be colonized with the fungus. The bleached areas of the head may be sterile or contain shriveled and discolored kernels. As the fungus develops it generally has a pink or salmon color and is often visible on colonized heads. Affected heads contain kernels that are shriveled and have a low test weight causing low yields and limited marketability. The amount of kernel damage by FHB is based disease severity.

There are many cultural options that are known to reduce the severity of FHB. Below is a short list of those recommendations

- Plant Resistant Cultivars
- Bury Previous Crop Residue
- Rotate Crops to Avoid Inoculum Buildup
- Apply Fungicide

Figure 1. Premature bleaching of wheat heads caused by FHB. (Photo by Melissa Keller)

Treating wheat with a fungicide to prevent and/or control FHB has not been a widely recommended practice to date in Virginia, but improved fungicide efficacy and application technology has recently caused us to revisit this practice.

Trials were conducted in the 2008 and 2009 growing seasons near Blacksburg and Mt. Holly, Virginia. Three moderate resistant (Tribute, Jamestown, and Renwood 3260) and one susceptible (Coker 9835) soft red winter wheat were used in the experiments. Studies employed a randomized complete block design with three replications and two treatments (with and without fungicide). The 2008 studies received Proline® while in 2009 Prosaro® fungicide at the full labeled rate was applied. The fungicide was applied with 40 gallons/acre of water using a pair of 8002 nozzles, one facing forward, and one backward. *Fusarium graminearum* colonized corn seeds were applied to the plots at the boot stage of wheat in the mist-irrigation nursery at both locations and spray inoculation with conidia spores of *Fusarium graminearum* was applied to each variety at 50% flowering time at Blacksburg.

The effect of fungicide application on disease Incidence – The number of colonized heads per unit area; disease Severity – the number of colonized florets per head (of those diseased); and the FHB Index – a value that combines both incidence and severity, is shown in Table 1.

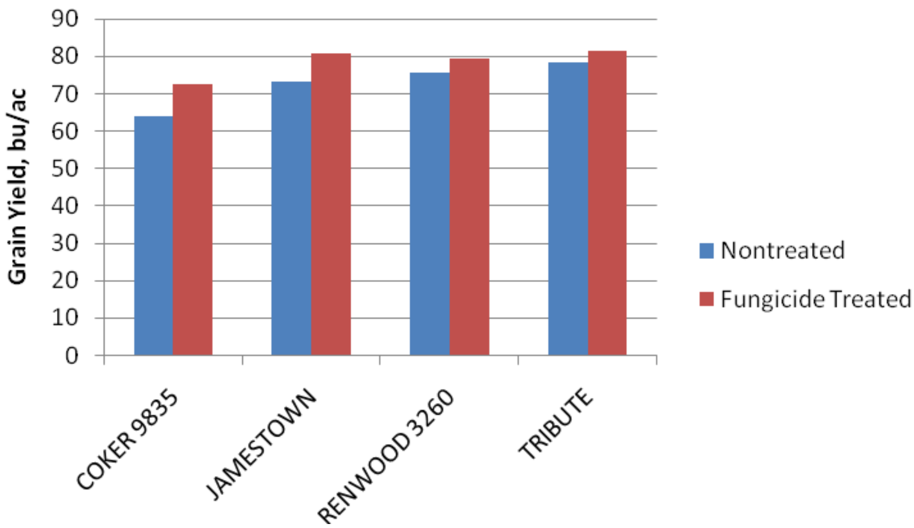
Table 1. FHB Incidence, Severity, and Index as affected by cultivar and fungicide treatment

Cultivar	Fungicide	Incidence	Severity	Index
COKER 9835	Nontreated	59.2	30.3	19.1
	Treated	48.5	31.8	16.7
JAMESTOWN	Nontreated	25.0	21.6	5.4
	Treated	19.8	17.7	4.6
RENWOOD 3260	Nontreated	19.8	34.6	6.1
	Treated	12.6	24.2	3.4
TRIBUTE	Nontreated	20.1	22.4	4.7
	Treated	10.2	20.3	2.4

Among the nontreated cultivars, there was obviously much higher disease in the susceptible cultivar Coker 9835. Fungicide application resulted in decreased Incidence and Index in all the cultivars.

Grain yield was increased by over 8 bu/ac for the susceptible cultivar Coker 9835 when fungicide was applied and by almost 5 bu/ac for the average of the more resistant cultivars. The amount of total FHB in Coker 9835 was considerably higher than for the other lines and this might have contributed to the overall lower yield, even with fungicide.

Figure 2. Grain yield of four SRW wheat cultivars with and without fungicide.



These results represent what we would expect under "worst case" conditions for disease. The area where these tests were conducted was provided mist irrigation to ensure favorable conditions for disease infection. Infested corn kernels and/or a mist of disease spores were introduced to the entire area. We would not expect this level of disease pressure in commercial fields except in an epidemic year. So the yield and/or quality increases we present in this note are at the upper end of the results producers can expect under field conditions.

While getting good coverage of the wheat head and the length of residual efficacy of fungicides are of concern, it does appear that fungicide application can reduce the negative effects of FHB. Whether or not this treatment is economical depends on the expected level of disease pressure, the value of the crop, and any losses associated with making the application.

If growers do choose to apply fungicide to control FHB, the following general recommendations are suggested:

- Use a double swivel body with nozzles mounted at 90 degrees to spray both forward and backward
- Do not use strobilurin fungicide as this is likely to increase DON levels in the grain
- Increase spray volume to improve head coverage (use at minimum 15 gal/acre)
- Spray wheat and durum at early flowering (Zadoks GS 58)
- Spray barley at early heading (Zadoks GS 50)
- Use appropriate adjuvant for fungicide used
- Use Fusarium Head Blight Prediction Model at http://www.wheatscab.psu.edu/riskTool_2011.html to assess risk in your area.
- Spray in evening or early morning, when is dew present

Is It Time to Revisit Splitting Spring N Application on Winter Wheat

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For a number of years, the spring decision of whether to split the nitrogen (N) applied to wheat was often controlled by the price of wheat. When wheat prices were four to five dollars or less per bushel, the return on investment for split N applications was either barely at the breakeven point or below it. Wheat prices this year could encourage growers to again consider if the yield gain, generally about 5 to 7 bu/acre and the environmental and economic impact of less N applied at a single application and subject to leaching, volatilization, and denitrification losses will be enough to incur the risk associated with trying to time and succeed in applying a second N application.

Another factor to consider is whether fall N was applied or if there was adequate residual N available following the previous year's dryland crop. Even on irrigated ground, residual N could have been present to give the fall planted wheat an excellent start on tiller development. Where an irrigated corn crop was fertigated with N up until tasseling or in fields where a legume crop (soybean or lima bean) was grown, adequate residual N was likely present to give wheat a good start on growth and development.

For fields that didn't receive fall N and there was unlikely enough residual N present for good fall growth and development, an early application of N at first green-up is critical to obtain maximum tiller production and good yield potential in a small grain crop. In such a case, a split application not only can improve yield potential but can also protect the grower from the loss of a large portion of a large single early application of N due to weather events.

In a four year study in New Castle County that Bob Uniatowski, Research Scientist at the University of Delaware, and I conducted, we found that for high yield wheat a 40 to 60 lb N/acre first application followed by a second 60 lb N/acre application (total of 100 to 120 lb N/acre) was sufficient for maximum economic yield (MEY). The first application occurred between February 15^{th} and March 15^{th} depending on the weather and when wheat green-up occurred. The second application occurred when the tillers assumed an erect position just prior to the first node being visible above the soil surface. For the more typical 60 to 90 bu/acre yield potential crop, a split of 40 to 60 lbs N/acre at green-up followed by 20 to 40 lb N/acre at Feekes 4 to 5 (total of 80 lb N/acre) produced MEY.

With the excellent price for wheat this year, the typical yield increase seen with the split of N into two applications, and the potential environmental benefit associated with a lower N application rate at a single point in time, I would encourage all growers to consider this option for maximizing your profitability in 2001.

Spring Cover Crop Management

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Although it seems like ancient history, many years ago when no-till technology was first beginning, Delaware and Maryland farmers were rapid adopters of cover crops for no-till grain production. Farmers mostly used cereal crops as winter cover crops. At the time, we learned some important lessons that we should remember this year because of the weather pattern that has occurred in a number of areas in Delaware.

Because there are a number of perceived environmental benefits with cover crops, government programs as well as many environmentally-conscious growers have moved production agriculture back into heavy reliance on cover crops. Wheat and cereal rye are two popular cover crops although some growers are using legumes, legume-cereal combinations, and even some other broadleaf crops such as the forage or Daikon radish. These cover crops are designed to protect the soil, add in organic residues, or supplement the soil with legume-derived nitrogen (N).

For any cover crop whether it's the grass cereals used for ground-covering, water-conserving mulch or legumes for spring N-fixation as well as for residue, I have found that there is a tendency to allow these crops to grow as much as possible by delaying herbicide or tillage or other cover crop control method as late as possible. In years when adequate rainfall occurs or good early season rainfall keeps the crop supplied, cover crops are not very harmful to soil moisture reserves or actually may be very helpful in drying out the surface soil. However, the season to be extra cautious in is the year when winter rainfall is below normal and this is followed by a dry early spring. The combination of lower than expected subsoil moisture level and rapid cover crop growth with heavy water use by the cover crop can lead to excessively dry sub-soil conditions.

The latter weather pattern seems to be developing in many areas of Delaware since winter rainfall has been below normal or the ground has been frozen during precipitation events. Growers need to monitor their subsoil moisture levels closely this spring and be prepared to terminate their cover crops earlier than normal if the subsoil becomes too dry. Early termination of the cover crop will allow time for subsequent rainfall to percolate into the subsoil and for the killed mulch to protect the soil from excessive water loss through evapotranspiration.

Growers or their consultants can check the subsoil moisture level with either the standard soil testing probe or with one that has an extended handle to make deep probing physically easier. It still is much of a "feel method" that depends on the experience of the person testing the soil. As a general rule if subsoil is formed into a ball by squeezing it together in one's hand and then the hand is opened and the ball easily falls apart with the least touch and no hint of moisture is present on the hand after making the ball, then the soil is on the dry to very dry side. The cover crop should be killed before the subsoil drops to the very dry state.

Time for Frost Crack Seeding of Small-Seeded Legumes

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Many growers like to overseed with legumes into their pasture and hay fields by using a method called frost-crack seeding. An article with full details was published in this newsletter in September 2006 in Issue 1, Number 3 for those who would like a more detailed description of the seeding method.

For a quick review, let's look at the seven steps to take when considering a frost-crack seeding of forage legumes.

Step 1. Evaluate your soil fertility and soil pH status either by reviewing past soil test reports or in the fall prior to the seeding taking a soil sample of the chosen field. Make corrections in pH by liming the fall or spring before overseeding as well as making corrections in the phosphorus (P) and potassium (K) status. You should avoid nitrogen (N) fertilizer additions in the fall prior to frost seeding the field as fall applied N will be picked up and stored by the grasses (and weeds) present and will stimulate serious competition for the legume seedlings the next spring.

If you've waited until the spring of the frost crack seeding as many of us do, then use your old soil tests to determine the field's fertility status and take this into account when you are making your species selection in Step 3 below.

Step 2. Provide seedlings with more sunlight and less competition as well as make it easier to get soil to seed contact. By this I mean that when possible the fall before a frost-crack seeding, you should graze or mow the field very close to stress the grass present to make it less competitive the following spring. This activity can be repeated just before overseeding to maximize soil exposure to the seed and to freezing and thawing temperatures.

Step 3. Select the correct species for your situation. In the mid-Atlantic region, we generally have three primary clover species from which to select. For fields that are generally wetter or lower in soil pH, alsike clover may be the best choice. All-around, white or ladino clover seems to respond best to this method of seeding especially under good soil fertility levels. Red clover is another species that responds well to frost-crack seeding but it is a taller growing species but like alsike clover it is a short-lived perennial.

If you decide to base your selection on the grazing animal species you have, then for horses I would choose white clover. You will need to keep the seedling rate lower since we recommend not having more than about 20 percent white clover in a horse pasture even though this limits the effectiveness of the legume in providing N for the companion grass crop. For beef, all three species are suitable but for small ruminants where close grazing occurs, white clover is probably the best choice.

For hay production fields where some legume contributed N is desired to boost grass yields and lower N fertilizer costs, the choice is more problematic. The tall growing species, red clover and alsike clover, have certain limitations. Red clover is more difficult to dry and because of the fine hairs that are on stems, petioles, and leaves it can make for dusty hay. Alsike clover is not suitable for the horse hay market since some horses develop alsike clover poisoning which shows up as photosensitivity causing the animal to sunburn easily. I've seen a vigorous tall growing ladino-type of white clover used in hay but its contribution to yield is limited to leaves and petioles since the stem stays on the soil surface. Ladino-grass hay for second and third cuttings can be very good although producers often are disappointed in the amount of legume in first cutting hay.

Finally on species selection, many of the species that contain quantities of condensed tannins that are thought to be useful in small ruminant parasite control are very difficult to establish using the frost-crack seeding method. The legumes in this category such as Birdsfoot trefoil and Sericea lespedeza are suited for more conventional seeding methods.

Step 4. Inoculate the seed before planting. Although we consider the probability very high that white, red, and alsike cover inoculating bacteria are present in all pasture and hay fields, a good habit to get in is to either buy preinoculated seed or inoculant for the seed. If preinoculated seed is past its sell by date, you should add more inoculate before seeding. Also when you buy the inoculant, check the label to be sure that you are within the expiration date on the package. Inoculant consists of live bacteria so protect its viability by keeping in cool and out of sunlight.

Step 5. Calibrate your seeding method and equipment to be sure that you are putting on the correct amount of seed. Making a pass over a parking area or tarp that's been placed on the ground is a good way to check both the width of the application pass and the density of seeds per square foot. Careful attention to this detail will pay extra dividends later in the season. This is especially true for broadcast spreaders or cyclone spreaders that fling the seed outward. Although clover seed is light it is fairly dense and may not travel as far as you expect.

Step 6. Frost seed at the correct time. Do not frost seed so early that the seed sits on frozen soil where heavy rainfall can move it off site. Also, do not frost seed on snow covered soil since rapid snow melt can again move the seed off-site. Instead seed in very early spring once the soil has at least begun to thaw, daytime temperatures are enough above freezing that the surface of the soil will thaw, and nighttime temperature are below freezing. You will need a number of weeks of this type of weather (at least off and on) to work the seed into the soil. You can also help in this process by allowing grazing animals access to the pasture or by running over hay fields with the tractor and mower. In addition to pressing the seed into the soil, you will also help reduce competition against the legume seedlings as they emerge and try to establish themselves.

Step 7—The Final Step. Essentially by returning to Step 2, your goal again is to control spring vegetation growth to encourage enough sunlight, nutrients, and water reaching the legume seedlings that they can effectively compete and establish themselves. Grazing can again help at this step but you will need to manage the grazing intensity closely as well as frequently so that you prevent the animals from grazing the tender young leaves of the new legume plants. As soon as you notice animals feeding on the new legumes or the legume reaches a height that will tempt the animals, remove them and change over to mowing. Once the plants have 6 to 8 trifoliate leaves or reach a height of 3 to 4 inches, the legume should be able to compete with the grass and weeds present in the pasture or hay field. Do not apply N-containing fertilizers since this will stimulate grass growth and suppress the nitrogen fixing ability of the legumes. Use grazing or hay harvest management techniques and fertilizer (lime, P, and K) management to favor the legume species you frost seeded. A rotational grazing system or hay cut system designed for the legume seeded can help ensure a longer lasting stand.

The GreenSeeker® Optical Sensor: Improving Nitrogen Utilization in Virginia Wheat and Corn

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Efficient management of nitrogen (N) is crucial for economic cereal production and protection of ground and surface waters. Conventional inputs of N, based on yield goals (historical averages), have been a good guide for farmers to use in planning fertilizer rates. One of the major determinants of N fertilizer need is spatial variability within a field, which may be natural (e.g., differences in soil texture) or man-made (e.g., due to management practices like differential manure applications etc.) The goal of a successful N management program is, therefore, not only to match plant-available N with crop needs but also to tailor N fertilizer rates to specific parts of a field. GreenSeeker® is an integrated optical sensing and application system that works in real time to analyze plant N needs and deliver a prescribed rate of N fertilizer.

How does the GreenSeeker® Sensor Work?

The GreenSeeker® optical sensor uses red and near infrared (NIR) light reflectance to assess the color and N status of crops. Plants absorb red light as an energy source during photosynthesis. Therefore, healthy plants will absorb more red light and reflect higher amounts of NIR light than unhealthy, or nitrogen deficient, plants. The sensor uses light emitting diodes (LEDs) to generate red and NIR light that reflects from the crop and is measured by a photodiode located on the bottom of sensor head. The sensor measures the fraction of the emitted light in the sensed area that is returned to the sensor (reflectance). Locally-developed algorithms, or equations, use this measurement to prescribe a spatially-specific N rate to the field.

Long-term research has determined that the amount of N required to achieve maximum yield varies significantly from year to year. To determine the degree of potential response to N fertilizer within a specific field, an N rich strip must be established prior to using the Greenseeker. Reducing pre-plant N application and using the N rich strip to establish a rich N environment allows a mid-season determination of additional N requirements. If the crop is capable of using additional N, the sensor will determine the magnitude and generate an N recommendation based on the predicted yield.

The Greenseeker prescribes fertilizer N based on yield potential and the responsiveness of the crop to additional nitrogen and as a result, plants get the optimal amount of N fertilizer they need rather than an average applied over an entire field.

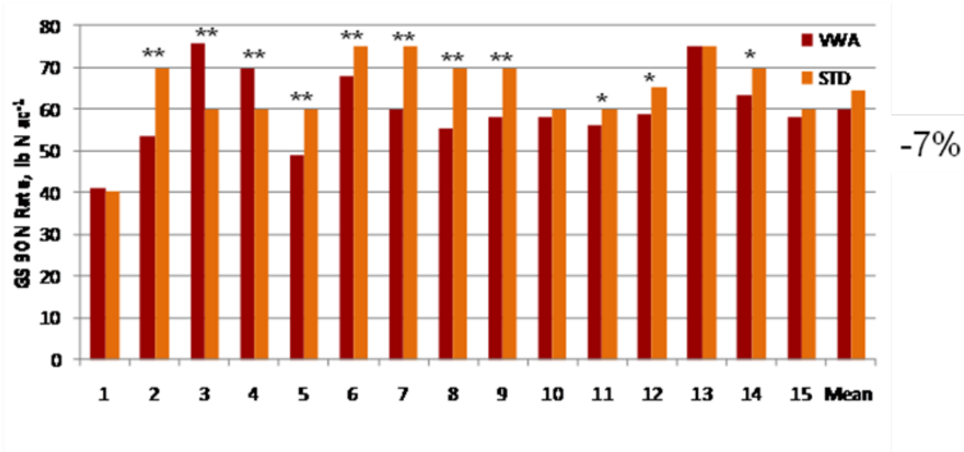
Performance in Virginia Trials

Replicated large plot studies were conducted in both wheat and corn over a number of sites and years to evaluate the performance of the GreenSeeker system and Virginia algorithms. Treatments in each field always included four or five fixed rate treatments to assess the overall site responsiveness and optimum N rate as well as a “standard” treatment which represents what the farmer would have done, and the GreenSeeker prescribed variable rate.

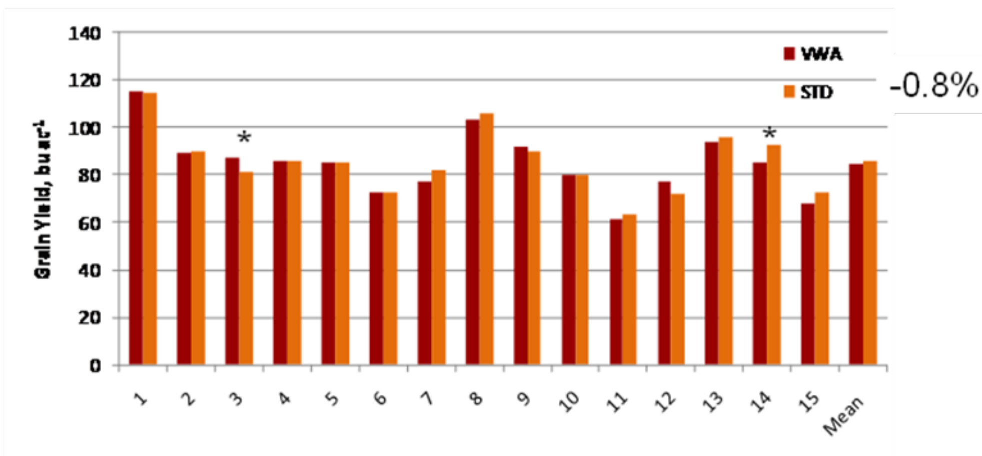
Wheat Results

Over 15 site years, compared to the standard GS 30 rate (STD), which was based on tissue N content, the Virginia Wheat Algorithm (VWA) resulted in yields that were similar at 13 sites significantly higher yield at one site, and significantly lower yield at one site. The VWA used an average of 7% less N than did the standard treatment, to reach the same yields.

Comparison of N Rates



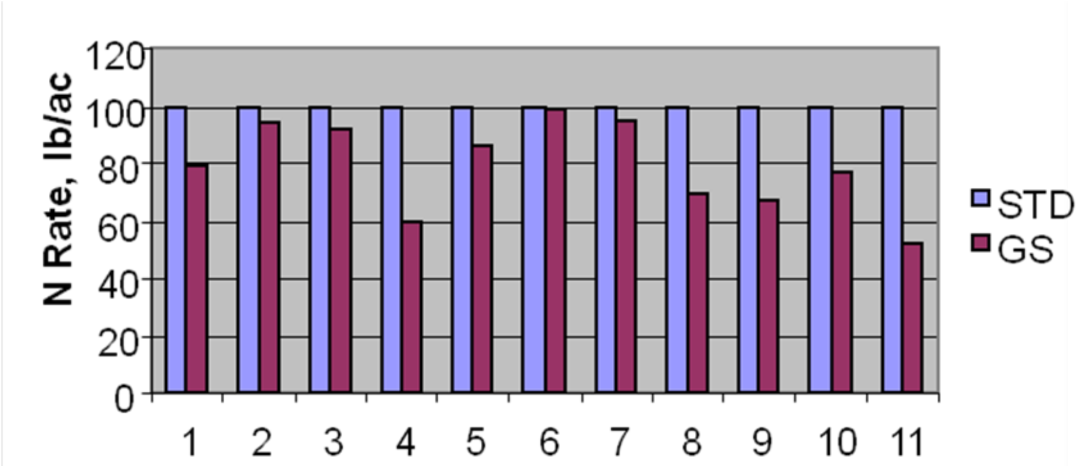
Comparison of Grain Yields

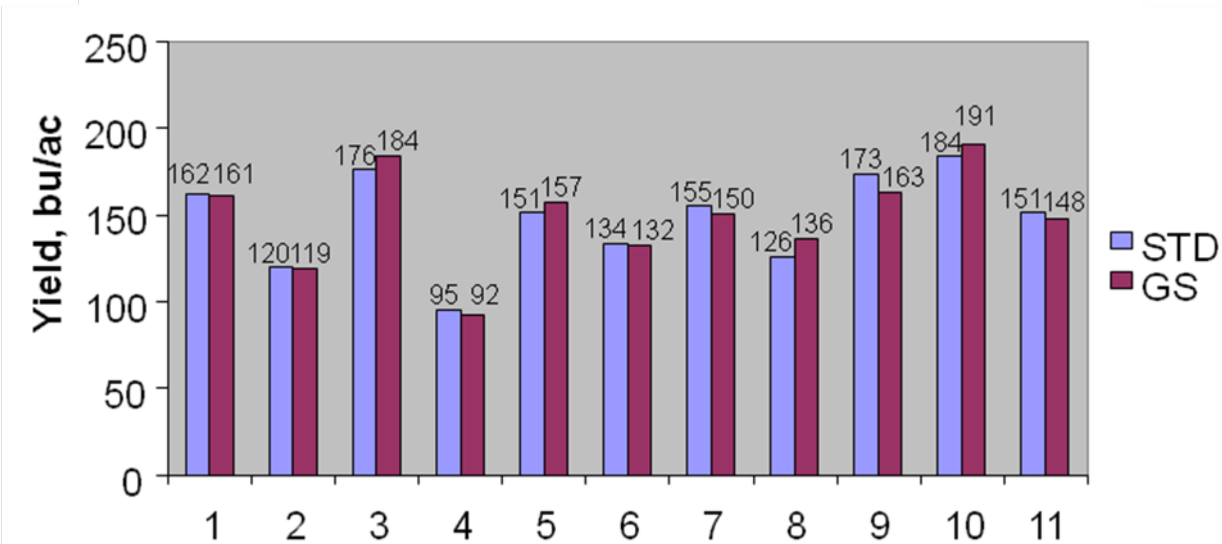


Corn Results

In corn, the GreenSeeker system is effective beginning at about the V5 stage and is therefore effective at determining recommended sidedress N rates. Over 11 site years, grain yields between the farmer practice, generally sidedressing 100 lb N/ac, and the GreenSeeker using the Virginia Corn Algorithm were not different and the Virginia Corn Algorithm prescribe approximately 20% less N.

GreenSeeker prescribed N rates and grain yield compared to the farmer standard rate, 11 site years.





Final Thoughts

Implementation of the GreenSeeker in this region requires establishment of both N rich and low N reference areas prior to employing the units. These reference areas are essential in the identification of N responsiveness, or estimate of soil N supply, in the individual field. If no difference is detected between the high and low reference areas, then very little response to added N fertilizer is expected. Conversely, if the difference is large, a large fertilizer response is expected. The advantages of the on-the-go variable rate application system are that no crop sampling or laboratory tissue analysis is required. This time and labor savings should result in more accurate and appropriate rates of top-dress N being applied and on a greater proportion of the crop.

Managing Risks in Continuous Corn

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Given the potential for greater economic returns, many grain farmers are planning to increase their corn acreage in 2011. Although much of this additional corn will be produced in fields following soybean or wheat, some will be produced in fields following corn. Continuous corn is not recommended by most agronomists. In Ohio, corn grown following soybeans typically yields about 10% more than continuous corn. Benefits to growing corn in rotation with soybean include less disease and insect buildup, less crop residue, and less nitrogen fertilizer use. Growers who intend to plant second year corn should consider management practices that will minimize potential yield losses. The following are some key steps for managing risks in corn following corn.

1. Plant corn on the most fertile, well drained soils to reduce stress and maximize yield potential. Avoid droughty soils as well as poorly drained soil conditions. Studies across the Corn Belt have shown that the yield differential between continuous corn and corn grown in rotation with soybeans is greatest when yield potential is low. This yield advantage to growing corn following soybean is especially pronounced when drought occurs during the growing season. In a study conducted in Minnesota, the yield advantage to an annual rotation of corn and soybean compared with monoculture was frequently greater than 25% in low yielding environments.

2. Plant Bt rootworm resistant corn hybrids or apply soil insecticides in areas where western corn rootworm problems have occurred. Bt corn requires either a 20% or 5% refuge, depending upon the transgenic hybrid chosen, to prevent resistance development. Corn

rootworm problems on refuge acres may be managed with soil-applied insecticides, or high rate formulations of seed treatments albeit that seed treatments often do not manage the population adequately under high rootworm populations. If Optimum AcreMax RW is planted, no refuge is needed because this hybrid has 10% refuge in the bag, also known as RIB ("refuge in a bag").

3. Adjust nitrogen rates. Optimum nitrogen rates for corn after corn are generally higher than those for corn after soybean and the additional nitrogen required ranges from 30 to 50 lbs nitrogen/ A.

4. Select hybrids that have demonstrated high yield potential across diverse environments and stress conditions. Only hybrids with above average ratings for drought tolerance, stalk strength, and emergence under stress conditions (low temperatures and cold, wet soils) should be considered. Select corn hybrids with resistance to gray leaf spot, northern corn leaf blight, anthracnose and gibberella stalk rots, and diplodia ear rot. The severity of these disease problems is much greater in reduced tillage systems where residues are present. In the past, the use of foliar fungicides has not been considered economical for disease control in field corn regardless of the rotation followed. Strobilurin fungicides have received much attention recently and university data have shown that along with the triazoles, they are effective against the major foliar diseases". However, fungicides are usually not economically beneficial if resistant hybrids are planted. The greatest yield benefits are seen when susceptible hybrids are planted, especially in continuous-reduced or no-till corn, and conditions are favorable for disease development.

5. Develop strategies for dealing with increased crop residues. Use stalk choppers and knife rolls on combine heads, spread trash uniformly during harvest, consider strip tillage, avoid no-till where practical, avoid no-till planting on top of old rows, use row cleaners, and plant hybrids with good disease resistance, emergence, and seedling vigor.

Studies in Ohio and Indiana have shown that increasing the amount of tillage from no-till to chisel to moldboard plow decreases the yield difference between continuous corn and corn rotated with soybean, especially on poor drained soils. No-till cropping systems are more likely to succeed on poorly drained soils if corn follows soybean rather than corn. The influence of crop rotation on corn response to tillage and soil type has been well documented in long-term OSU-OARDC studies. On poorly drained Hoytville silty clay soils in NW Ohio, where corn followed soybean, yield differences between no-till and tilled ground were greatly reduced. Crop rotation with soybeans had much less effect on corn response to tillage on well-drained Wooster silt loam soils in NE Ohio.

In recent years, agronomists and farmers in Illinois reported that corn following corn yielded as much, or nearly as much, as corn following soybean. However this was not the case in 2010. According to Dr. Emerson Nafziger, corn extension specialist at the University of Illinois, lower yields of corn following corn in 2010 came as a shock. In an Oct. 2010 newsletter article ("What Ailed Corn following Corn in 2010", online at http://bulletin.ipm.illinois.edu/article.php?id=1426), Dr. Nafziger listed several factors that may have contributed to problems of corn following corn in 2010.

One of the factors involved “allelopathy” (the inhibition of growth in one species of plants by chemicals produced by another species), a concept we don’t hear that much about when discussing continuous corn. Dr. Nafziger noted “Corn plants following corn in cool, wet soils tend to be affected a lot by where their roots are in relation to last year's residue, including root remnants. A lot of the residue even in tilled fields was not buried very well, and it's not hard to imagine that a lot of new-crop roots were close to a lot of old-crop residue. We think that's a negative, perhaps due in part to allelopathy, perhaps from temperature effects, and maybe from some diseases that can carry over.

Allelopathy starts with the release of substances as crop residue starts to break down, and it diminishes over the course of breakdown. Residue after the fall and winter was unusually well preserved into the spring in 2010, and this could have contributed to the problem.”

Another question addressed by Dr. Nafziger concerned differences between "corn following corn" and "continuous corn,", with the former referring to second-year corn (following soybean two years earlier) and the latter to corn that follows at least two years of corn. Illinois researchers showed that second-year corn tends to yield a little more than continuous corn, but they have not been able to determine if that calls for differences in management. Moreover they did not think that second-year corn fared much better than continuous corn in 2010.

2010 Ohio Corn Performance Test: An Overview

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In 2010, 299 corn hybrids representing 35 commercial brands were evaluated in the Ohio Corn Performance Test. Testing was conducted in three regions of Ohio - Southwestern/West Central (SW/WC); Northwestern (NW); and North Central/Northeastern (NC/NE), with three test sites established within each region. Testing was also conducted at Coshocton, an area with high gray leaf spot incidence. Entries in the regional tests were planted in either an early or full season maturity trial. These test sites provided a range of growing conditions and production environments.

Environmental conditions varied greatly across Ohio during the 2010 growing season, especially with regard to the amount and distribution of precipitation. Yields were highest at the S. Charleston and Washington CH test sites in the SW region (averaging above 242 bu/A) and lowest at Hoytville in NW Ohio and Beloit in NE Ohio (averaging less than 148 bu/A). At most test sites, rainfall from planting through the mid- to late-vegetative stages of corn development was above normal. Excessively wet soils in May and June limited early season root development and resulted in shallow root systems. Saturated soil conditions contributed to reduced emergence of some hybrids. Dry weather conditions combined with above average temperatures persisted from the late vegetative stages through maturity at most sites. Water deficits were especially severe at the Hoytville test site.

Test results from Greenville in the SC/WC region and Wooster in the NC/NE region test locations are not reported because of weather related damage. At Greenville, heavy rains shortly after planting, in combination with late season water stress, resulted in erratic stands that led to highly variable yields. At Wooster, strong winds associated with a tornado on Sept. 16, destroyed and flattened much of the corn test. At other test sites, water stress was limited by timely rains and adequate soil moisture. In contrast to 2009, high temperatures during grain fill accelerated crop maturation and resulted in much lower than normal grain moisture at harvest. Despite the varying degrees of stress present at most sites, stalk lodging was negligible – averaging no more than 5% at any location. Extensive foliar disease (primarily gray leaf spot and northern corn leaf blight) was evident late in the season at several locations but impact on crop performance appeared to be limited.

Grain yields in the Southwest and West Central region (the S. Charleston and Washington C.H. locations), averaged across hybrid entries in the early and late trials, were 243 bu/A. Yields in the Northwest region (Van Wert, Hoytville, and Upper Sandusky locations) averaged across hybrid entries in the early and late trials, were nearly 185 bu/A. Yields in the North Central and Northeast region (the Bucyrus and Beloit locations) averaged across hybrid entries in the early and late trials, were 180 bu/A. In addition, hybrid yields at Coshocton averaged 212 bu/A.

Tables 1 and 2 provide an overview of 2010 hybrid performance in the early maturity and full season hybrid trials by region. Averages for grain yield and other measures of agronomic performance are indicated for each region. In addition, the range in test sites averages is shown in parentheses. Complete results are available online at: http://www.ag.ohio-state.edu/~perf/ and http://www.oardc.ohio-state.edu/corntrials/.

As you peruse this year's corn test results, it's important to keep the following in mind. Confidence in test results increases with the number of years and the number of locations in which the hybrid was tested. Data from a single test site should be avoided, especially if the site was characterized by abnormal growing conditions. Look for consistency in a hybrid's performance across a range of environmental conditions. Grain moisture percentage at harvest can provide a basis for comparing hybrid maturity, especially when grain moisture levels average above 20% at a test site. Since drydown was so rapid this year, using grain moisture as an indicator of relative maturity may be of somewhat limited value this year compared to past years (especially 2009). Similarly, the exceptionally low level of stalk lodging this year provides a limited basis for making comparisons of stalk quality among hybrids. Yield, standability, test weight, and other comparisons should be made between hybrids of similar maturity to determine those best adapted to your farm. Results of the crop performance trials for previous years are also available online at:

http://www.ag.ohio-state.edu/~perf/archive.htm

Table 1. A regional overview of the early maturity 2010 Ohio Corn Performance Test.

Region	Entries	Grain Yield (Bu/A)	Moisture (%)	Lodging (%)	Emergence (%)	Final Stand (plants/A)	Test Wt. (lbs/bu)
SW/WC	72	239 (212-260)	16.6 (14.1-19.7)	0 (0-1)	96 (87-99)	33700 (28400-38900)	59.7 (56.6-63.3)
NW	88	181 (162-204)	16.8 (14.7-19.5)	2 (0-21)	88 (75-97)	30700 (24200-36600)	59.5 (57.1-62.5)
NE/NC	78	181 (163-203)	18.4 (15.3-21.5)	2 (0-13)	92 (79-98)	32400 (25200-38300)	58.0 (55.3-61.3)

Table 2. A regional overview of the full season 2010 Ohio Corn Performance Test.

Region	Entries	Grain Yield (Bu/A)	Moisture (%)	Lodging (%)	Emergence (%)	Final Stand (plants/A)	Test Wt. (lbs/bu)
SW/WC	96	246 (211-265)	18.0 (15.4-20.9)	0 (0-3)	97 (87-100)	34100 (27500-38700)	58.7 (55.6-62.0)
NW	92	191 (168-213)	18.3 (16.5-21.6)	5 (0-28)	89 (74-96)	30600 (23200-35200)	59.0 (55.2-62.8)
NE/NC	65	181 (159-215)	20.4 (16.6-24.9)	2 (0-18)	93 (79-99)	33100 (26900-37800)	57.5 (54.3-61.6)

Transgenic Products Evaluated in the 2010 Ohio Corn Performance Test

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Transgenic seed technologies are becoming more complex. There were at least 15 transgenic seed technologies or products evaluated in the 2010 Ohio Corn Performance Test (OCPT) (Table 1). These products represent the wide range of stacked trait hybrids currently available to Ohio farmers. About 87% of the hybrid entries in the OCPT contain transgenic traits for Bt insect resistance and/or herbicide tolerance (down slightly from recent years). However, nearly 80% of the 2010 entries contain three or more transgenic traits providing protection from both above ground (e.g. European corn borer) and/or below ground (e.g. rootworm) insects, in addition to glyphosate and/or glufosinate herbicide tolerance. In the past, most triple and quad stacked hybrids with rootworm and corn borer resistance contained one Bt protein for corn borer resistance and another for rootworm resistance. SmartStax hybrids entered in the 2010 OCPT contain multiple Bt toxins for both corn borer and rootworm, which allow a reduced refuge requirement.

According to the USDA-Economic Research Service (see their web site at http://www.ers.usda.gov/data/biotechcrops/) in 2010, 71% of Ohio's corn acreage was planted to transgenic corn hybrids (36% of total acreage planted to stacked trait hybrids, 22% to herbicide tolerant hybrids, and 13% to some type of Bt hybrid). The acreage of corn planted to non-GMO hybrids (29%) was greater in Ohio than any other major corn producing state in the US in 2010. There were 37 non-transgenic (non-GMO) hybrid entries in 2010 OCPT.

The 2010 Ohio Corn Performance Test results are now available online at:

http://www.oardc.ohio-state.edu/corntrials/ or http://agcrops.osu.edu/~perf/
Hybrids can be sorted by yield, brand, and transgenic traits online.

Table 1. Transgenic products evaluated in the 2010 Ohio Corn Performance Test

Product	Major Insect Targets[1]	Herbicide Tolerance[2]	# of Hybrids
Non-GMO (non-transgenic, Clearfield)			37
YieldGard Corn Borer	ECB		1
Roundup Ready		RR	12
Agrisure GT		GT	7
Agrisure CB/LL	ECB	LL	1
YieldGard VT Rootworm	RW	RR	1
Herculex Xtra	ECB, RW	LL	3
YieldGard VT Triple (VT3)	ECB, RW	RR	69
Genuity VT Triple Pro (VT3P)	ECB, RW	RR	27
YieldGard Plus with Roundup Ready	ECB, RW	RR	3
Agrisure GT/CB/LL	ECB	GT, LL	2
Agrisure CB/LL/RW	ECB, RW	LL	1
Herculex 1 Roundup Ready	ECB	RR, LL	21
Herculex Xtra Roundup Ready	ECB, RW	RR, LL	36
Agrisure 3000GT	ECB, RW	GT, LL	42
SmartStax	ECB, RW	GT, LL	13
Total Hybrid Entries			276

[1] ECB – European corn borer; RW – rootworm
[2] RR – Roundup Ready; GT – glyphosate tolerant; LL – glusofinate tolerant

For more details on transgenic seed technologies, including events associated with transgenic traits, insects controlled or suppressed by various Bt toxins, refuge requirements, etc. consult the following:

Chris DiFonzo and Eileen Cullen. 2010. Handy Bt Trait Table. Wisconsin Crop Manager University of Wisconsin. Available at URL: http://ipcm.wisc.edu/WCMNews/tabid/53/EntryId/1058/Handy-Bt-Trait-Table.aspx

R.L. Nielsen. 2010. A compendium of Biotech Corn Traits. Corny News Network, Purdue Univ. [On-Line]. Available at URL: http://www.kingcorn.org/news/timeless/BiotechTraits.html (URL accessed Nov. 22 2010)

Will Your Crop Suffer from Sulfur Deficiency this Cropping Year?

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Past and recent emphasis has been place on reducing sulfur (S) emissions from power plants, diesel vehicles, and other industries. The question of whether the Clean Air Act and other programs run by the Environmental Protection Agency are accomplishing their objectives can be answer by the farm community with respect to sulfur emissions. The answer growers would likely give is that yes the air quality programs have worked but so well that their crops are increasingly showing sulfur deficiency symptoms especially when grown on sandy, low organic matter, non-manured soils.

Why is S critical for maximum economic yields (MEY)? Sulfur is needed by a crop when making certain amino acids such as cystine and methionine that are vital components of many proteins. The entire factory output (yield) of a crop is dependent on proteins that make up the chlorophyll molecule, all the plant enzyme systems, the plant's genetic material such as DNA, the assimilation function of legume rhizobia, and all the inter-related metabolic activity in the plant. The ideal nitrogen (N) to sulfur ratio in a plant is 15:1. Above that ratio, the S concentration is not adequate for MEY.

Sources for S include commercial fertilizers, atmospheric deposition, and manures or biosolids. The movement away from the old superphosphate (16 to 22% P_2O_5 and 12 to 14% S) to triple superphosphates in the late 1900's and then more recently to ammonium phosphates and ammonium polyphosphates (DAP, MAP, and others) has reduced the amount of S fertilizer applied without us consciously being aware of the trend. With the success of the Clean Air Act, atmospheric S deposition had dramatically decreased even before the very recent change over to ultra low sulfur diesel fuel. In addition, the emphasis on nutrient management planning to reduce manure application rates due to phosphorous buildup in the soil and the development of programs to help move poultry manure to areas without manure resources has also contributed to reduced S application rates.

Who should be concerned about the potential for S deficiency on their crops? The answer is that probably everyone but especially those growers with coarse textured soils, with soils low in organic matter, or with soils that have received enough rainfall or irrigation water to leach S below the crop rooting zone should be concerned. For shallow rooted crops such as wheat and barley, it is especially critical to ensure that adequate S is available during tillering and early growth and development. Growers should consider adding enough ammonium sulfate to their normal nitrogen application to provide from 20 to 30 lbs of S per acre in the first N application split in the spring.

If there is adequate S accumulation in the soil clay subsoil as determined with a deep soil test, S fertilization may not be a yield limiting factor on deep rooted crops such as corn.

However, this does not mean that early season growth won't be improved with the early season addition of some type of sulfate fertilizer. Even in high yield irrigated environments, such an application could help improve yield potential or at least not limit yield.

Some growers will want to rely on soil test results to make a decision on whether to add S fertilizer. These growers should be aware that the normal soil test depth of 0 to 6 or 0 to 8 inches is not as good an indicator of soil S status as it is for phosphorus and potassium. Sulfur is taken up by plants as the sulfate (SO_4^{2-}) ion and as an anion (negatively charged ion) in the soil that is similar to nitrate it is subject to loss via leaching and anaerobic conditions (similar to denitrification).

Sulfur deficiency symptoms vaguely resemble those of N except that S unlike N is not mobile in the plant so symptoms occur first on new growth. Sulfur deficiency is most often described as stunting with general yellowing or chlorosis of the plant. For examples, please review the photos at the end of this article.

The choices available for fertilizing with S include ammonium sulfate and potassium magnesium sulfate (K-PoMag) plus ammonium thiosulfate, calcium sulfate (gypsum), magnesium sulfate (Epsom salts), potassium sulfate, and elemental sulfur. Sulfate is immediately available for plant uptake whereas elemental S^o must be oxidized by the soil bacteria (requiring warm soil temperatures and adequate moisture) into sulfate before plants can absorb the S. Organic sources (manures, crop residues, biosolids) must undergo mineralization into inorganic sulfate before being available for plant uptake.

Other by-products such as derivatives from battery acid are sold as S sources but should be evaluated carefully by the grower to be certain that potential problems such as heavy metal contamination, non-available S forms, or injurious compounds are not present. Even then the S form in some by-products will need to be converted into plant available forms by the soil microorganisms and if S is needed immediately or if soil conditions are not favorable for this conversion yield potential could be impacted negatively. Certainly, any form other than the sulfate form is not appropriate in-season when deficiency symptoms indicate the immediate need for S.

Photo 1. Induced sulfur deficiency in corn grown in sand culture. Note reddening of lower stem, general chlorosis or yellowing especially of new growth, and stunting of the plant.

Photo 2. Field corn showing stunting and general chlorosis or yellowing especially of new growth on sandy soil in southern Delaware. Photo by Richard Taylor.

Photo 3. Sulfur deficiency in barley grown on a very light sandy soil low in organic matter in Sussex County, Delaware. Note general chlorosis or yellowing especially of new growth and severe plant stunting. Photo by Richard Taylor.

Photo 4. Sulfur deficiency in wheat grown on a very light soil low in organic matter in Sussex County, Delaware. Note general chlorosis or yellowing especially of new growth and severe plant stunting. Photo by Richard Taylor.

Initial Results from the Mid-Atlantic Orchardgrass Survey

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Growers across the Mid-Atlantic region have experienced problems with orchardgrass stands in recent years. Reduced forage yield, fewer hay harvests each year and premature death of orchardgrass stands have been reported and confirmed in University sponsored forage variety trials. Estimates suggest lower orchardgrass yields and premature death of stands may be costing hay producers over $90 million a year. With the help of Extension agents in Virginia and other neighboring states, I organized a survey to help answer questions about this orchardgrass problem and perhaps find the path to a solution.

The survey contained 28 questions that covered a wide range of issues. Data were entered on-line by agents who interviewed growers – usually in the field. Soil samples from many fields were collected and analyzed for standard soil nutrients. By the end of 2010, 43 orchardgrass fields had been surveyed across 4 states and 22 counties. Below is a summary of the more significant findings:

- 74% felt their stands had declined faster than expected.
- 64% of the problem fields were planted in last 5 years.
- 53% harvest hay twice per year, 30% harvest hay three times each year.
- 86% cut stands to the recommended 3-4 inch stubble height.
- 63% reported no visible insect or disease problems.
- 86% apply nitrogen fertilizer every year.
- 79% had a soil test done within last 3 yr.
- P and K ratings for most fields were in the Low to Medium range.
- Cultivar type appeared unrelated to poor stand persistence.

Overall, most growers reported poor stand persistence and these included seemingly well-managed stands. None of the individual variables surveyed (e.g., pests, disease, cutting management, soil fertility) were well correlated with poor orchardgrass persistence.

So what might have caused these orchardgrass problems? Well, the evidence probably points to a combination of factors, and I suspect a major player was climate. For example, from June 2007 to April 2008, approximately 90% of Virginia was under drought. Drought conditions also were widespread in 2006, 2008 and 2009 but for shorter duration. Moreover, since 1960 mean air temperature has increased by 0.3 deg F each decade. Warmer temperatures and periodic droughts surely stressed many orchardgrass stands in recent years. When combined with other issues, like low soil fertility, these environmental stressors probably contributed to many problems observed by growers. If this climate hypothesis is correct and temperatures continue to rise, as they have been, growers in Virginia might consider switching to more stress tolerant forage species (e.g., novel tall fescue varieties) to replace declining orchardgrass stands.

The Word is Out: Roundup Ready® Alfalfa Gains Approval for Spring Planting

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In a press release through Reuters on Jan. 27, 2011, the word came down that the United States Department of Agriculture (USDA) has approved GMO alfalfa without restrictions and that the alfalfa can be planted as early as this spring. Surprising few in the agricultural community, Secretary Vilsack stated that there are no doubts about GMO crop safety and that APHIS has determined that Roundup Ready alfalfa is as safe as traditionally bred alfalfa.

Many in the industry had expected that a compromise was in the works that would place limitations and restrictions on planting Roundup Ready alfalfa and that the process of defining those limits and restrictions would delay approval past spring planting time. This worry proved unnecessary as no restrictions were announced on Thursday. Many conventional and organic producers are very worried that pollen from Roundup Ready alfalfa and carried by the bee pollinators will end up pollinating their conventional or organic alfalfa seed sources. Actual hay and feed producers have less to be concerned about since if they are managing their alfalfa correctly, the crop should never reach the seed set stage of growth. Also since alfalfa has its own regulatory means (autotoxicity) of preventing self-generated seed from germinating and establishing in an established stand of alfalfa, there should be minimal chance of contamination of a stand during its lifetime as a hay, greenchop, haylage, or grazing field.

Secretary Vilsack said that the USDA would promote research into how genetics could be used as a means of preventing contamination and research designed to improve detection of any contamination that might occur. The Secretary will have the USDA set up two advisory committees to help ensure the availability of high-quality seed and to set up programs to try to protect the purity of the alfalfa germplasm base.

Evaluating Alfalfa Stands in the Spring

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This season I've already had a couple of questions asked as to when and how to evaluate alfalfa stands. Below are descriptions of two methods that can be used to determine the viability of an alfalfa stand. An alfalfa producer should use not only one of these methods but their feel for the vigor of the particular stand they wish to evaluate as well as the production history of that field.

The first method consists of counting the number of plants per square foot. Current research information suggests that when stand counts fall below 3 to 5 plants per square foot, it's time to either rotate out of pure alfalfa or interseed a grass crop such as orchardgrass, festulolium, tetraploid ryegrass, or annual ryegrass or interseed another legume not hurt by the autotoxicity seen in year old or older alfalfa stands. Red clover is the legume of choice and should be planted at 6 to 8 lbs pure live seed per acre either by broadcasting it on in very early spring or seeding it with a no-till drill (plant either in very early spring or in early to mid-Sept after the last harvest of the season).

The second evaluation method derives from research out of Wisconsin by Dr. Dennis Cosgrove that indicates that stem number rather than plant number is a more accurate determination of when to plow down or interseed an alfalfa stand. Cosgrove suggests using a value of 55 or more stems per square foot to indicate that the stand will produce maximum yield. A reduction in stem number per square foot to 40 stems or less will result in a 25 percent yield reduction. At this critical level, alfalfa fields begin to lose profitability and should be rotated to another crop for one or two years.

Although you can get some idea on the potential of your alfalfa stand by counting either the number of plants or the number of tillers per square foot, you will need also to consider checking on the health of those plants to have an accurate basis for a decision on keeping or destroying an alfalfa stand. To do this in the spring when new growth is about 4 to 6 inches tall, check a random one square foot site for each 5 to 10 acres of alfalfa or at least 4 to 5 sites on small fields. Dig up several plants at each site and slice open the crown and root (longitudinally) with a sharp knife to determine the health of the crown and tap root. Healthy roots and crowns will be firm and white to slightly yellow in color. Diseased roots will have dark brown areas extending down the center, especially if crown rot is a problem. Reduce your counts of plants per square foot or tillers per square foot so only the healthy plants present are counted. Plants with roots that are mushy or soft are likely to die; and although those with a few brown spots may survive, the overall vigor of the stand will be compromised by the presence of disease.

If you must decide on whether to reseed before growth begins in the spring (and you do not plan to take a first harvest of alfalfa before planting another crop) or after a very hard winter with significant heaving or winter injury, base your decision to reseed on the number of plants per square foot (Table 1). If a decision to reseed can be made during the growing season or after about 4 to 6 inches of growth has occurred in the spring, either evaluation method can be used (Table 1). In Table 1 below, I've modified various estimates for good, marginal, and poor stands to give the grower possible guidelines to consider in making a decision on keeping the stand or interseeding a grass or other legume.

Table 1. Suggested plants per square foot or tillers per square foot (#) criteria for evaluating alfalfa stands on Delmarva.

Age of stand	Good stand	Marginal stand	Consider replacement[*] or renovation[**] with interseeded grass or red clover
Plants per square foot with spring tillers per square foot in parentheses			
New	25-40 plts (> 75)	15-25 plts (< 55)	< 15 plts (< 50)
1 year old	> 12 plts (> 60)	8-12 plts (< 55)	< 8 plts (< 45)
2 years old	> 8 plts (> 55)	5-7 plts (< 50)	< 5 plts (< 40)
3 years old	> 6 plts (> 50)	4-6 plts (< 45)	< 4 plts (< 40)
4 years old or older	> 4 plts (> 50)	3-4 plts (< 40)	< 3 plts (< 40)

[*], If the stand is to be plowed for replacement, growers often find it economically favorable to take a first cutting and then plow and plant a rotational crop that can use the nitrogen mineralized from the decomposing alfalfa plants. Rotate out of alfalfa at least until the next fall (14 to 18 months) but preferably for 2 to 4 years. This will allow time for a reduction in the potential for alfalfa diseases and provide the grower the opportunity to correct soil nutrient and pH (acidity) problems as well as make use of the residual N mineralization potential that exists in a field following an alfalfa crop.
[**], If you consider renovation or extending the stand life, try no-tilling a grass crop such as orchardgrass, tetraplpoid annual or perennial ryegrass, or one of the new varieties of festulolium (a cross between meadow fescue and one of the ryegrasses). The grass will increase your tonnage especially if you fertilize for the grass with nitrogen fertilizer. This also has the effect of driving out

alfalfa at the same time as production levels are maintained for an additional year or two. Another option for extending an alfalfa stand's life for 1 to 2 years is to seed in 6 to 8 lbs of red clover per acre. This option will maintain the higher protein production from the field.

Managing Drought in Grazing Systems

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In the Mid-Atlantic region drought is a part of our agricultural landscape. An analysis of long-term weather records conducted by Dickerson and Dethier in the 1970's indicated that we can expect a moderate drought once every five years and a severe drought once every 10 years. Developing a drought management plan could significantly reduce the economic impact of drought on your operation. The strategy that is used will depend on the resources of the farm and its long term goals. The remainder of this article will outline some strategies that could be used either alone or in a combination.

Implement rotational grazing. Although this does not sound like much of a drought management strategy, the first thing that people notice when they switch from a continuous to rotational grazing system is that pastures grow longer into a drought and recover faster after the rain finally comes. The reason for this is that rotationally grazed plants have larger and healthier root systems that can go deeper into the soil for water. In fact maintaining a healthy pasture is not just a drought management strategy, but probably one the best ones.

Incorporate deep-rooted legumes into pastures. Interseeding legumes into pastures increases pasture quality, supplies nitrogen for grass, and extends grazing during a drought. The most commonly used legume would be red clover. The primary advantage of red clover is that it has great seedling vigor and can be easily frost seeded into pastures. Alfalfa possesses a deeper tap root and is more drought tolerant than red clover, but takes more effort to get into a sod. Alfalfa mixes well with a variety of grasses like orchardgrass and matua. The most drought tolerant legume and our only truly perennial warm-season legume is sericea lespedeza. Sericea has an extremely deep taproot, but its major limitation is poor seedling vigor making it difficult to incorporate into an established sod. Once established, sericea has amazing drought tolerance. There is only one commercially available variety of sericea lespedeza, "AU Grazer." This variety was selected at Auburn University for increased tolerance to grazing, medium tannin levels, and finer stems. It is available from Sims Brothers, Inc. located in Union Springs, AL (http://simsbrothers.com/index.htm or 334-738-2619).

Incorporate warm-season perennial grasses into grazing system. Warm-season grasses will produce about twice as much dry matter per unit of water when compared to cool-season grasses. There are a number of perennial warm-season grasses that can used in the Mid-Atlantic region, but one of the most productive, persistent, and tolerant to close and frequent grazing is bermudagrass. Bermudagrass requires management to be productive, which means it needs to be grazed frequently to keep it vegetative and it needs nitrogen. Other perennial warm-season grasses include the native grasses such as big and little bluestem, Indian grass, switchgrass, and eastern gammagrass. Although these grasses can be productive during the summer months, they do not tolerate close and frequent grazing well.

Incorporate warm-season annual grasses into grazing system. Warm-season annual grasses like pearl millet, sorghum-sudangrass, and crabgrass can provide high quality summer grazing. The primary disadvantage with summer annual grasses is that they need to be reestablished every year, which costs money and provides the chance for stand failure. The exception to this is crabgrass that develops volunteer stands from seed in the soil. Although most people don't realize (or want to admit it) crabgrass has saved many cows during dry summers in the Mid-Atlantic region. Research at the Southern Piedmont Station has shown that crabgrass responds well to improved management and can produce 2-4 tons per acre of highly digestible forage. Crabgrass can produce a tremendous amount of growth from small amounts of rainfall that accompany summer thundershowers. Only two commercially available varieties of crabgrass exist, Red River and Quick-n-Big. Both are available from Elstel Farm Seeds, Ardmore , OK (http://www.redrivercrabgrass.com/contact.html or 580.223.8782). More information on crabgrass and other summer annual grasses can be found at http://pubs.ext.vt.edu/418/418-004/418-004.html.

Irrigate pastures. Irrigating your pastures can increase dry matter production by about 50% in a normal year and much more than that in a dry year. The best grass to irrigate is a warm-season grasses. One common misconception is that irrigating a cool-season grass will make it grow in the summer. Cool-season grass growth is limited by not only moisture, but also temperature. Once temperatures exceed 70 F, cool-season grass growth greatly slows and even stops in some cases. In contrast, warm-season grasses do not even reach peak growth until 90 to 100 F. Research has shown that warm-season grasses will produce about 1.5 to two times as much growth per unit of water used when compared to cool-season grasses. Although irrigation of forage crops is a viable drought management strategy, the economics may be questionable. In recent years, lower cost irrigation systems, such as pod systems have been developed. These sytems offer a relatively low initial investment. Two lines of 5 pods and a pump to run them can be purchased for less than $5000. More information on irrigating pastures and irrigation pods can be found at http://hayandforage.com/hay/alfalfa/kline-receives-high-marks/ and http://www.arec.vaes.vt.edu/southern-piedmont/forages/camtasia/2010madgc.html.

Feed hay. The most efficient way to harvest forage is with the animal. In the Mid-Atlantic region we should strive to reduce or eliminate hay feeding in our grazing systems. This doesn't mean that we will not ever need hay. It does mean that in most cases you are better off to let someone else make it. Drought is certainly one of those cases that hay will likely be required. A common problem with the hay feeding strategy is that when you need it, everybody needs it and there is little to go around. In addition, the price of hay during a drought can be high. One thing to think about is buying hay during a good year and storing it under cover. It is kind of like having money in the bank. Hay that was well cured will keep for years if it is kept off the ground and out of the weather. A key to successfully using hay is to start to feed it before pastures have been overgrazed. Hay feeding should be done in one paddock so that damage from overgrazing is confined to this area.

Utilize commodities to extend pastures. Commodities such as brewer's grain, corn gluten, and soybean hulls can be used to supplement and extend hay and pasture during drought periods. Things to consider are the availability, storage, handling, feeding, and price of commodities. The ability to readily get commodities and efficiently feed them is critical if they are going to be a key component in your drought management strategy.

Stock for five year drought. Having a perpetually light stocking density that underutilizes pastures in most years, but gets you through drought years is a viable drought management strategy. However, the opportunity cost for using this strategy is high. In most cases, you are better off to stock for an "average" year and focus on other strategies for drought years.

Wean and sell calves early. This has a two-fold effect, first it reduces the number of grazing units and the total forage needed, and second it reduces the nutritional requirements of the brood cows. A dry brood cow requires 14% for less DM, 15% for less energy, and 24% less crude protein. The downside is that you may be selling small calves when the prices are low.

Cull cows. This could be a good time to get rid of those older cows that you have been meaning to cull. Ideally, culling decisions should be based on long-term records and take into account reproduction, functionality, and production. This may also be a good time to assess if your cows fit your system. A good example is body weight and frame size. There has been an increasing interest in moderating cow size. Simply put smaller cows will tend to eat less. At this winter's beef conference held at Virginia Tech's Southern Piedmont AREC, Scott Greiner, Extension Animal Scientist from Virginia Tech, said that mature cow weight and calf weaning weight are not well correlated. In a nutshell this means that smaller cows don't always wean the smaller calves and vice versa. Dr. Greiner's presentation on utilizing EPDs can be viewed at http://www.arec.vaes.vt.edu/southern-piedmont/forages/camtasia/sparecbeef2011.html.

Once you have settled on a drought management strategy, it is important that you are ready to implement it in a timely manner. If you are selling cattle, sell them before the price is rock bottom. If you are feeding hay, feed it before the cattle loose condition and pastures have been damaged from overgrazing. To accomplish this you will need to set quantifiable benchmarks. These could be days with out rain, available forage on hand, days on hay, pounds of weight loss or change in condition. Regardless of what you have set as a benchmark you need to be ready to implement your drought plan when you reach it.

To learn more about managing pastures and livestock contact your local extension agent or visit Dr. Teutsch's website at the Southern Piedmont Agricultural Research and Extension Center at http://www.arec.vaes.vt.edu/southern-piedmont/forages/index.html.

Do We Need to Add Sulfur for Agronomic Crops in the Shenandoah Valley?

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In 2009, I documented low sulfur (S) levels in corn tissue in four Shenandoah Valley fields. For many years, Virginia Tech has not been recommending S additions to soils in the Shenandoah Valley, but these observations have caused us reconsider the need of corn for S.

Why might we see more S deficiency now? The two prevailing theories are that (1) atmospheric S deposition (i.e. S in rainfall) is less now than in decades past. The following web site below shows the concentration of S in the atmosphere and deposition estimates from 1985 through 2005. http://nadp.sws.uiuc.edu/data/animaps.aspx

The second theory is that we have had several years of good crop yields which inevitably remove more S from the soil. The third theory is that there is less manure that contains S applied to cropland and the manure is applied less frequency than in years past.

It is also worth noting that several of the soil samples collected in the process of diagnosing low S had low pH. As soil pH declines, S availability (as well as other crop nutrients) declines. Also, as soil pH declines crop root development is impeded and since a large proportion of the S in soil is stored in the deep clay layers shallow rooting can reduce S uptake.

How much S is removed by crops? Table 1 shows general estimates of S removal by crops commonly grown in the Shenandoah Valley.

How can farmers determine if their crops are at risk of being S deficient? Soil tests for assessing S status are not considered to be highly reliable. The Virginia Tech Soil Testing Laboratory does not analyze for S. Some private laboratories analyze soil for S, but these tests should be viewed as only identifying fields that should be watched for S deficiency (Dick et al. 2008). Tissue samples in corn, soybean, and alfalfa are considered to be more reliable than soil samples. We do not know the reliability of tissue samples in grass hay.

- Fields that have not received manure applications for the past 2-4 years may be at greater risk of S deficiency than fields that have received manure applications.
- Fields where the past 2-3 years of crop removal of S has been higher (higher yields) than previous years are likely a little higher at risk of being S deficient.
- Fields with low organic matter may be at greater risk of S deficiency than fields with high organic matter.
- Although not present in the Shenandoah Valley, fields that are very sandy with little clay or soil organic matter are at risk.

What should Shenandoah Valley farmers do in 2011? Bottom line is that we don't know. The best answer we can give is to estimate your relative risk for S deficiency to make a somewhat informed decision for 2011. It would be good to compare the cost of adding a little additional S to the value of the crop being grown. It will also be good to collect some tissue samples from fields to assess the S status of crops. This tissue analysis can also assess the status of other crop nutrients. Finally, we need to conduct a few trials in the valley to see if we get a response to S. Simple replicated strip trials will suffice.

How much S is needed to fertilize a corn crop? Currently the Virginia Tech Soil Testing Laboratory does not have a recommendation for S fertilization rates. So if a farmer thinks he might have a S deficiency or if a farmer wants to install a strip trial, how much S should be added? Is it 100 pounds per acre or 1/2 pound per acre? Based on my review of recommendations from other states, my best professional estimate of S fertilization rates for agronomic crops in the Shenandoah Valley is shown below. These are 'ballpark estimates' because we have little data to back up these recommendations.

(1) No S needed for fields not at risk
(2) 5-8 pounds S per acre for questionable fields
(3) 12-15 pounds S per acre for fields documented to be deficient

How can farmers add S? There are several fertilizers that contain S. In addition, most animal manures contain S. Table 2 gives some different sources of S. Keep in mind that fertilizers will have a guaranteed analysis whereas the concentration of S in manure will likely be highly variable. Most manure analysis including results from Clemson University include S. However, the S in manures must be mineralized from the organic forms before it is plant available. For immediate availability, a fertilizer must contain the sulfate form (SO_4^{2-}) of S as this is the form that plants take up.

Table 1. General Sulfur Removal by Crops.

Crop	Yield	Sulfur removal rate Pounds S/acre
Alfalfa hay	3 tons/acre	22
Orchardgrass hay	3 tons/acre	17.5
Timothy hay	2 tons/acre	2.5
Corn	100 bushels/acre	7.5
Soybean	50 bushels/acre	23
Barley (grain)	60 bushels/acre	8
Barley (straw)	2 tons/acre	4

Table 2. Sources of Sulfur Common in the Northern Shenandoah Valley.		
Fertilizer or manure type	Sulfur concentration	Comments
Elemental sulfur	100%	Lowers soil pH
Sul-Po-Mag	22%	Good source of potash and magnesium
Ammonium Sulfate	24%	Lowers soil pH
Gypsum	18%	
Poultry litter	11.8 lbs/ton	Average of most recent 32 samples in the Northern Valley; the range was 5 to 21 lbs/ton
Dairy Slurry	2.5 lbs/1,000 gal	Average of most recent 14 samples in the Northern Valley the range was 1.4 to 5.6 lbs/1,000 gal.
Biosolids	Highly variable	S content dependent on wastewater process. Check each source.

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Sub Acute Rumen Acidosis (SARA): Gastrointestinal Events and their Consequences for Dairy Cows

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Introduction

Higher genetic merit for greater milk yields in modern dairy cattle have required producers to design, construct, and manage diets with very high energy densities. These needs are achieved by feeding rations with high concentrate to forage ratios. These diets challenge cows with high amounts of readily fermentable, dietary carbohydrates that trigger significant pH disturbances in the rumen that threaten the health of the rumen, the liver, the feet, and the lower intestine. The syndrome is widely known across the industry as sub acute ruminal acidosis (SARA). SARA is the increased intraruminal production of volatile fatty acids and the associated decrease in rumen pH. Typically, rumen pH falls from the normal 6.3-6.5 pH to levels between 5.2-5.6 for greater than 3 hours per day. The sequella (secondary consequences) of SARA include a devastating but often subtle decrease in dry matter intake (DMI), significant alterations in rumen microflora composition, diminished rumen nutrient digestion, and the associated loss in feed efficiency. Abnormal fermentation in the rumen damages the rumen wall while abnormal cecal and colonic fermentation of nutrients passing too rapidly through the rumen leads to lower colonic acid production, diarrhea, and damage to the intestinal wall. Permeability changes in the rumen and intestine likely favor passage of microbes and microbial breakdown products through the wall and into the circulatory system leading to liver abscesses, laminitis, sole ulceration, and white line disease.

Nutritional Events and SARA

Some data indicates SARA may affect 20% of early and peak lactation animals and 26% of mid-lactation cows. Loss of feed efficiency associated with SARA decreases milk production on average by 6 lb milk/day/cow and depresses milk fat and protein by 0.3% and 0.12% respectively. Losses due to unrealized potential income can be as high as $400 per lactation/SARA cow. As many as 25% of producers feed total mixed rations (TMR) with properties placing lactating animals at high risk of developing acute and chronic, long term SARA. These rations have particle lengths where < 40% of the ration particles are longer than 8-mm and effective neutral detergent fiber (eNDF) content is < 16.5% of the dry matter content.

Depression of rumen pH in SARA is driven by a rise in the rumen content of the short chain volatile fatty acids (VFA) of butyrate, acetate, and propionate and to a lower extent lactic acid. When VFA production outpaces the buffering capacity of the rumen, rumen acid content rises thereby depressing rumen pH. Many factors contribute to the onset of SARA with the leading event being feeding concentrates with their enriched content of highly fermentable rumen starch. Concentrates typically contain between 50-90% rumen degradable starches. The most important fermentation products are the VFA acetate, butyrate, propionate, and the acid, lactic acid. When excessive, the fermentation of starch can lead to a buildup of rumen VFA high enough to increase intraruminal osmotic pressure and decrease the pH of rumen fluid. These changes are associated with depressed dry matter intakes that can rise to 5-6 lbs per day/cow. Butyrate probably has the greatest osmoregulatory effect on DMI because it is produced in greatest amounts during starch degradation in the rumen. Intraruminal acidity and osmotic stress may damage the rumen wall sufficiently to diminish permeability function and allow gut products to translocate across the wall, trigger inflammation, and thereby depress DMI. Although propionate is produced in lowest amounts during starch fermentation, it can be a potent inhibitor of DMI when it fluxes through the rumen and is metabolized by the liver to blood glucose. Decreased rumen pH also erodes DMI by destroying the fibrolytic bacteria that sustain fiber digestibility in the rumen.

Replacement of ration forage components with concentrates increases ration energy density and tends to be associated with increased DMI in rations with relatively high neutral detergent fiber (NDF). Normally, bulk fiber distends the rumen wall and triggers satiation signals that limit feeding behavior. The signals triggered by rumen fill are in turn dependent upon the amount of NDF ingested, NDF digestibility, and the rate of NDF passage out of the rumen.

Rumen motility and fiber size are two key elements effecting rumen NDF passage. Passage is delayed with increased fiber particle size and slowed rumen motility. Fiber size in turn is impacted by chop length, processing, and cud chewing behavior. The more energy dense rations with lowered NDF simply have a lowered “filling effect” in the rumen due to less NDF content. Energy dense rations with lower NDF fail to trigger rumen wall distention and onset of satiation signals that decrease feeding so that DMI tends to increase as concentrates replace forages in rations. Feeding concentrates decreases dietary NDF intake as well as the particle size of the NDF and enhances rumen passage time. This also allows for greater DMI. However, excessive loss of NDF with too much concentrate depresses cud chewing that can eventually depress DMI.

One of the greatest effects of eNDF in the ration is stimulation of cud chewing and the associated production of bicarbonate enriched saliva that buffers acid production so problematic in SARA. Salivary buffering capacity (bicarbonate loads in saliva) needs to keep pace with acid production in rumens exposed to rations enriched with concentrates and highly fermentable starch. Diets with insufficient fiber disfavor cud chewing, saliva production, and the buffering of rumen acid production.

The physical and chemical properties of forage fiber differ widely in their ability to stimulate saliva production and cud chewing. This has lead to the development of the concept of physically effective fiber (peNDF) that functionally speaking is the fiber in a ration that sustains cud chewing and salivary bicarbonate production. Physically effective fiber (peNDF) is determined as the proportion of the ration that is greater than 1.18 mm multiplied by total ration NDF. Physically effective fiber is also determined as the proportion of fiber retained by the 9 and 18 mm screens of the Penn State Particle Separator (PSPS) times total dietary NDF. To avoid SARA problems it has been recommended 40% of ration particles or 12-13% of the ration DM be at least 8 mm in length or retained by the 9 and 18 mm screens of the PSPS. This amount of particle length in the ration sustains total chewing time long enough to produce sufficient amounts of salivary bicarbonate to adequately buffer rumen pH above 5.8. These estimates can however, be modified by dietary, animal, and management factors. Use of non-forage fiber sources such as peanut or soy hulls can raise ration NDF amounts without improving NDF buffering functions because of ease of rumen digestibility. Addition of buffers increase buffering capacity of eNDF while infrequent feeding and push-up, ration sorting, over mixing, and inaccurate measures of ration components lower buffering abilities of rations with adequate eNDF content. .

The capacity of the rumen to absorb VFA out of rumen fluid impacts rumen pH. This function is carried out by millions of finger-like projections or papilla off the rumen wall. Papilla increase surface area at the interface of the rumen wall with rumen fluid. Thickening of wall structures by inflammation or callous formation along the wall hinders absorptive function of the papilla. Callous thickening of the papilla always accompanies repeated episodes of SARA. Papilla can shorten and reduce rumen surface area by as much as 50% in cattle fed rations with relatively high forage to concentrate ratios. This typically occurs with dry cow rations and can depress acid absorptive function of the rumen in early transition cows inappropriately adapted to transition diets with high concentrate to forage ratios. Lengthening of the papilla to re-establish adequate surface area in the rumen may take as long as three weeks of exposure to rations with higher content of concentrates. Animals lacking adequate rumen papilla length or with thickened, inflamed rumen surfaces are at risk for SARA because they lack adequate capacity for volatile fatty acid absorption. Accumulation of VFA acidifies the rumen. The most problematic VFA may be butyrate. Some evidence indicates animals with greater ability to remove butyrate from rumen fluids resist development of SARA.

Sequella of SARA

SARA has many consequences for lactating cattle. Perhaps the most ubiquitous problem is depression of DMI. DMI can be depressed as much as 5-6 lbs per day in cows with SARA. Normally, forage replacement with concentrates decreases ration NDF and the associated rumen fill. The effect reduces rumen-reticulum distention and could be expected to actually increase DMI. But because of incompletely understood conditions in SARA, concentrate feeding often depresses DMI. Even though decreased DMI is a frequent event in cows with SARA, it is not an inevitable sequella in experimentally induced SARA. The reasons for these differences are incompletely understood even though all cows with SARA experience the precipitous fall in rumen pH to 5.6 for 3.5 hours or more after a meal. This suggests events other than rumen acidity per se are responsible for depressed food intake in cows with SARA. Rumen acidity in SARA destroys a large proportion of the fibrolytic bacteria of the rumen that aid NDF digestion. The effect occurs at the onset of rumen acid buildup during high rates of VFA release from starch fermentation. Decreased fiber digestion leads to delayed rumen passage, prolonged rumen distention, and therefore depressed appetite drive.

Some cases of SARA, particularly the concentrate-dependent, SARA are associated with mild to moderate systemic inflammatory responses. Mediators of the systemic inflammation can directly depress satiety centers in the brain and depress appetite. The actual trigger and the site of the inflammatory responses associated with SARA remain undefined although the rumen or intestinal wall and the liver seem likely. Traditionally, build up of intra-ruminal bacterial endotoxin and its translocation through the rumen wall into the vascular system was said to be the causal agent of SARA associated inflammation. Indeed, recent evidence indicated a close relationship between increased amounts of blood borne endotoxin and inflammatory responses in SARA. Whether or not endotoxin mediates one or more sequella of SARA in lactating cows is unclear but the amount of endotoxin increases in the rumen and occasionally in the blood of cows with SARA.

Endotoxin is an integral component of bacterial cell walls and builds up to mg levels in rumen fluid as bacterial overgrowth occurs during fermentation of highly digestible starch in the rumen. Endotoxin levels rise through overgrowth and subsequent killing of coliform (E. coli) bacterial populations during VFA and acid production in SARA. Like pH changes, build up of soluble endotoxin in the rumen occurs with experimentally induced SARA. As pointed out by Plaizer et al. (2010), the rise in rumen endotoxin levels may be quite variable with SARA. Although rumen amounts of endotoxin rise in SARA, cows clearly show wide ranges of soluble endotoxin release with similar changes in rumen acidity. Acidity is not always associated with large elevations in soluble endotoxin levels in the rumen. Moreover, high amounts of rumen endotoxin are not inevitably associated with endotoxin translocation into the vascular system or induction of a systemic inflammatory response. Thus, despite intra-ruminal acid build-up, rising endotoxin levels in the rumen per se may be necessary but insufficient for induction of the inflammatory responses associated with SARA. Interestingly, the magnitude of intra-ruminal endotoxin release in SARA may be positively correlated with pre-existing amounts of intraruminal endotoxin prior to induction of SARA. Plaizer et al. (2010) suggested the amount of intra-ruminal endotoxin production during SARA may depend upon factors such as pre-existing rumen microbial conditions, diet prior to the onset of SARA, and overgrowth of specific types of E. coli.

Shifts in the rumen microbial ecology with SARA have been recognized for years. One of those changes is the increased numbers of E. coli in experimentally induced concentrate-dependent SARA. Recently, one particular type of E. coli that overgrew was shown to possess unique adhesion factors that facilitate bacterial attachment to tissues like the rumen papilla. It has been proposed that E. coli attachment to rumen epithelium (previously damaged by the osmotic and acidic elements of SARA) triggers local inflammatory responses in the rumen wall. Breakdown in permeability barrier functions of the wall could facilitate bacterial and endotoxin translocation through the wall thereby triggering even greater inflammatory responses in the cow. Circumstantial evidence exists in support of eroded rumen permeability barrier function in SARA but the nature of those changes remains unknown.

Many issues remain to be addressed in SARA. Why inflammatory responses are not inevitably associated with SARA in all cows remains unknown. The role of inflammatory responses in the production and health problems associated with SARA seems likely but remains to be established. Appearance of the inflammatory response likely depends upon the functional morphology of the rumen papilla, the rumen pH, rumen osmotic stress, rumen microbial populations, presence of preexisting inflammation in the rumen wall, and the presence or absence of damage to the rumen wall prior to the onset of SARA. How these factors are impacted in single acute versus chronic, repetitive episodes of SARA needs to be understood to manage SARA more effectively in commercial dairy units.

SARA is associated with a low volume output diarrhea that produces fecal pads with a semi-solid to puddle like fecal consistency. The fecal pad is often yellow-green and contains mucous plugs or strings. Bubbles or small crater-like marks left by ruptured bubbles often appear on the surface of the fecal pads. These fecal characteristics mark problems with cecal and colonic fermentation of nutrients that by-passed rumen digestion. Hindgut microbial fermentation generates VFA, gas, and acid in the colon that irritates, erodes, and inflames the colonic wall. Hemorrhage from the colonic erosions can produce red, blood-tinged feces. Colonic damage can result in an accumulation of hemorrhage, mucous, fecal debris, and clot along 3-4 foot segments of the hindgut wall. The entire mass can be passed in cast-like segments of material known as diphtheritic membranes. Clearly, hindgut permeability barrier function would be reduced under these conditions. Conceivably, these colonic inflammatory events in cattle with SARA could be responsible for bacterial and endotoxin translocation across hindgut walls and trigger the systemic signs of inflammation otherwise attributed to the rumen.

Milk fat depression is a widely recognized occurrence in cattle fed over ground rations and rations with high ratios of concentrate to forage. Milk fat depression can reduce milk fat by as much as 50%. Depression affects all the fatty acids in milk but favors those synthesized by the cow. Generally, milk fat depression results in decreased amounts of short and medium chain fats accompanied by increased secretion of long chain fatty acids in milk secreted by SARA cows. Typically milk fat is decreased by 0.3% of milk fat but may not change at all with isolated, single episodes of SARA or may be considerably greater with chronic, sustained episodes of SARA.

Milk fat depression in SARA arises from changes in rumen microbial functions secondary to shifts in rumen microbial populations with increased VFA and acid production. The low rumen pH in SARA favors incomplete biohydrogenation of fatty acids like linoleic acid in the rumen leading to the intraruminal synthesis of a specific type of unsaturated fatty acid termed trans 10 C18:1 (trans-10 octadecaenoic acid). The reason for trans 10 C18:1 synthesis in SARA is SARA induced rumen microbes transform dietary unsaturated fatty acids like linoleic acid into trans 10 C18:1 fatty acids by addition of hydrogen to the unsaturated dietary fatty acid (biohydrogenation). As this occurs, the content of trans 10 C18:1 fat increases while total milk fat decreases because the newly synthesized trans 10 C18:1 fatty acid inhibits mammary gland fat synthesis. Changes in rumen microbial populations in SARA enable this process. Diets high in concentrate to forage ratios or diets with inadequate peNDF favor the process and lead to milk fat depression.

Cattle with SARA are also considered to be at increased risk for lameness. Much of the lameness problems stems from disorders of the claw capsule. Presumably, one or more ill-defined events in the rumen trigger damage to support structures and horn forming tissues of the claw in what is widely regarded as laminitis. Intra-ruminal production of endotoxins or histamines has been proposed to link SARA with laminitis and claw horn disease. Interestingly, neither endotoxin nor histamines per se have been experimentally shown to clearly generate claw horn disease. It may be complex interactions between endotoxin, histamine, inflammatory reactions, hormonal events, and genetics mediate the claw horn damage associated with SARA.

The pathogenesis of damage to the suspensory apparatus and horn forming tissue in the claw remains poorly understood and a causal relationship between SARA and claw horn damage remains to be established. Nevertheless, ample epidemiologic evidence supports an association between feeding high concentrate diets, induction of SARA, and claw horn problems in the dairy cow. It has been widely accepted that production of poor quality horn tissue promotes lesion formation in the claw capsule leading to sole ulceration, white line disease, and toe ulceration. Indeed, the claw capsule and the horn of claws from cattle with claw horn diseases show diminished resilience and ability to withstand mechanical stress, strain, and compression. These tissues apparently develop permeability barrier dysfunction due in part, to changes in lipid components of the permeability barrier known to exist in these types of tissues. Increased water content of diseased claw horn tissues probably reflects barrier dysfunction and underlies part of the eroded biomechanical properties of these claws. Clearly, much work remains to definitively establish any causality between SARA and the onset of claw horn diseases in dairy cattle.

Conclusion

SARA is triggered by management and nutritional factors. Management factors include practices that promote bolt feeding, component feeding, ration fiber sorting, over grinding of forage and inaccurate weights of ingredients in ration preparation. The nutritional factor is an excessive proportion of concentrate in rations. These problems trigger a cascade of events in the rumen that alter microbial populations and lead to the overproduction of VFA and acid in the rumen. Damage to the gastrointestinal wall coincident with over production of bacterial endotoxin can lead to translocation of bacteria and bacterial products into the blood stream. These microbial "accidents" activate inflammatory responses in the gut wall and possibly the liver during SARA. Production and clinical sequella in these events are depressed DMI, lower milk production, milk fat depression, debilitating claw disease, and profound feed inefficiency. SARA induced nadirs in negative energy balance lead to excess loss of body condition score and severe reproductive inefficiencies.

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Virginia Forage and Grassland Council to Hold Fencing Schools

The Virginia Forage and Grassland Council will again this spring be holding four producer fencing schools. These high quality, hands-on schools are one the best schools in the Mid-Atlantic region and are certainly the best value. The dates and locations are:

March 22 –Southern Piedmont AREC, Blackstone, VA. Contact person: Chris Teutsch (434) 292-5331

March 24 – Brightwood Ruritan Hall (Madison County), Contact person: Brad Jarvis (540) 672-5408

March 31 – Tenth Legion / Mt.Valley Ruritan Hall, Broadway, VA Contact person: Richard Fitzgerald (540) 248-6218 extension 105

April 19 – Middleburg AREC, Middleburg, VA Contact person: Shea Porr (540) 687-5362

The schools will feature all fencing systems, with special emphasis on electrified smooth wire high tensile fencing and high tensile fixed knot woven wire fencing. The instructors for these schools have over 75 years of combined fencing experience and include Lewis Sapp of Stay-Tuff Fence Manufacturing, Lee Ellsworth of Gallagher USA, and Rusty Tanner of Tanner's Fencing.

The morning classroom session will include fencing economics, fence types for various livestock classes, cross fences and perimeter fences, brace construction, and fencing design and layout. The afternoon session will be a hands-on session where participants will receive training on constructing braces, tying high tensile fence knots & splices, fence charger installation, and construction of smooth wire and fixed knot high tensile fencing. The fencing school at the Middleburg AREC will focus on equine fencing while the other two locations will focus primarily on cattle and sheep fencing.

If you are interested in participating make sure to sign up early because space is limited to 30 participants per location and they typically fill up fast. The fencing school agenda and registration form can be found on the Virginia Forage & Grassland Council website at www.vaforages.org. For questions or more information, contact Margaret Kenny at 434-292-5331 or makenny@vt.edu.

"Grandin, Provenza, and Anderson" Available on DVD

This winter's *Virginia Forage and Grassland Council's Winter Forage Conferences* were well attended with more than 1,100 people participating. Speakers include Temple Grandin, Fred Provenza, and John Anderson. Topics covered at this winter's conferences included animal handling and welfare, grazing behavior and nutrition, and the impact of global economics on livestock agriculture in the U.S. If you missed this meeting don't despair, we were able to capture all of the presentations as Camtasia videos and they along with handouts and an electronic copy of the proceedings are available on DVD. All you need to do is to slip the DVD into your personal computer and click on the talk you would like to hear or the handout you would like to view. For more information on purchasing a DVD from this year's or past year's winter conferences, please visit our web page at www.vaforages.org or contact Margaret Kenny at 434-292-5331 or makenny@vt.edu.

Notices and Upcoming Events

March 22. 2011
2011 Fencing for Controlled Grazing Systems, Southern Piedmont AREC, Blackstone, VA. To register ($30/person if by March 10) contact Margaret Kenny 434-292-5331 ext 240 during business hours or Dr. Chris Teutsch at 434-292-5331 ext 234 or by email at cteutsch@vt.edu. For program description, see above.

March 24, 2011
2011 Fencing for Controlled Grazing Systems, Brightwood Ruritan Building, Brightwood, VA (Madison County). To register ($30/person if by March 10) contact Margaret Kenny 434-292-5331 ext 240 during business hours or contact Brad Jarvis at (540) 672-5408.

March 29, 2011
Winter Crops for BioEnergy, State College, PA. Contact Greg Roth at 814-863-1018 or by email at gwr@pus.edu or visit the website: http://www.bioenergy.psu.edu/news/shortcourses.asp

March 31, 2011
2011 Fencing for Controlled Grazing Systems, Tenth Legion / Mountain Valley Ruritan Hall, Broadway, VA. To register ($30/person if by March 10) contact Margaret Kenny 434-292-5331 ext 240 during business hours or contact Richard Fitzgerald at (540) 248-6218 extension 105.

April 19, 2011
Growing Your Own N: Improving Legume Cover Crop Management, Abundant Life Farms, Clayton, NC. Contact Molly Hamilton at 828-273-1041 or email: molly_hamilton@ncsu.edu

Come learn how to manage legume cover crops to maximize fertility. We will discuss inoculation, cover crop types and varieties, how they perform on different soil types, how cost compares with other fertility sources, and how to tell you are getting the most out of your cover crop.

April 19, 2011
2011 Fencing for Controlled Grazing Systems, Middleburg AREC (equine fencing), Middleburg, VA. To register ($30/person if by March 10) contact Margaret Kenny 434-292-5331 ext 240 during business hours or contact Shea Porr at (540) 687-5362.

April 21, 2011
Renovating Pastures for a Thicker Grass Stand, Central Maryland Research and Education Center, Ellicott City, MD. Contact Jennifer Reynolds at 301-405-1547 or by email at jenreyn@umd.edu or visit the website: www.ansc.umd.edu/ERG

Your pastures may be green, but is your grass stand as healthy as it can be? Learn how to assess whether a renovation would benefit your pasture and how to increase the growth you've already established.

April 26, 2011
Organic/Sustainable Farming in DE Workshop, Dover, DE at the Kent County UD Paradee Building from 5:30 pm to 7:30 pm. Preregistration required by April 20, 2011. Contact the Kent County Extension Office at 302-730-4000.

May 26, 2011
Using Pasture to Reduce Feed Costs, Central Maryland Research and Education Center, Ellicott City, MD. Contact Jennifer Reynolds at 301-405-1547 or by email at jenreyn@umd.edu or visit the website: www.ansc.umd.edu/ERG

Horses are natural grazers and under the right conditions a healthy pasture can provide all the nutrition a horse needs. Learn how to use pasture to its full potential and keep those extra dollars in your pocket.

June 1, 2011
Penn State Small Grains Field Day, State College, PA. Contact Greg Roth at 814-863-1018 or by email at gwr@psu.edu

June 2, 2011
Canola and Spelt in NC? Organic Production and Harvsting Techniques, Center for Environmental Farming Systems (CEFS), Goldsboro, NC. Contact Molly Hamilton at 828-273-1041 or email: molly_hamilton@ncsu.edu

Canola and spelt are two crops that could potentially be added to expand organic rotations in NC. Markets for these crops are emerging in the area. NCSU's Organic Grain Program has planted demonstrations on production and harvesting techniques for these new crops. Come out to see variety and seeding rate trials, canola harvesting techniques, and to discuss new markets. We will also be discussing and trialing hermetic grain storage bags, an alternative storage technique that may be very useful for storing seed, small acreage harvests, and ID preserved grains.

June 22, 2011
NE SARE Dairy Cropping Systems Field Day, State College, PA. Contact Ron Hoover at 814-865-6672 or by email at rjh7@psu.edu

June 23, 2011
Best Management Practices for Healthy Pastures, Central Maryland Research and Education Center, Ellicott City, MD. Contact Jennifer Reynolds at 301-405-1547 or by email at jenreyn@umd.edu or visit the website: www.ansc.umd.edu/ERG

Knowing how and when to rotate, mow, harrow, and over-seed pastures can be tricky. Experts will discuss tips for keeping your pastures in top condition.

July 21, 2011
Weed Identification and Control, Central Maryland Research and Education Center, Ellicott City, MD. Contact Jennifer Reynolds at 301-405-1547 or by email at jenreyn@umd.edu or visit the website: www.ansc.umd.edu/ERG

What weeds are common in horse pastures and how can you control them? Develop your skills in weed identification and learn which weeds are toxic.

July 19 and 20, 2011
Field Crop Diagnostic Clinic, State College, PA. Contact Dwight Lingenfelter at 814-865-2242 or by email at Dwight@psu.edu

July 21, 2011
Weed Management in Organic Soybeans: Multiple Tactics for Success, Lower Coastal Plain Research Station, Kinston, NC. Contact Molly Hamilton at 828-273-1041 or email: molly_hamilton@ncsu.edu

Weed control is the most challenging aspect of producing organic soybeans. We have spent the last several years looking at multiple tactics that, together, can really help fight weed pressure in organic soybeans. See how seeding rate, seed size/variety, roll-kill/no-till, and cultivating can contribute to a soybean weed management plan. We will also be visiting the organic Official Variety Trials for corn and soybeans, and have time to discuss selecting varieties and hybrids for organic production.

September 10, 2011
2011 Horse Pasture Management Seminar, Central Maryland Research and Education Center, Ellicott City, MD. Contact Jennifer Reynolds at 301-405-1547 or by email at jenreyn@umd.edu or visit the website: www.ansc.umd.edu/ERG

The cost of this seminar is $25 per person and includes all materials and lunch. This full-day event will help you learn about a variety of pasture-related topics including:

- pasture management: a year-round approach
- weed control methods
- getting control of water and mud in pastures

- best suited grass species for horse pastures
- strategies for managing all that manure
- where and how to apply for money for pasture improvements
- rotational grazing

This unique opportunity will prepare you with the knowledge and resources you need to make your own managed grazing project a success.

Newsletter Web Address

The Regional Agronomist Newsletter is posted on several web sites. Among these are the following locations:

http://www.grains.cses.vt.edu/ Look for Mid-Atlantic Regional Agronomy Newsletter

or

www.mdcrops.umd.edu Click on Newsletter

Photographs for Newsletter Cover

To view more of Todd White's Bucks County photographs, please visit the following web site:

www.scenicbuckscounty.com