Plant & Soil Sciences Extension Newsletter

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Plant & Soil Science Extension

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Tissue testing

By Brian Arnall and Hailin Zhang

Use of plant tissue analysis can be a good tool for crop management. Tissue testing is simply chemically analyzing the plant for nutrient content. Tissue testing is similar to soil test nitrate (NO3) analysis in that it is only a snapshot of the crop at the moment of sampling. I have in the past discussed how soil test N values can change over time; the same is true for tissue testing results only more variable. The environment greatly impacts the plants' ability to uptake and assimilate nutrients therefore it is always recommended that tissue testing should not be performed during times that the plant is under stress e..g, drought, water logging, cold soil temps, soil compaction, pest and so on. However, the level of nutrients in the plants compared with the results of established sufficiency level can indicate if the plant is suffering from a deficiency or toxicity that may not have been evident to the naked eye.

There are two approaches for the utilization of tissue testing: nutrient status evaluation and diagnoses of potential deficiencies. For evaluation of nutrient status, representative samples are collected from around the field of interest. The table below shows the proper plant part, growth stage, and number of samples needed to obtain good results. When analyzed the samples will be compared to published sufficiency levels (OSU Soil Fertility Handbook, page 70, Table 4.12). The table contains what is to be considered the normal range in concentration that the nutrient found within a normal plant. Keep in mind this is just the average range and it has been observed that in high yielding cultivars or hybrids that the normal range for that plant is at or below the published sufficiency values. So just because the tissue test results are slightly below the range does not always mean the plant is suffering. However if the value is well below the sufficiency action should be taken and further investigation should be preformed. Having values above the range are also possible since this would indicate over fertilization, luxury consumption (when the plant takes up more than it can use), and potential toxicity. When using tissue test for nutrient status the results can be used in season but more than likely should be used to help guild the fertilization of the following crop. Keep in mind that tissue test cannot tell you how much of a nutrient to apply, soil sampling must be utilized in conjunction before a fertilization recommendation can be produced.

Maybe the most beneficial use of tissue testing is for diagnoses of potential deficiencies. When issues develop in a field and you are unable to identify the cause of poor growth or unusual color, tissue testing can help diagnose the problem or at least a symptom. In this case you would collect representative samples from both affected and unaffected areas. Have them analyzed and compare the results. If you suspect a nutrient deficiency, it is good practice to submit a soil sample along with the tissue sample. This will tell you if the poor plants are suffering from deficiencies that the healthy plants are not. However keep in mind the deficiency could be caused by multiple underlying issues. The poor spot

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Tissue testing (cont.)

may be acidic, have a heavier soil texture that compacted, be in a water logged area, or did not warm up as quickly.

I would like to leave you with a quote from the OSU Soil Fertility Handbook "Plant analysis cannot be used to make fertilizer recommendations because the soil pH and soil nutrient level must be known. It can be used to adjust the fertilizer recommendation once the soil level is known. The same factors that interfere with identifying nutrient deficiency symptoms must be considered when interpreting plant analysis."

Follow the link below to view the OSU Soil Fertility Handbook, plant analysis is discussed further on pages 69-71.

http://npk.okstate.edu/documentation/factsheets/index.htm.

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Table 4.13 is from the OSU Soil Fertility Handbook.

Table 4.13. Guide to plant sampling for tissue analysis.

Crop	Plant part to sample	Stage of growth	Number of plants
Corn or grain sorghum	All above-ground	Seeding stage (less than 12")	20-30
Corn or grain sorghum	Top fully developed leaf	Prior to tasseling	15-25
Corn or grain sorghum	Leaf at ear node	Tasseling to early silk*	15-25
Grain Sorghum	Second leaf from top	At heading	15-25
Soybeans	All above-ground	Seeding stage (less than 12")	20-30
Soybeans	Top fully developed trifoliate leaves	Prior to or during initial flowering*	20-30
Small grain	All above-ground	Seeding stage (prior to tillering)	50-100
Small grain	All above-ground	As head emerges from boot*	15-25
Peanuts	All above-ground	Seeding stage	20-30
Peanuts	Upper stems and leaves	Early pegging*	15-25
Alfalfa	All above-ground	Prior to bloom	30-40
Alfalfa	Top 1/3 of plant	At bloom*	15-25
Bermudagrass	Whole plant top	4 to 5 weeks after clipping	15-25
Cotton	Whole plants	Early growth	20-30
Cotton	Petioles of youngest fully expanded leaves	During bloom*	20-30

*Recommended sampling period for fertilizer evaluation.

What can be done about low protein?

By Jeff Edwards

A surplus of wheat on the world market means that it is a buyer's market, and many end users have indicated that they are not interested in wheat with < 12% protein. This has put elevator managers and farmers in a tight spot and significantly decreased the cash price for wheat in Oklahoma. The questions now are what caused the low protein and how to we keep this from happening again?

Wheat protein is primarily determined by genetics, nitrogen fertility, and temperature. Wheat protein contents of varieties tested in the OSU wheat variety testing program are available at *www.wheat.okstate.edu* under variety testing. In most circumstances, however, I would not choose a variety based on wheat protein. If you can find a variety that fits the agronomic profile you need AND has high protein potential, that is great; but I would not give up the agronomic characteristics I need just to get a variety with a slight protein advantage.

Nitrogen fertility is the protein-influencing factor that has received the most attention. While this answer would not get an 'A' in organic chemistry, nitrogen is the basic building block of amino acids and protein is a big bunch of amino acids strung together like a chain that is twisted and folded on itself. So, the plant needs adequate nitrogen fertility during grain fill to form proteins, but Mother Nature throws a curve by dictating that the nitrogen must come through the phloem with the products of photosynthesis. This means that the nitrogen for grain protein is mostly taken up by the plant much earlier in the season and then remobilized when the plant needed it. We probably did not have adequate uptake of nitrogen in Oklahoma this year due to a variety of reasons. Rainfall moved many of our pre-plant applications of nitrogen deeper in the soil profile and they were not accessed by the crop. Likewise, wet conditions during February and March delayed or prevented topdress nitrogen applications to wheat. Finally, many producers chose to cut back on fertilizer applications because of cash flow considerations.

High temperature during grain fill reduces carbohydrate accumulation (starch) at a greater rate than N accumulation, which increases the final N level in the plant. This generally reduces grain yield as well, so there is **sometimes** an inverse relationship between protein and grain yield. Grain fill in southwestern Oklahoma was marked by cooler than normal temperatures, which improved grain yield but may have negatively impacted grain protein. This was beyond the farmers' control.

What can farmers do to increase grain protein? The best thing that farmers can do to increase grain protein content is to provide adequate nitrogen fertility to the crop in a timely fashion. This is not a recommendation for nitrogen fertilizer in excess of that which is required for a reasonable yield goal. If farmers fertilize their crop to achieve a reasonable yield goal, they are fertilizing to produce acceptable protein too. If market conditions change, there could be some potential to boost protein with post-flowering, foliar application of nitrogen fertilizer, but there is little incentive for the individual producer to make an extra pass across the field at this time. Again, the take-home message for farmer should be to provide adequate nitrogen fertility to the crop via pre-plant and/or topdress application of nitrogen fertilizer.

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Burndown treatments ahead of planting summer crops

By Joe Armstrong

As the dust settles from harvest and the fields dry out enough to start planting summer crops, it will be especially important to control any weeds before planting. There are several options available for burndown of weeds prior to planting a summer crop or double crop. Glyphosate is the standard burndown treatment and will provide excellent control of many weeds. The standard rate for glyphosate is 0.75 pounds of acid equivalent/acre, or 32 fl oz/acre for most generic glyphosate products. However, if the weeds are over 6 inches tall or the weather is especially hot and dry, I would recommend increasing the rate of glyphosate to 48 fl oz/acre. Whenever using glyphosate, be sure to add ammonium sulfate (AMS) at 17 pounds per 100 gallons of spray solution to the water in the spray tank before adding the glyphosate. Many glyphosate products come "fully loaded" and do not require the addition of a surfactant, but be sure to check the label for each product for specific instructions.

Another option for burndown treatments is Ignite® from Bayer CropScience. Ignite is the new name and formulation for Liberty®. Ignite provides broad-spectrum control of most broadleaf and grass weeds, including weeds that may be resistant to glyphosate. Like most herbicides, Ignite works best on actively growing weeds that are 4 to 6 inches or less in height. Ignite is typically used at 22 fl oz/acre, but the rate can be increased to 29 fl oz if there is a dense canopy of weeds. Ignite works primarily through contact activity and should be applied in a total spray volume of 15 to 20 gallons per acre to ensure good spray coverage. For maximum herbicide activity, AMS should be added at 17 pounds per 100 gallons of spray solution to the tank before adding the herbicide. Ignite is labeled for burndown applications ahead of planting corn, soybeans, and cotton.

Finally, the newest option for burndown treatments is Sharpen®, part of the Kixor® brand of herbicides from BASF. Sharpen is used exclusively for burndown and preplant applications and can improve control of many broadleaf weeds that glyphosate may not completely control, including marestail, wild buckwheat, and morningglory. Sharpen does not have any activity on grass weeds and, therefore, should be tank-mixed with glyphosate. Sharpen can provide weed control results in only a few days, making it very useful if it is necessary to plant soon. The use rate is 1 fl oz/acre and requires methylated seed oil (MSO) at 1% of the total spray volume as an adjuvant and AMS at 8.5 to 17 pounds per 100 gallons of spray solution. There is no plant-back restriction for Sharpen ahead of corn, grain sorghum,

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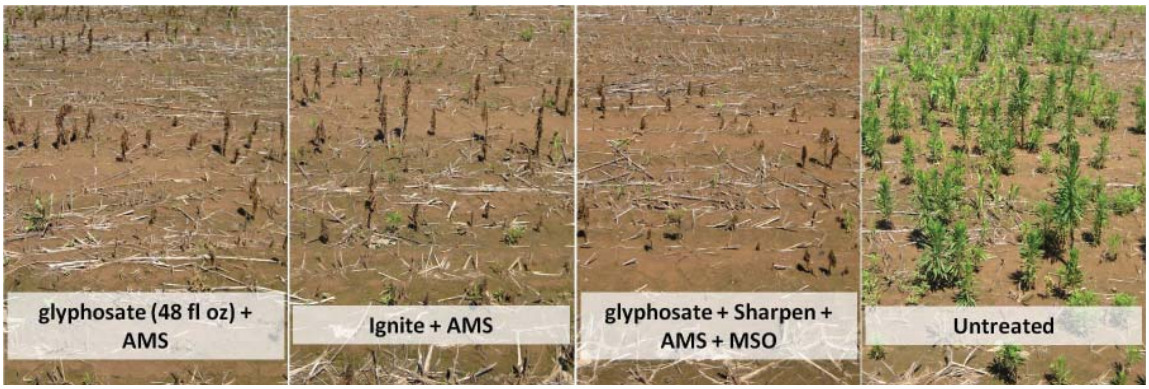

Glyphosate at 48 fl oz, Ignite, or Sharpen + glyphosate will provide good to excellent control of many grass and broadleaf weeds before planting, including large marestail. Herbicides should be applied as soon as possible, while conditions are favorable and weeds are actively growing.

Goals for next year

By Jeff Edwards

The 2009-2010 wheat production season is winding down and it is time to start planning for next year's crop. As we wrap up this season, I have four points that I would like for producers to consider when planning for this fall.

1.) Plant newer varieties. Planting a variety with inferior grain yield potential reduces the value of every other management input for the crop. Anyone who grew up raising hogs knows that no matter how much care you take with the runt of the litter, he/she is almost always a losing proposition. The money spent in turning around the runt would have been much better spent on a healthy pig with more potential from the start. The same is true for wheat varieties. The more yield potential you start the season with, the easier it is to make a profitable crop. There has been as much as 27 bu/ac difference in grain yield of varieties at OSU wheat variety test sites this year. Starting the year with a variety with a 27 bu/ac disadvantage would make profitability tough for even the best manager.

2.) Improve weed control. If there was an easy way control problem weeds such as feral rye and rescuegrass in wheat, we would already be doing it. The truth is that hard-to-control weeds will require an integrated approach to management. In some cases growers will find a way to control these weeds in a continuous wheat environment, but in most cases control will require rotation to crops such as sesame, grain sorghum, corn, soybean, sunflower, or winter canola. What works on one farm might not work on another, so coming up with a management plan is tough and will require some trial and error.

3.) Soil test this summer. Fertilize according to soil test results or sensor-based nitrogen recommendations. Make adjustments when things don't go as planned, but above all, provide adequate N, P, & K fertility to the crop.

4.) Take care of the basics before you spend on any other crop inputs. Spending money on micronutrients, for example, is questionable if you don't have your N, P, & K fertility where it should be. In some cases this year, I feel as though we have been painting go-faster stripes on the hood of a YUGO rather than addressing the inherent deficiencies. By the same token, I have observed cases where a Lamborghini has been restricted to the school zone because basic fertility needs have not been met.

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Burndown (cont.)

or soybeans; however, this product should not be used prior to planting sunflowers or sesame, as there is a four month plant-back restriction.

Regardless of the herbicide you use for burndown, remember that the weeds will be easiest to control when they are small and not stressed due to hot and dry weather. Make your applications as soon as possible to ensure maximum weed control. Additionally, look to add a tank-mix partner with your burndown treatment to improve the control of large or difficult-to-control weeds such as yellow nutsedge or giant ragweed.

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Hay production losses

By Daren Redfearn

The process for hay production is relatively simple. The forage is cut, allowed to dry, and then baled. However, there are several factors that can result in this process not being as so straightforward. There are three occasions during the hay harvesting process where field losses are likely to occur. These are during mowing, raking, and baling.

Dry matter losses that occur when the forage is mowed are minimal. However, higher dry matter losses can occur with raking and baling operations. Dry matter losses due to raking can range from only 5 to over 20%. The high dry matter losses are generally those associated with the production of legume hay. These losses are usually due leaf shattering as a result of raking hay that is too dry. To avoid extreme losses in dry matter from legume hay production, legumes should be raked when the moisture is between 45 to 55% and allowed to dry in the windrow until baling. Anytime hay must be raked or fluffed to aid in drying, dry mater losses will result from leaves that are separated from the stems. Additional losses from baling operations can range from 1% to more than 15%. Forages that are more dry and brittle during baling will generally have greater dry matter losses.

There are two additional situations that can have a significant impact dry matter losses during hay production. These are plant respiration and weather. Dry matter losses that occur as a result of plant respiration is unavoidable. Respiration is a normal process that occurs in all plants. It is simply the breakdown of food materials that are used for plant growth. However, respiration will continue after the plant is cut until the moisture content drops below 40%. However, since the plant does not have the capability to grow after it has been cut, respiration will result in lost production. On the other hand, losses that occur from adverse weather conditions usually are the result of unplanned weather patterns. The losses resulting from adverse weather conditions can be minimal to greater than 35%. These losses have their greatest negative impact between mowing and baling.

Most of the problems encountered during the hay making process are the result of poor environmental conditions that occur from the time the hay is mowed until it has been baled. Although we usually consider hay to be "dry", properly cured hay will still have between 10 and 15% moisture. Hay that is cured and harvested under ideal conditions will still have losses around 10%. However, under less than ideal conditions, these losses can be as high as 75%. Remember that field losses from hay crop production are avoidable. The most critical factor affecting hay production is moisture content, so there is a lot of truth in the saying "Make hay while the sun is shining".

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Double cropping grain sorghum

By Rick Kochenower

With the recent rainfall many producers are considering double crop grain sorghum, to make this successful a few things need to be considered: weed control, seeding rate, fertility, and hybrid selection.

The most important thing in weed control is to know your weed species, if there is a history crabgrass or johnsongrass in the field soybean or sunflower maybe a better option. Both grass species are difficult to control with herbicides presently available in grain sorghum. If most of the weed pressure is from broadleaf weeds, a tank mix containing a grass herbicide

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Double cropping grain sorghum (cont.)

(dual, outlook, and lasso) (with concept treated seed) and atrazine is recommended.

With seeding rate, an increase in the seeding rate is recommended when compared to planting in April. The soil and air temperatures are higher at planting and early growth is increased which reduces the amount of tillering in the plant. A good recommendation would be to seed 45 to 50,000 seed/ac to achieve the desired plant population.

When double cropping, it is very important to have a realistic yield goal in mind when applying nitrogen (N). What yields have you had in the past for double crop grain sorghum? If this is your first time see what your neighbor yields have been. A good rule of thumb for N rate is 1 lb N/bu of yield goal. For phosphorus (P), if it was required for the wheat it will be needed for the double crop grain sorghum. The easiest way to apply would be to apply 5 gal of 10-34-0/ac in the seed row if no-till, or apply the same recommended rate for the wheat as a broadcast if tillage will be done.

Hybrid selection will be based on days to mid-bloom as June progresses you want to shorten maturity and have sorghum planted by July 4th, after this date it is hard for sorghum to mature before a freeze in the fall. Generally for most of the state it desirable to have sorghum flowered as near to the first week of September as possible. Use the planting dates in the example below to manage your dates and maturity selections.

Planting and maturity examples:

June 15 planting and 5 days for emergence

•60 days to mid-bloom hybrid = August 19 •65 days to mid-bloom hybrid = August 24 •70 days to mid-bloom hybrid = August 29

July 1 planting and 5 days for emergence

•60 days to mid-bloom hybrid = Sept. 4
•65 days to mid-bloom hybrid = Sept. 9
•70 days to mid-bloom hybrid = Sept. 14

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Upcoming Events

OSU Winter Canola Conference

July 20, 2010 *Hoover Building*
Enid, Okla.
(More details to follow.)