D's Notes
03/15/21

Reminders

1. Prune fruit trees
2. Remove mulch from strawberries when growth begins or when soil temperature reaches 40 degrees.

Why Seeding Cool-Season Grasses in the Spring is Difficult

People often wonder why we recommend seeding cool-season grasses such as tall fescue and Kentucky bluegrass in the fall. It would seem that the spring would be the more natural time for seeding because the entire growing season is available for the grass to become established before the turf has to deal with winter. Actually there are a number of reasons that tend to make fall seedings more successful.

The soils are warmer in the fall. Warm soils mean less time required for germination and growth so the grass becomes established more quickly. I have seen tall fescue seeded in the last week of August come up in four days. Now, you had to be on your hands and knees to see it but it was up. Tall fescue seeded in the spring may take well over a week to come up and the time required to become established is much longer.

Weeds are less of a problem in the fall. The major weed problems in the fall tend to be the broadleaves such as chickweed, henbit or dandelion. Turf seeded in early September is usually thick enough by the time these broadleaves germinate that often there is not much weed invasion. Even if there is some invasion by broadleaves, the turf should be mature enough by early November that mild broadleaf herbicides can be applied.

In the spring, our major weed problems are the annual grasses such as crabgrass. Since the spring-seeded turf is slow to mature, there are often thin areas that are easily invaded by these grassy weeds. If this invasion occurs, the weeds are better adapted to our hot, summer conditions than our cool-season grasses and so the weeds tend to take over. The number of chemicals that can be used on young turf is limited, and so these grasses become more of a problem. One of the preemergence herbicides that can be used on young grasses is dithiopyr (Dimension). It is found in Hi-Yield Turf and Ornamental Weed & Grass Stopper and Bonide Crabgrass & Weed Preventer and can be used on tall fescue, Kentucky bluegrass, and perennial ryegrass two weeks after germination.

Summer is the hardest time of the year for cool-season grasses; not the winter. Summertime is very difficult because our cool-season grasses do not have the heat or moisture stress tolerance that our warm-season grasses such as buffalo, zoysia and Bermuda have. Therefore they tend to become weakened in the summer which makes them more susceptible to disease and other stresses. Spring-seeded cool-season grasses are less mature and therefore less able to tolerate these stresses.

Seeding cool-season grasses in the spring can be successful but is more difficult to pull off than fall seedings. If you have a choice, always opt for seeding cool-season grasses in the fall. (Ward Upham)

Lawn Calendar for Warm-Season Grasses - zoysiagrass and bermudagrass

Following is a lawn calendar for zoysiagrass and bermudagrass. Buffalograss, also a warm-season grass, is covered in a separate article.

March - Spot treat broadleaf weeds if necessary. Treat on a day that is 50 degrees F or warmer if possible. Rain or irrigation within 24 hours of application will reduce effectiveness.

April - Apply crabgrass preventer between April 1 and April 15, or apply preventer when the eastern redbud is approaching full bloom. If using a product with prodiamine (Barricade), apply two weeks earlier. Crabgrass preventers must be watered in before they will start to work.

May – August 15 - Fertilize with 1 lb. of nitrogen per 1,000 square feet per application. Follow the recommendations on the bag. More applications will give a deeper green color, but will increase mowing and lead to thatch buildup with zoysiagrass. Bermudagrass can also have problems with thatch buildup but thatch is less likely with Bermuda than zoysia.

Bermudagrass – Use two to four applications.

Zoysiagrass – Use one to two applications. Too much nitrogen leads to thatch buildup.

One Application: Apply in June.
Two Applications: Apply May and July.
Three Applications: Apply May, June, and early August.
Four Applications: Apply May, June, July, and early August.

June - If grubs have been a problem in the past, apply a product containing imidacloprid or chlorantraniliprole during May or anytime from May through June for imidacloprid. These products kill the grubs before they cause damage. They are effective and safe but must be watered in before they become active. June is a good time to core aerate a warm-season lawn. Core aeration will help alleviate compaction, increase the rate of water infiltration, improve soil air exchange and help control thatch.

Late-July through August - If you see grub damage, apply a grub killer. If Imidacloprid has been applied, this should not be necessary. Grub killers must be watered in immediately.

Late October - Spray for broadleaf weeds if they are a problem. Treat on a day that is at least 50 degrees F. Rain or irrigation within 24 hours reduces effectiveness. Use the rates listed on the label for all products mentioned. (Ward Upham)

Lawn Calendar for Buffalograss

General Comments - Buffalograss has become more popular in recent years due to its reputation as a low-maintenance grass. Buffalograss can survive with less water and fertilizer than our other turfgrasses.

March - Spot treat broadleaf weeds if necessary. The most important treatment for broadleaf weeds should be in late October to early November well after the buffalograss is dormant. Treatments are much more effective then than in the spring as the weeds are smaller and the weeds are sending energy, as well as the herbicide, to the roots. Treatments in March are to take care of any "escapes" missed in the fall spraying. Spray early enough in March that the buffalograss is still dormant. Look at the base of the plants to make sure there is no green. Try to treat on a day that is 50 degrees F or warmer. Rain or irrigation within 24 hours of application will reduce effectiveness. Use a combination product such as Trimec, Weed-B-Gon or Weed-Out. Weed Free Zone is also good and will give quicker results under cool conditions.

April - Apply crabgrass preventer between April 1 and April 15, or apply preventer when the eastern redbud is in full bloom. If using a product with prodiamine (Barricade), apply two weeks earlier. Crabgrass preventers must be watered in before they will work. Avoid using broadleaf herbicides as the buffalograss is greening up as injury can result. The buffalograss will not be killed but growth will slow making the buffalograss less competitive with weeds.

June - Fertilize with 1 lb. of nitrogen per 1,000 square feet during June. More applications will give a deeper green color. If it is felt that a second application is needed, apply in July. If grubs have been a problem in the past, apply a product containing imidacloprid or chlorantraniliprole during May or anytime from May through June for imidacloprid.

Imidacloprid and chlorantraniliprole can be applied as early as mid May if there are problems with billbugs or May beetle grubs. These products kill the grubs before they cause damage. They are effective and safe but must be watered in before they become active. Again, treat only if grubs have been a problem in the past. Note that the whole area may not need to be treated. The beetles that lay the eggs for the grubs are attracted to lights and moist soil and those areas are most likely to be infested.

Late-July through August - If you see grub damage, apply a grub killer. If imidacloprid has been applied or if grubs have not been a problem in the past, this should not be necessary. Grub killers must be watered in immediately.

Late October to Early November - Spray for broadleaf weeds if they are a problem. Look carefully as our winter annuals such as chickweed and henbit are small and easily overlooked. Use a product that contains 2,4-D as it increases effectiveness on dandelions. Treat on a day that is at least 50 degrees F. Rain or irrigation within 24 hours reduces effectiveness. Use the rates listed on the label for all products mentioned. (Ward Upham)

It's Not Too Late for Dormant Overseeding of Turfgrass

As mentioned in a companion article in this newsletter, the best time to overseed cool-season grasses such as tall fescue and Kentucky bluegrass is September because the turf has more time to mature before crabgrass germination in the spring and the heat stress of summer. However, dormant seeding of turfgrass is sometimes used to help fill in bare spots of lawns that weren't overseeded in the fall. Dormant seeding is normally not used to

seed large areas because of the possibility of erosion before the seed emerges and becomes mature enough to hold the soil.

Dormant overseeding is usually done during the winter (December through February) when it is too cold for germination to take place. Spring seedings done in March can be just as successful as dormant seeding, but spring rains may delay plantings. As with any seeding program, it is vital that good seed-soil contact is achieved. There are several methods that are commonly used in dormant seeding.

One method is to seed when there has been a light snowfall of up to an inch over unfrozen soil. This is shallow enough that bare spots can still be seen. Spread seed by hand on areas that need thickening up. As the snow melts it brings the seed into good contact with the soil where it will germinate in the spring.

Another method is dependent on the surface of the soil being moist followed by some freezing weather. As moist soil freezes and thaws, small pockets are formed on the wet, bare soils which are perfect for catching and holding seed. As the soil dries, the pockets collapse and cover the seed.

If dry enough and the soil is unfrozen, seed can be applied to bare spots and then raked in to ensure good seed/soil contact.

With any of the above methods, seed germinates in the spring as early as possible. There will be limitations on what herbicides can be used for weed control. Tupersan (siduron) can be used as a crabgrass preventer on new seedings even before they have come up. Also dithiopyr, found in Hi-Yield Turf and Ornamental Weed & Grass Stopper and Bonide Crabgrass & Weed Preventer, can be used on tall fescue, Kentucky bluegrass, and perennial ryegrass two weeks after germination. Dithiopyr is longer lasting and more effective than siduron. Other preemergence herbicides available to homeowners require that the turf be well established before application. (Ward Upham)

Use a String Line and Planting Board

Two simple tools can make planting a vegetable garden easier. A string line is used to ensure straight rows and a planting board can make spacing vegetables within a row easier. Most gardeners make their own string line. A very simple one can be made with a tent peg, a 12" piece of 1 x 2 lumber and some string. String is wound on the 1 x 2. Either notch each end of the board or drive a nail near each end to hold the string as it is wound. The end of the string is tied to the nail driven into the board. The other end of the string is tied to the tent peg. When marking out a row, drive the tent peg into the ground where you want the row to start. Mark the end of the row with a second tent peg and unwind enough string to stretch between them. Actually, you will want the string line offset where the plants will go by a couple of inches so that it isn't in your way. In other words, you will make your row next to the string; not under it. You now have the means of making a straight row.

So, what is a planting board? A planting board is a 1 x 4 board that is four feet long. Relatively deep notches are cut every foot with shallow notches at 6 inches from each deep notch. Some gardeners also bevel the side opposite the notches so they can work the beveled end into the soil to make a shallow trench for seed.

When planting, lay the planting board near your tent peg and align it with the string. It is now easy to place plants or seeds at the recommended spacing. Move the planting board with you as you progress down the row. (Ward Upham)

Establishing a Wildflower Area

Native grasses and many native wildflowers do well within a wide pH range. Any pH between 5.5 and 8 should work. Just make sure the area receives at least 8 hours of sun a day.

It is better to choose a blend of grasses and wildflowers rather than a single species. Companies that provide regional blends include Sharp Brothers, Stock Seed and Wildseed Farms.

These plants do not take root and grow well in areas that already have established plants. Existing vegetation should be killed before seeding. Follow the following steps to increase the chances of success.

- Control perennial weeds by using a product containing glyphosate.
- Using glyphosate the fall before planting makes soil preparation easier the following spring
- Adjust pH and fertilize according to soil test before planting.
- The seedbed should be firm so that a boot heel sinks in no more than ½ inch.
- The goal is good seed/soil contact.
- Can mix seed with damp sand (4:1 sand/seed) for more uniform coverage with a drop seeder or whirlybird spreader.
- The seed should be raked in about 1/4" deep. It is best if the seedbed is firmed up by using roller or driving over the area with a riding lawn mower. Don't mulch.
- Keep seed moist while the seed is germinating (3 to 4 times per week, if possible). Slowly back off watering as plants develop.

What about planting dates? Warm-season grasses and most prairie flowers should be seeded between April 1 and May 15. To control any remaining living vegetation, spray with a product containing glyphosate, wait a week and plant. Make sure the soil temperature is at least 60 degrees before planting. Soil thermometers are often available in garden centers, hardware stores and auto stores (they are used to test air temperatures from air conditioners as well as in gardens).

Hand weeding can help but must be done with care to avoid uprooting small prairie flowers. Mowing as high as possible can help control fast growing weeds while preserving most of the foliage on the prairie flower. (Ward Upham)

Rhubarb

Rhubarb is a perennial vegetable that can be a bit tricky to grow in Kansas. It is native to northern Asia (possibly Siberia) and so is adapted to cold winters and dry summers. However, it is susceptible to crown rot and should not be subjected to “wet feet” and therefore should be grown in a well-drained soil. The addition of organic matter can increase drainage as well as raise the soil level so that crown rot is less likely. Also, have a soil test done as rhubarb does best with a pH below 7.0.

Rhubarb should be planted from mid-March to early April in Kansas. Mix 5 to 10 pounds of well-rotted barnyard manure into the soil for each 10 square feet of bed before planting. Rhubarb is propagated from crowns (root sections) that contain one or two buds. Plants should be spaced 2 to 3 feet apart in the row with 4 to 5 feet between rows. The crowns are planted shallow so that the buds are just one-half to 1 inch below the soil surface. Firm soil around the crowns and make sure they are not in a depression that holds water. Recommended varieties include Canada Red, Crimson Red, McDonald and Valentine.

Rhubarb needs rejuvenated at least every 5 to 10 years and should be dug and divided from mid-March to early April. Use a cleaver or ax to cut crowns into sections that each contain one or two buds. Plant as described above.

Newly transplanted rhubarb should not be harvested the first year so the plant can recover from the transplant process. Only a few stalks should be harvested the second year to allow the plant to continue to build up its energy reserves. The harvest season for plants that are three years or older usually lasts about 8 weeks. Harvest only the largest and best stalks by pulling them slightly to the side so that they break away from the plant. Never harvest over one-third of the leaf stalks at one time. Only the leaf stalk (petiole) is eaten as the leaf blade contains oxalic acid and is poisonous.

Established rhubarb should be fertilized in late March. Fertilize according to soil test or use a 10-10-10, 12-12-12 or similar fertilizer and broadcast or band at the rate of 1.5 to 2 pounds per 100 square feet or about 1/2 cup per plant. An additional 1/4 cup of fertilizer per plant of a high nitrogen fertilizer such as a 27-3-3, 28-4-4 or something similar in late June or July after the last harvest is often helpful to stimulate recovery from the harvest season. Though most of these high nitrogen fertilizers are lawn fertilizers, each will work well for our purposes as long as they do not contain weed killers or weed preventers.

Mulches can be used to reduce moisture loss, prevent weed growth and provide winter protection. However, it should be pulled away in the spring to allow the soil to warm so that early growth is encouraged. (Ward Upham)

Time to Plant Potatoes Approaching

St. Patrick's Day is just around the corner, so it is time to think about getting seed potatoes in the ground. Actually any time from mid- to late-March is fine for potato planting.

Be sure to buy seed potatoes rather than using those bought for cooking. Seed potatoes are certified disease free and have plenty of starch to sprout as quickly as soil temperatures allow. Most seed potatoes can be cut into four pieces, though large potatoes may yield more, and small less. Each seed piece should be between 1.5 and 2 ounces. Seed pieces this size will have more than one eye.

Each pound of potatoes should yield 8 to10 seed pieces. Cut the seed 2 to 3 days before planting so freshly cut surfaces have a chance to suberize, or toughen, and form a protective coating. Storing seed in a warm location during suberization will speed the process. Plant each seed piece about 1 to 2 inches deep and 8 to 12 inches apart in

rows. Though it is important to plant potatoes in March, emergence is slow. It is often mid- to late-April before new plants poke their way through the soil. As the potatoes grow, pull soil up to the base of the plants.

New potatoes are borne above the planted seed piece, and it is important to keep sunlight from hitting the new potatoes. Exposed potatoes will turn green and produce a poisonous substance called solanine. Keeping the potatoes covered will prevent this. (Ward Upham)

Bolting and Buttoning in Cole Crop Plants

Broccoli, cabbage and cauliflower are cole crops that have a tendency to bolt (go to seed) or button (produce an extremely small head) if plants are not grown properly. These crops need to be kept actively growing through their production cycle, including growing transplants from seed. If they slow down due to under-fertilization or are stunted due to overgrowing their container, buttoning or bolting is more likely. Therefore, be sure to properly fertilize plants grown from seed and ensure they have enough light. The easiest way to fertilize transplants is to use a potting soil with fertilizer already added. Light may be more of a challenge. Often natural sunlight is not sufficient unless the plants are in a greenhouse. Therefore, additional light is often needed.

If you are not growing your own transplants but rather selecting plants later in the month for transplanting, choose small, stocky, dark green plants. Even after transplanting, these plants need to be well-fertilized. Fertilize at transplanting with a starter solution and continue to fertilize every 2 to 3 weeks until harvest. Both buttoning and bolting are irreversible. Once a seed stalk starts for form, nothing can be done to force the plant to produce a normal crop. (Ward Upham)

Use Wide Rows for Certain Vegetables

Lettuce, radishes and spinach are planted early enough that weeds are usually not a problem. These plants can usually be planted starting in mid-March to as late as mid-April. If space is at a premium, gardeners can plant a wide row and get more production out of a small space. How wide? Usually 12 to 18 inches is about right. Leaving aisles between wide rows allows for convenient harvesting.

Seed can be planted in several rows close together to make a wide row but it is easier to scatter seeds uniformly over the area. After seeding, tamp down the row lightly with the back of a hoe to eliminate air pockets. Then pull soil from the sides of the row with the back of a garden rake to cover the seed. One-quarter inch of soil over the seed should be good.

Be careful to not sow too densely as too much competition can stunt plants. Space seed according to the instructions on the seed packet. If you do happen to sow too thickly, plants can be thinned later.

It is best to go back to a single row for later planted crops to allow for easier weed control. (Ward Upham)

Cut Back Ornamental Grasses

March is a good time to remove dead foliage from ornamental grasses. Grasses green up earlier if foliage is removed and are more attractive without a mixture of dead and live leaves. A number of tools can be used including hand clippers, weed whips (if the foliage is of a small enough diameter), weed whips with a circular blade, or even a chain saw. Use the top of the chainsaw bar to cut so the saw doesn't pull in debris and clog.

Also, it is often helpful to tie foliage together before cutting so it doesn't interfere and is easier to dispose of. Burning is another option — but only if it is safe and legal to do so. Note that these grasses may not burn long, but they burn extremely hot. Even so, the crown of the plant is not damaged and new growth appears relatively quickly.

If the center of the clump shows little growth, the plant would benefit from division. Dig up the entire clump and separate. Then replant the vigorous growth found on the outer edge of the clump. (Ward Upham)

Don’t Work Wet Soil

Resist the temptation to work any soil if it is wet. Doing so destroys the structure of the soil resulting in clods that may not break down all summer.

To determine if a soil is too wet to work, grab a handful and squeeze. If water comes out, it is much too wet. Even if no water drips out, it still may not be dry enough to work. Push a finger into the soil you squeezed. If it crumbles, it is dry enough, but if your finger just leaves an indentation, more time is needed. Be sure to take your handfuls of soil from the depth you plan to work the soil because deeper soils may contain more moisture than the surface.

If there is a small area that you wish to plant in a few weeks and it much too wet to work, try tarping the area during wet weather and uncovering when it is dry. This will allow the soil to dry enough to work by the time you are ready to plant. (Ward Upham)

Chloride as a topdressing nutrient for wheat

Chloride (Cl) is a highly mobile nutrient in soils and topdressing is typically a good time for application, especially in regions with sufficient precipitation or with coarse-textured soils are prone to leaching.

One of the main benefits from good Cl nutrition is the improvement in overall disease resistance in wheat. Wheat response to Cl is usually expressed in improved color, suppression of fungal diseases, and increased yield. It is difficult to predict whether Cl would significantly increase wheat yields unless there has been a recent soil test analysis for this nutrient. Chloride fertilization based on soil testing is becoming more common in Kansas.

As with nitrate and sulfate, Cl soil testing is recommended using a 0-24 inch profile sample. Based on current data, the probability of a response to Cl in dryland wheat production in northeast and central Kansas seems higher than in western Kansas.

The interpretation of the Cl test and corresponding fertilizer recommendations for wheat are given in the table below. Chloride fertilizer is recommended when the soil test is below 6 ppm, or 45 pounds soil chloride in the 24-inch sample depth. Dry or liquid fertilizer sources are all plant available immediately. Potassium chloride (potash) and

ammonium chloride are commonly available and widely used fertilizer products, though other products such as calcium, magnesium, and sodium chloride can also be used and are equal in terms of plant availability.

Table 1. Soil test chloride interpretations for wheat in Kansas

	Soil Chloride in a 0-24 inch sample		**Chloride Recommended**
Category	(lbs/acre)	(ppm)	(lbs Cl/acre)
Low	<30	<4	20
Medium	30-45	4-6	10
High	>45	>6	0

Chloride deficiency symptoms appear as leaf spotting and are referred to as physiological leaf spot.

Figure 1. Upper and lower photos both depict chloride deficiency symptoms (physiological leaf spotting) in wheat. Photos by Dorivar Ruiz Diaz, K-State Research and Extension.

K-State has done considerable research on Cl applications to wheat since the early 1980's, mostly in the eastern half of the state. Results have been varied, but there have been economic yield responses in almost all cases where soil test Cl levels have been less than 30 lbs per acre (Figure 2).

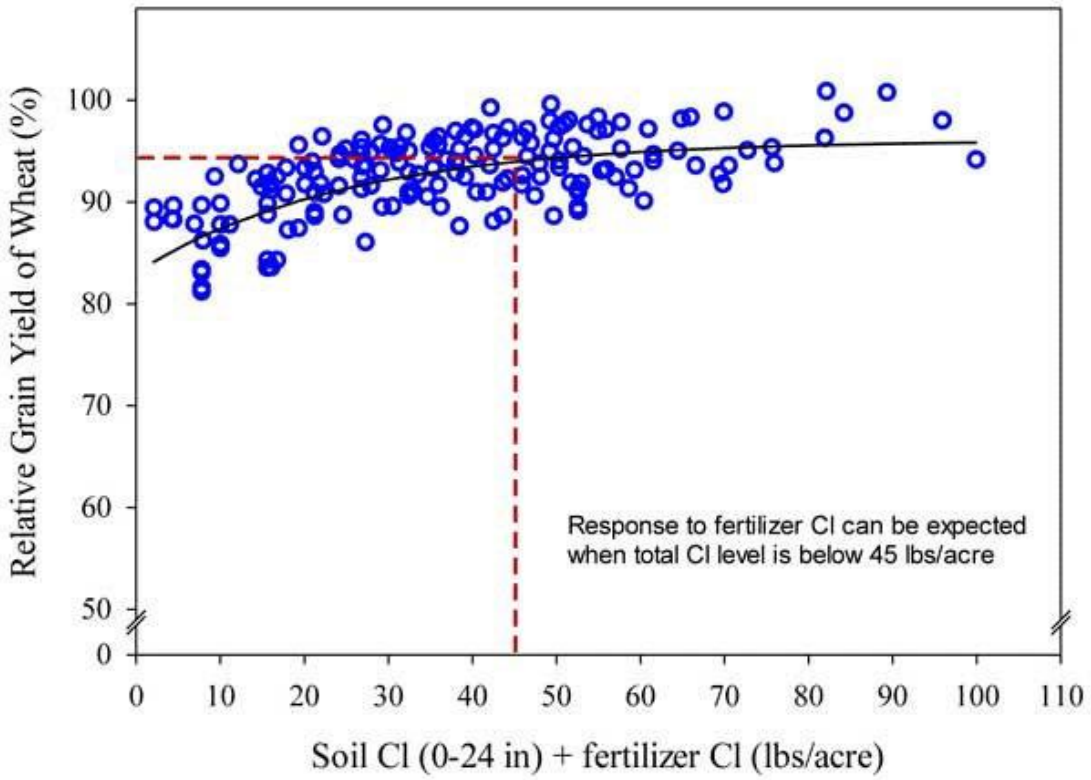

Figure 2. Relative wheat grain yield as affected by total chloride supply (soil + fertilizer) in Kansas.

Deficiencies were most likely to be found on fields with no history of potash (KCl) applications. Recent studies showed that there are variety differences in response to Cl and are likely associated with the tolerance of that variety to fungal diseases.

For more information, please refer to the KSRE publication *Chloride in Kansas: Plant, Soil, and Fertilizer Considerations*, MF2570: www.ksre.ksu.edu/bookstore/pubs/MF2570.pdf Dorivar Ruiz Diaz, Nutrient Management Specialist, ruizdiaz@ksu.edu

Topdressing wheat with sulfur

Traditionally, sulfur (S) deficiency is most common on high-yielding crops grown on irrigated sandy soils that are low in organic matter and subject to leaching. However, due to reduced S additions from the atmosphere (there is less S in the air now) and continued crop removal, an increasing number of finer-textured soils have shown S deficiency.

In recent years, sulfur deficiency in wheat has become common in many areas of Kansas, particularly in no-till wheat where cooler soil temperatures can slow S mineralization in the soil. Classic S deficiency symptoms, confirmed by soil and plant analysis, have been observed in many no-till wheat fields during periods of rapid growth

in the spring. These observed deficiencies generally occur during periods of rapid growth prior to jointing or during stem elongation.

The photos below are a good representation of the problem. Generally, the S-deficient wheat is yellow and stunted (Figure 1-top photo), and the problem is found in patches in the field (Figure 1-bottom photo), especially in areas where there has been previous soil erosion or soil movement. Sulfur deficiency in growing crops is often mistaken for nitrogen (N) deficiency. However, unlike N deficiency where the older leaves show firing and yellowing, with S deficiency, the pale yellow symptoms of S deficiency often appear first on the younger or uppermost leaves. Wheat plants with S deficiency often eventually become uniformly chlorotic. The patchy S-deficient areas of the field are often found on hilltops or sideslopes where erosion has occurred and soil organic matter is reduced, or where leaching is more pronounced. In terraced or leveled fields, wheat in areas where topsoil was removed or significant cuts were made, also commonly shows symptoms.

Figure 1. Sulfur deficiency in wheat. Photos by Dorivar Ruiz Diaz, K-State Research and Extension.

The majority of S in soil is present in organic forms (requires mineralization to become plant available) in surface soils and as sulfate (SO_4^{2-}), an inorganic form and plant available. Sulfate is relatively soluble, so it tends to leach down from the surface soil into the subsoil. In many of our Kansas soils it will accumulate in the B horizon (subsoil) in two forms:

- Some sulfate will be sorbed to clay surfaces and coatings similar to the processes whereby phosphates are sorbed, though sulfate will not be sorbed as strongly.
- Sulfate will also be present in the subsoil of many Kansas soils as gypsum.

A soil test for available sulfate in the soil profile is available. For proper interpretation of this test, soil organic matter, soil texture, the crop to be grown, and the expected yield level all need to be considered. Since sulfate is mobile, sampling to a 24-inch depth is important. Accurate estimates of S needs cannot be made from a surface sample alone. However, due to the relatively high demand for S during the rapid vegetative growth phase of wheat and relatively shallow rooting by the wheat crop at this time, the S measured in the deeper subsoil by the test may not be available to wheat in the early spring, especially where soils are still cold.

Sulfur deficiency in wheat has been showing up early in the spring, shortly after green-up, before organic S is mineralized from soil organic matter, and before wheat roots can grow into the subsoil to utilize sulfate accumulated there. Deficiencies of S are often difficult to identify because the paling in crop color is not always obvious. Wheat plants lacking S also may be stunted, thin-stemmed, and spindly. In the case of wheat and other

cereal grains, maturity is delayed. Due to the slower growth and lack of good tillering, winter annual weed competition is also enhanced.

There are many S-containing fertilizer materials. Several dry materials are available that can be blended with dry phosphorus or nitrogen fertilizers for winter/spring topdressing. Some of these products are best used in preplant applications, however.

- **Elemental S** (typically 90-95 percent S) is a dry material marketed by several manufacturers. Before it becomes available for plant uptake, elemental S must first be oxidized by soil microorganisms to sulfate-S and this can be a slow process when surface-applied. As a result, this material is well suited for preplant applications only. Elemental S is not suited for corrective applications to S-deficient wheat in the spring.
- **Ammonium sulfate**, (21-0-0-24S) is a dry material that is a good source of both N and available S. It has high acid-forming potential, however, and soil pH should be monitored. Ammonium sulfate is a good source to consider for both preplant or topdressing to correct existing sulfur deficiencies.
- **Gypsum** (analysis varies) is calcium sulfate, and is commonly available in a hydrated form containing 18.6 percent S. This material is commonly available in a granulated form that can be blended with other materials. Since it is a sulfate source, it would be immediately available, and is another good source for spring topdressing.
- **New N-P-S products,** such as Microessentials, 40-Rock, and others, are ammonium phosphate materials formulated with sulfur, and in some cases micronutrients such as zinc. In most of these products the sulfur is present as a combination of elemental-S and sulfate-S.

There are also liquid sources of sulfur fertilizers available.

- **Ammonium thiosulfate**, (12-0-0-26S) is the most popular S-containing product used in the fluid fertilizer industry, as it is compatible with N solutions and other complete liquid products.
- **Potassium thiosulfate**, (0-0-25-17S) is a clear liquid product that can be mixed with other liquid fertilizers.

Liquid and dry fertilizer sources can be applied in combination with N at topdressing this spring. However, is important to consider the potential plant availability of each S fertilizer source for this wheat growing season.

For more information see K-State publication MF 2264 "*Sulfur in Kansas"* at http://www.ksre.ksu.edu/bookstore/pubs/MF2264.pdf

For estimations of required application rates of S see K-State publication MF-2586 "*Soil Test Interpretation and Fertilizer Recommendations" at* http://www.ksre.ksu.edu/bookstore/pubs/mf2586.pdf

Dorivar Ruiz Diaz, Nutrient Management Specialist, ruizdiaz@ksu.edu