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Forage Team Newsletter

UNIVERSITY OF GEORGIA EXTENSION

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Soil Health is Vital

By Savannah Tanner
Emanuel County

Masks, hand washing, social distancing, vaccines, quarantine; words that are excessively familiar this day and time. What do you think of when you hear these words? My first thought is health. You have now began checking your website because you supposedly pulled up UGA Extension's Forage Team Newsletter, but don't worry, you are in the right place. Now, I am sure you are slightly confused because forages and health are not exactly two words we use often in the same sentence. What if I told you soil health has everything to do with forage production? Would you believe me?

Oxford defines soil as "the upper layer of earth in which plants grow, a black or dark brown material typically consisting of a mixture of organic remains, clay, and rock particles." Most of us would agree with this definition but then again, most of us would agree that it is so much more than the upper layer of earth in which plants grow.

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As agriculturalists, we know that soil provides water and nutrients to the roots of a plant but sometimes we under estimate the true value of soil. Soil properties critical to forage production include soil structure, organic matter, acidity or pH, and soil nutrient levels.

Soil structure is the manner in which soil particles are arranged. This structure is primarily comprised of soil texture and what percentage of your soil is sand, silt, and clay. The structure of the soil will determine pore size and pore space, which affects the water holding capacity and drainage. It is simple really, a soil structure that has a higher percentage of sand will drain more quickly but it will also not hold water as well in a drought compared to a soil structure with more clay. While soil structure and texture remain a huge part of our soil health system, there is very little we can do in agriculture to alter and change the natural structure of a soil.

What we can change or make significant effort in improving are the measurements of organic matter, pH, and soil nutrients. Organic matter is the measure of soil that consists of decomposing plant or animal tissue. This organic matter supports soil microbes that are critical to producing and creating many of the required soil nutrients a plant needs to thrive. Other benefits of soil organic matter include supporting nitrogen-fixing bacteria used by legume's nitrogen nodule roots, increasing the ability of a soil to drain and hold moisture, and preventing some soil compaction. We can alter soil organic components by reducing tillage and soil disturbance.

Soil pH is critical to the overall health of not only our plants and forages but also the general soil health of an area. Measuring soil pH, we find that most forage crops grow best between 6.0-6.5 with some legume crops being closer to 7.0. So what happens when we do not meet these parameters of soil pH? When soils are too acidic, crop growth is reduced, aluminum becomes available resulting in aluminum toxicity in some plants. When soil pH is too high, we see similar plant growth reductions as we do when soil pH is too low. However, it is rare in Georgia that we see soil pH levels above 7.0. Decreasing soil pH is relatively easy and while increasing soil pH is a little more difficult, it can be done.

Like organic matter and soil pH, farmers can alter the soil nutrient profile to beneficially impact forage health and growth. Soil provides roughly 13 plant required nutrients. Those nutrients are categories into three components: macronutrients, secondary nutrients, and micronutrients. Macronutrients include nitrogen, phosphorus, and potassium. Secondary nutrients are calcium, magnesium, and sulfur. The micronutrients soil provides to a plant include boron, copper, manganese, zinc, iron, molybdenum, and chlorine.

While we know that soil organic matter, acidity, and nutrient content can be changed, we need to ask two questions. 1. How do we know how much of either component we have in our soil? and 2. What do we do when we know those levels? Both answers require a simple answer. Contact your local county extension agent. Okay, so not quite the most in-depth answer, however each county extension agent will give you this answer, “let’s send off a soil sample.” A soil sample for a hay field should be collected every year and a pasture sample should be sent off every 2-3 years. To take a soil sample you should collect 8-10 core samples from no more than 15 acres to mix into one sample. It is important you label the soil bag from your extension office with all of the correct information. In addition to completely filling out the soil bag, it is important you know where each sample is taken on your farm. This sample will tell you a variety of information including macronutrients levels, secondary nutrient levels, soil pH, and recommendations on how much and when to apply nutrients or lime to your soil. Using these recommendations, you along with your county extension agent can make plans to increase the soil health on your farm to ensure the best starting point for your forages and crop production.

While most of us are tired of the current buzzwords like health, we can think about health outside of the box to ensure that not only do we remain healthy and work on our health, but we do not forget about the health of our soil, forage, and animals health.

Testing for Nitrates in Your Forages

By Lucy Ray
Morgan County

It seems like every summer I get calls from hay producers and cattlemen worried that a lack of timely rain or over-fertilization will cause their forage to be high in nitrates. Every winter I get calls from producers with dead cattle or late term abortions, that are worried that the hay they are feeding is the cause of these issues. So what are nitrates? Why are they dangerous? And what can we do about them?

Anything that is stressful for the plant, and delays growth, can cause an increase in nitrates.

Nearly all forages contain some level of nitrates. When feeds containing nitrates are consumed by ruminants, the nitrates are converted to nitrites and finally to ammonia by microbes in the rumen. Nitrites is one of the intermediate products in the breakdown of nitrate to ammonia and is what causes poisoning in livestock. Nitrite, when it enters the bloodstream, changes hemoglobin to methemoglobin. Hemoglobin carries oxygen from lungs to the rest of the body. Methemoglobin is not able to carry oxygen. Therefore, if enough methemoglobin is produced, the animal effectively smothers due to lack of oxygen. One of the tell-tale symptoms of nitrate poisoning is chocolate-colored blood, due to the lack of hemoglobin. Other signs are rapid breathing, muscle tremors, incoordination, diarrhea, frequent urination, abortion and death. Interestingly enough, ruminant animals are the ones severely affected by high nitrates in forages. Non-ruminant herbivores, like horses, have a digestive system that handles increased nitrate levels much better than their ruminant counterparts.

So what causes high nitrates in forages? Several management and weather factors play into this. Since plants use nitrate for growth, young plants take up nitrates and utilize them fairly quickly. As plant growth slows, the plant continues to take up nitrates but does not convert it to protein as readily. This can cause a buildup of nitrates in the plant. Periods of drought or prolonged bouts of cloudy weather are often associated with slowed plant growth and the accumulation of nitrates. Plants take up nitrogen quickly after a drought ending rain in an effort to grow, also. So expect nitrates to be high for approximately a week after the pasture or hayfield has gotten adequate rainfall. Anything that is stressful for the plant, and delays growth, can cause an increase in nitrates. Some herbicide applications can also increase nitrate accumulations.

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Some forage species are more commonly associated with accumulation of nitrates. Particularly, sorghum and sudangrasses store high amounts of nitrates. Millet can have the same issues if cut at the wrong time. Certain weeds, like pigweed, and lambsquarter are typically high in nitrates during normal growing conditions, and can quickly accumulate dangerous levels under stressful conditions. Large applications of nitrogen fertilizer, followed by insufficient rainfall, are one of the most common causes of high nitrates in hay production. Ensiling tends to reduce the nitrate content of forages, but it is not a magic bullet. Forages high in nitrate can lose from 40-60 percent of their nitrate content during fermentation. Keep in mind that fermentation normally takes at least 3 weeks.

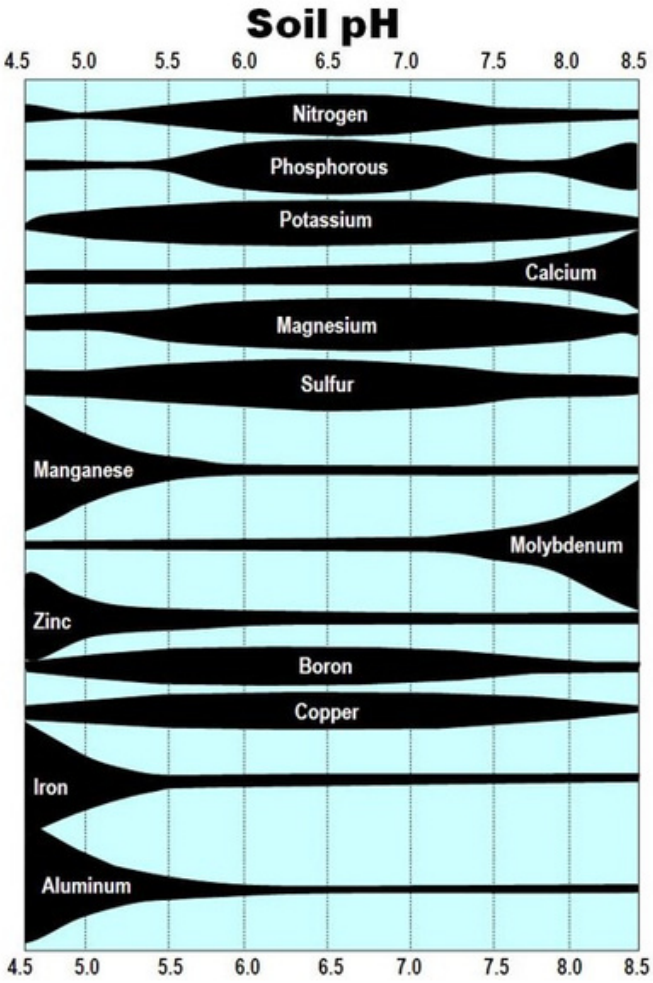
As a producer, what can you do to manage high nitrates in your forage? One of the easiest, is to split the nitrogen applications on pastures and hayfields. It is more beneficial from a nitrate standpoint, as well as a financial standpoint. Weather is not a factor that we can control. But we can be smart about putting out nitrogen in front of a rain, or using irrigation if it's available. Is a forage that can accumulate nitrates is the right fit for your operation? Test your forages! If you are worried about high nitrate levels, call your County Agent for a forage sample. I can promise that the cost of the test is less than a dead cow. If you do end up with higher than ideal nitrate levels, dilute that high nitrate forage with one with an acceptable level. For example, if feeding hay, put out both low and high nitrate forage in order to diffuse the effects. Don't strip graze high nitrate pastures.

Don't turn hungry animals into high nitrate pastures or feed hungry animals high nitrate hay. This ensures that they won't gorge themselves on something that is harmful to them. Also, in some instances, if cattle can adjust

to feeds that have potentially toxic levels of nitrates, they will develop a population of microbes in the rumen that convert nitrates to a non-toxic form. Don't graze suspected high nitrate pastures for about a week after a killing frost.

So what are high levels of nitrates? Typically, we advise folks to start being careful at levels above 4500ppm. 4500-6500 ppm can be safe under must conditions, but if feeding pregnant animals, it should be limited to half of the ration. 6500-9000 ppm should be limited to one half of the ration, regardless of the class of animal. If your forage has over 9000 ppm of nitrates, contact your county agent to discuss your feeding situation. There is some evidence that horses can tolerate up to 10,000 ppm nitrate concentrations easily. Also, be aware that not every lab reports nitrates in the same manner. For example, the Clemson University Forage Lab measure units of nitrate-nitrogen and the University of Georgia Forage Lab measures nitrates. To convert nitrate-nitrogen to nitrates, multiple the nitrate nitrogen by 4.426. So if looking at reports from different labs, make sure to compare apples to apples.

Nitrate toxicity in any type of livestock can be frightening. But with a little effort and planning, it doesn't have to be an issue on your operation.



Strategically Fertilizing Forages

By Jeremy Kichler
Colquitt County

Fertilization can be a significant portion of the cost of producing forages. According to UGA production budgets, fertilization can range from 30 to 60% of the total variable cost of producing various forages. So, taking a little time to strategically plan your fertilization program can hopefully save you money in the end. Steps that you can take include soil sampling, application timing, and rate.

Take a soil sample…. One of the basic steps in determining a fertilization program is taking a soil sample. Soil samples give producers a strategy on applying enough fertilizer and or lime to maximize yields. Soil pH is a key factor to maintain root development and nutrient availability.

The table above illustrates the relationship between soil pH and the availability of plant nutrients in soils. For example, if soil pH drops below 6.0, nitrogen, phosphorus, and potash become less available. A wider bar in the table indicates an increased availability of the nutrient. If the soil pH drops below 5.4 then aluminum and manganese can be toxic to some crops. On the other hand, nutrients such as iron, manganese, zinc, and others become less available if the pH is too high. If soil pH needs to be adjusted higher then it is advised to apply the lime a few months ahead of planting.

Nutrient	Amt. Used Annually (lbs/acre)	Unit Price ($/lb)	Dec. in Efficiency*	Value of Decrease ($/acre)
N	200	$0.60	35%	-$42
P_2O_5	50	$0.30	50%	-$ 8
K_2O	150	$0.67	10%	-$10
			Total	**-$60**

* Resulting from the lower soil pH.

This table represents a comparison of the annual value of decreased fertilizer efficiency in a soil where the pH is 5.6 relative to a soil with a pH of 6.2. It contains the amount of nutrients used annually in a forage crop and the percent of decreased efficiency of N-Nitrogen, P-Phosphorus, and K-Potassium. Can low soil pH cost a producer money? Yes! In this example, the 5.6 pH costs the grower about $60 per acre.

Soil test recommendations…. County Extension agents get questions all the time about soil sample results. A question that I receive from forage growers from time to time is “Will this fertilizer application make me any money?”

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According to the UGA Soil Test Handbook, the pounds per acre of phosphorus and potassium extracted from the soil are index values. They do not represent the actual amount of phosphorus and potash that is available to the plant. Soil sample results will place the index levels in low, medium, high, and very high categories. A low level means that a yield response would be expected 80% of the time from a phosphorus or potash application. A medium-level would indicate a 50% probability of yield response from an application. A high level would indicate a low probability of a yield response usually less than 10% of the time.

Fertilizer application timing…. When your soil sample comes back, it gives information about how much and when to apply fertilizer during the growing season based on the crop you are growing. The timing of fertilizer applications can influence yield. For example, hybrid bermudagrass can utilize 200 to 400 lbs of nitrogen per year based on yield goals. Growers need to split the nitrogen during the production year. A good strategy would be applying 75 to 100 lbs of nitrogen per acre when spring growth begins and 75 to 100 lbs after each harvest. If you assume 4 harvests, 200 lbs of nitrogen per acre should produce 4 to 5 tons of hay per acre. If you increase to 400 lbs of nitrogen per acre a yield goal of 7 to 8 tons is reasonable. This would depend on the yield environment.

Growers might consider splitting the potash applications on bermudagrass. Consider one half in the spring and the other half of the recommendation after the second or third cutting. This would reduce the change of winter injury, increase disease resistance, and might improve the stand. All the phosphate can be applied in the spring or at the time the potash is applied.

If you have questions about soil sampling, forage production, or other topics in agriculture please contact your local county Extension agent.

Stands of tall fescue that have persisted for any length of time have a very high probability of being infected with the toxin–producing fungal endophyte.

Successful Tall Fescue Conversion - Part 1

By Roger Gates
Whitfield County

In the Piedmont and northern Georgia, UGA Extension recommends planting tall fescue between September 1 and October 15. So, why discuss planting in March? In areas where tall fescue is adapted, conversion of toxic Kentucky-31 pastures and hayfields to a non-toxic, novel endophyte variety represents one of the most financially beneficial decisions available to livestock producers. Research, over many years and locations, has documented that consumption of tall fescue forage containing toxic compounds reduces both reproduction and growth. For cattle producers that means a reduced calving rate and lighter calves. “Fescue cattle” are likely to be discounted when marketed, further reducing the revenue from fewer pounds available for sale.

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Contemplating the removal of an existing stand that has been productive and persistent is not trivial. When the conversion is being considered, experts suggest the first step should be confirming that toxins are indeed a problem. Stands of tall fescue that have persisted for any length of time have a very high probability of being infected with the toxin-producing fungal endophyte. However, being certain of the toxicity level is a relatively low-cost investment to be certain before a costlier investment in seed and temporary loss of forage is pursued.

There are no visual clues that indicate a tall fescue plant is producing compounds toxic to livestock. A laboratory test must be used. Reliable assay results depend on careful and representative sampling. In Georgia, the Agrinostics, Ltd. lab, operated by retired UGA professor, Dr. Nick Hill, is a dependable source of instruction about sampling procedures as well as analytical results. University labs in Kentucky and Missouri also analyze samples for the presence of tall fescue toxins, ergot alkaloids.

If a detrimental level of toxin production is established a single term may summarize the requirement for "prior planning:" SEEDS. Plans must account for both old seeds and new seeds.

Research has demonstrated that two applications of herbicide are the most effective means to removing an existing stand of toxic tall fescue. Proper glyphosate application will effectively eliminate tall fescue vegetation. It will not prevent the establishment of toxic plants from "carry over" seed. Preventing the production of seed from the existing stand is essential to establishing a new stand of uniformly non-toxic plants.

Production of toxic seed can be managed by clipping seed heads before they mature viable seed or use of a growth-regulating herbicide, Chaparral, which if properly applied, will prevent seedhead development. Because seed head development is extensive, more than one clipping is likely to be necessary to eliminate the production of viable toxic seeds. A plan which deals with "old" seed is critical to successful conversion.

Planning for "new" seed requires selection of an adapted variety and ensuring proper handling before planting. Several excellent novel endophyte varieties are currently available. It's important to distinguish novel endophyte from endophyte-free varieties. The same compounds produced by the seed-borne fungus which are toxic to livestock are responsible for the success of tall fescue when environmental conditions are hostile. Endophyte-infected Kentucky-31 is persistent because of tolerance to insect and disease pests as well as drought. Research has clearly shown that removing the endophyte leads to a plant that will not persist and provide a dependable source of forage. Discovery of endophytes which produced an array of compounds which conferred persistence without livestock toxicity led to the development of varieties which are classified as "novel endophyte."

Infection is usually considered undesirable. In the case of tall fescue, ensuring the infection of seed with the novel endophyte is essential for stand persistence. A collaboration of university and public organizations with several seed companies has established The Alliance for Grassland Renewal. In addition to educational and promotional efforts, the Alliance supervises quality control aspects of novel endophyte tall fescue seed. Seed companies have voluntarily agreed to submit seed samples for testing. Seed packages displaying the Alliance label ensure that the seed is infected with a viable, non-toxic novel endophyte.

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Selection of one or more novel endophyte varieties should be made in time to ensure seed availability from a supplier of choice. Also, the plan should include the provision of alternatives if dry conditions in late summer suggest that fall planting is unwarranted. Suppliers and seed companies may offer to accept returned seed for credit if planting is prevented. Those arrangements should be made at the time of purchase with clear information about required conditions.

A final seed decision depends on the procedure selected to accomplish the conversion. Two approaches have proven to be effective in eliminating existing stands and encouraging the establishment from novel endophyte seed. Described as "spray-smother-spray," one procedure requires the establishment of a summer annual forage crop following a late spring glyphosate application. This procedure has the advantage of producing a desirable summer forage that complements the cool-season production of tall fescue. Selection of seed for a summer annual, such as pearl millet or sorghum-sudangrass, should also be made sooner rather than later.

The alternative approach to conversion is termed "spray-wait-spray." A late summer glyphosate application reduces the exiting toxic tall fescue stand and a second application at planting time ensures the elimination of any escapes from the initial application. This approach depends on summer production from the existing toxic stand but has the advantage of delaying a planting decision. If late summer conditions indicate moisture status is unlikely to support good establishment from a fall planting, it may be wise to delay conversion for a year.

Timely decisions are always important in forage and livestock production. More decisions associated with actual planting procedures will be discussed in a Part II segment.

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