Issue 773

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eUpdate

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These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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1. Considerations for fall applications of anhydrous ammonia

Soils across most of Kansas are now cool enough to allow producers to apply anhydrous ammonia for their 2020 corn crop (Figure 1). This practice has some appeal to producers. For one thing, fall fertilizer application spreads out the workload so there's more time to focus on corn planting in the spring. Secondly, wet conditions in the spring sometimes prevents producers from applying lower-cost anhydrous ammonia ahead of corn planting, and forces them to apply more expensive sources after planting. Equally important for many producers have been issues with anhydrous ammonia availability at times in the spring.

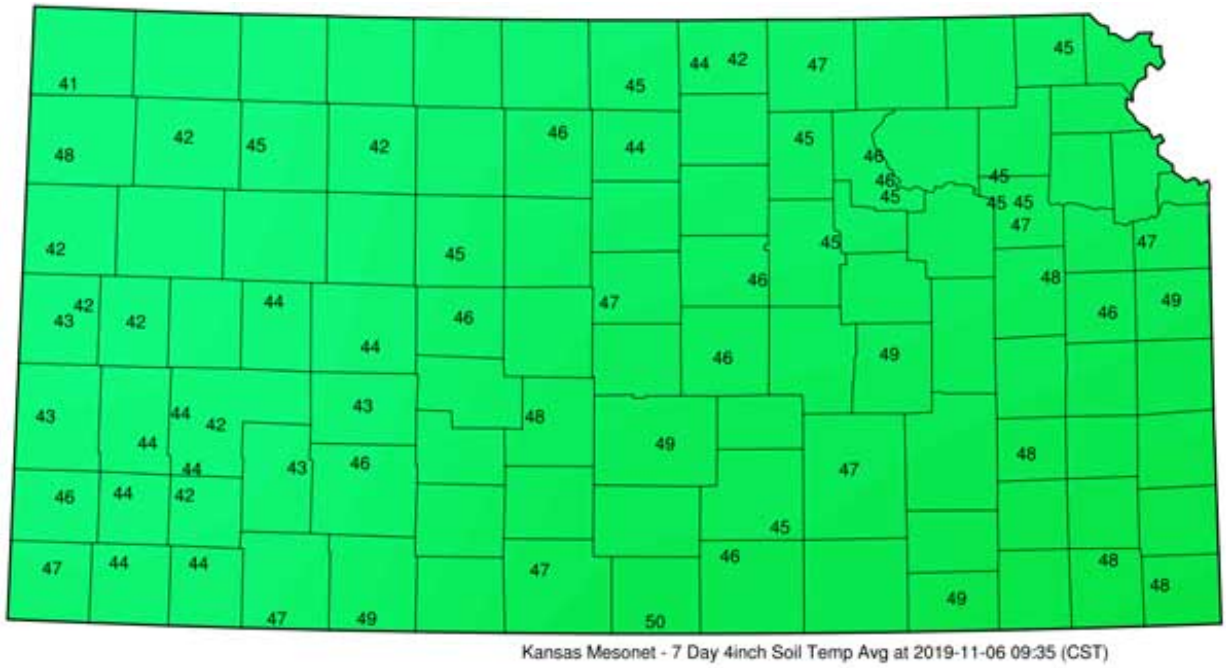

Figure 1. Weekly average 4-inch soil temperatures for the period of Oct. 31 – Nov. 6, 2019. Soil temperatures in individual fields in any given area will vary with differences in vegetative cover, soil texture, soil moisture, and other factors. (Kansas Mesonet)

Despite those advantages, producers should be aware that there is potential for higher nitrogen (N) loss in the spring following a fall application, as a result of nitrification of the ammonium during late winter and very early spring and subsequent leaching, or denitrification**.**

Reactions of anhydrous ammonia in the soil

When anhydrous ammonia is applied to the soil, a large portion of the ammonia is converted to ammonium (NH_4^+), and can be bound to clay and organic matter particles within the soil. As long as the nitrogen remains in the ammonium form, it can be retained on the clay and organic matter, and does not readily move in most soils except sandy soils with very low CEC, so leaching is not an issue.

At soil temperatures above freezing, nitrification occurs - ammonium is converted by specific soil microbes into nitrate-N (NO_3^-). Since this is a microbial reaction, it is very strongly influenced by soil temperatures. The higher the temperature, the quicker the conversion will occur. Depending on soil temperature, pH, and moisture content, it can take 2-3 months or longer to convert all the ammonia applied in late summer/early fall to nitrate.

By delaying application until cold weather, most of the applied N can enter the winter as ammonium, and over-winter losses of the applied N will be minimal.

Traditionally, producers should wait until soil temperatures are less than 50 degrees F at a depth of 4 inches before applying ammonia in the fall or early winter. Nitrification does not cease below 50 degrees F, but rather soils will likely become cold enough to limit the nitrification process. In many areas of Kansas, soils may stay warmer than 50 degrees well into late-fall and only freeze for short periods during the winter.

The use of a nitrification inhibitor such as N-Serve can help reduce N losses from fall N applications under specific conditions, particularly during periods when soil temperatures warm back up for a period after application.

One should also consider soil physical properties when considering fall application. Fall applications of N for corn should not be made on sandy soils prone to leaching, particularly those over shallow, unprotected aquifers. Rather, fall N applications should focus on deep, medium- to heavy-textured soils where water movement through the profile is slower.

When is N lost?

When considering fall application of N, keep in mind that loss of N during the fall and winter is not normally a problem in Kansas. The conversion of "protected" ammonium to "loss prone" nitrate during the fall and winter can be minimized by waiting to make applications until soils have cooled, and by using products such as nitrification inhibitors. The fact that essentially all the N may remain in the soil as ammonium all winter, coupled with our dry winters, means minimal N is likely to be lost over winter.

However, soils often warm up early in the spring and allow nitrification to get started well before corn planting. Generally, if the wheat is greening up, nitrification has begun! Thus, one of the potential downsides of fall application is that nitrification can begin in late February and March, and essentially be complete before the corn crop takes up much N in late May and June.

Summary

The bottom line is this: If anhydrous ammonia is to be applied in the fall, there are a number of factors that must be considered, including soil texture, temperature, and soil moisture. Consider the following guidelines:

- Do not apply anhydrous ammonia in the fall on sandy soils.
- On silt loam or heavier-textured soils, wait to apply anhydrous ammonia until soil temperatures at the 4-inch depth are below 50 degrees F (records indicate in most years this will be in November).
- Use a nitrification inhibitor such as N-Serve with anhydrous ammonia to help reduce fall

nitrification rates.

- To check the soil temperature in your area visit the K-State Research and Extension Weather Data Library at: http://mesonet.k-state.edu/agriculture/soiltemp/

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The five-year average of corn acres harvested reported by NASS leads to an estimate of approximately 5.5 million acres of corn and 200,000 tons of residue produced annually in Kansas. In addition, 2.8 million acres of grain sorghum and 70,000 tons of residue were produced. While not all acres are suitable for grazing, this represents a tremendous resource for the state. Residue yield and nutrient contents are dependent on grain yield, fertility, harvest date, and conditions at harvest. Nutrient content of residues is additionally impacted by duration and timing of grazing initiation.

Figure 1. Cattle grazing crop residue. Photo submitted by Sandy Johnson, K-State Research and Extension.

The amount of grain left in the field has been reduced considerably compared to historical levels through varietal and harvest equipment improvements. However, weather conditions can result in significant ear drop or plant lodging. Before grazing, scout fields to look for piles of grain on the ground and determine if there is over 8-10 bushels of grain on the ground. If so, management steps should be taken to remove these piles prior to turning out cattle on the residue. Directions to estimate ear drop and head drop can be found here. While sorghum grain is always processed prior to feeding to crack its tough shell coat, cattle can still founder on downed grain sorghum heads.

Nutritive value of corn and sorghum residues

A nutritional evaluation of grazed Kansas corn and sorghum crop residues was conducted with the help of numerous producers and county agents across the state. Table 1 summarizes values from that survey.

Table 1. Range of crude protein (CP), acid detergent fiber (ADF; higher values reflect lower digestibility), neutral detergent fiber (NDF; higher values reflect animal intake), and total digestible nutrients (TDN) in corn and sorghum residue from Kansas samples.

	Leaves				Stem			
	CP	**ADF**	**NDF**	**TDN**	**CP**	**ADF**	**NDF**	**TDN**
Corn Nov.	4.6 – 6.0	46.7 – 48.2	75.6 - 81	51- 52	3.3 - 4.4	55.9 – 60.6	79.0 – 79.7	41 - 45
Corn Dec.	4.9 – 5.7	48.4 – 53.5	75.2 - 77.3	47 - 51	3.9 - 4.6	55.3 – 59.1	78.7 – 80.3	42 - 45
Sorghum	8.3 – 11.7	40.3 – 46.1	58.5 – 65.7	53 - 57	5.3 - 4.9	46.3 – 50.4	66.2 -73.5	49 - 52

A more detailed look at plant components indicate any grain available would have the highest CP content followed by the leaves. The cob has the lowest protein and energy value. The stalk and husks have similar crude protein content, but more energy is available from the husks than the stalks due to the lower lignin content. In general, leaves from sorghum residue have higher CP content than corn leaves. The stalks of corn and sorghum are similar in CP, but digestibility is somewhat higher in sorghum than corn. More details on nutrient concentrations of crop residues can be viewed in this UNL publication.

Duration of grazing

To ensure adequate residue remains on the field after grazing, we can use animal weight and grain yield to determine the amount of grazing available. Cattle will readily remove approximately 15% of the residue (leaves and husk), but can be forced to remove more if desired. The goal should be to leave at least ½ of the total amount of residue on the field.

If an irrigated corn yield is 180 bu/acre, a rule of thumb is to divide by 3.5 to get grazing days for a 1200-pound cow. In this case, 180 bu/acre corn residue should provide approximately 51 days of grazing (180/3.5 = 51) for a 1200 lb cow. The harvest index (grain production/total biomass) is similar for both corn and grain sorghum (1.6%). So an 85 bus/acre dryland sorghum divided by 3.5, would provide approximately 24 days of grazing (85/3.5 = 24). A lactating cow or a heavier cow will consume more dry matter and the days of grazing would be adjusted downward. A spreadsheet is available to calculate stocking rate based on animal body weight and grain yield.

Selective grazing

Cattle will selectively graze the crop residue, eating the highest quality portions first, grain then leaves and husks. Depending on the stalking rate, amount of grain available, and nutrient demands of the cows, no energy or protein supplementation may be needed early in the grazing period for dry cows with a body condition score of 5 or more and grazing as described above. Weathering and trampling will decrease quality over time and this loss is greater with moisture and high humidity.

Soil compaction considerations

Cattle will cause soil compaction in paths leading to and around a water source. These compacted areas will only be surface compaction in the top 2-inches of soil. These compacted areas can be remedied by shallow tillage or spreading manure on the trafficked area if no-till is used. Results on soil compaction from grazing have shown mixed results. A study near Bushland, TX found surface compaction in a no-till system reduced crop yield after several years of grazing. While grazing studies from Nebraska found no increase in compaction and increased crop yield. Studies from western Kansas found compaction to only occur in the top two inches when grazing occurred on wet soils and shallow tillage removed any compaction. Compaction will be less on frozen, dry, sandy soils. It is best to remove cattle from the field to a nearby perennial pasture if the field is wet and not frozen. Also, the producer should be open to using shallow tillage should compaction occur.

Nutrient removal from grazing

Another common concern about grazing residue is nutrient removal. Nutrient removal will vary by the type of animal, with a growing calf requiring more nitrogen than a mature dry cow. Dry cows will typically be used to graze residue, which will remove between 1 and 2 lbs of N per acre (depending on crop yield) and few other nutrients. Crop residue is low in phosphorus (P); thus producers will likely supply a free-choice mineral, resulting in an increase in the amount of P and calcium left in the field. Wind will blow leaves and husks blow off fields, but manure remains in place.

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3. Ag-Climate Update for October 2019

The Ag-Climate Update is a joint effort between our climate and extension specialists. Every month the update includes a brief summary of that month, agronomic impacts, relevant maps and graphs, 1-month temperature and precipitation outlooks, monthly extremes, and notable highlights.

October 2019 – Rapid onset of winter!

The first winter weather advisories of the season ushered out October when widespread snow accompanied by strong winds hit the state on October 29 and 30. Temperatures were the big story. State-wide average temperature for the month was roughly 51 ^{o}F, 4.8 ^{o}F cooler than normal. This ranks as the 6th coolest on record. Temperature swings were great, ranging from 2 ^{o}F at Tribune 1W on October 31 to 98 ^{o}F at Atwood, Decatur County, on October 1.

Figure 1. Snow on the ground in Scott City, Kansas. Photo by Mary Knapp, K-State Research and Extension.

Both winter wheat GDD accumulation and precipitation percentiles at the initial stages were around their lower bounds for all four planting zones due to lower tempeatures in October in Kansas. The top soil moisture conditions were relatively wetter in eastern Kansas but obviously dryer in western Kansas. While wheat planting progress was similar to the long-term average (~90% planted by the

end of October), many fields have not yet emerged either due to dry topsoil,late planting (when following soybeans), or cold temperatures.

View the entire October 2019 Ag-Climate Summary, including the accompanying maps and graphics, at http://climate.k-state.edu/ag/updates/.

4. Dallas Peterson, Professor and Extension Weed Science Specialist, retires after 30 years at K-State

The Department of Agronomy and the College of Agriculture recognize Dallas Peterson for 30 years of professional service to Kansas State University and K-State Research and Extension. Dallas served his last official day in the department on October 31, 2019. People from all sectors of his life (family, colleagues, ag agents, industry representatives, students, and friends) attended a retirement reception hosted by the department on October 30 at the North Agronomy Farm.

Dallas grew up on a small diversified crop and livestock farm in north central Kansas, and received his B.S. and M.S. degrees in Agronomy from Kansas State University. He completed his Ph.D. degree in Weed Science at North Dakota State University and worked as an Assistant Professor and Extension Weed Specialist in North Dakota from 1987 to 1989.

Dallas returned to Kansas State University in 1989 when he started as an Assistant Professor and

Extension Weed Specialist, advancing to full professor in 1998. As a Specialist, he developed educational programs and conducted applied research on weed management in soybeans, small grains, alfalfa, and specialty crops. His extension program had a strong farmer and dealer focus, including participation in many public meetings, field days and demonstrations at which he has made approximately 1500 presentations to more than 70,000 participants during his extension career. He is author or co-author of 60 refereed journal articles, hundreds of Extension publications, research reports, meeting abstracts, and newsletter and popular press articles. His educational programs often included information generated from an applied research program that is focused on local issues, such as herbicide resistance, new weed control technologies, and application technology.

Dr. Peterson was an active member of the Weed Science Society of America, the North Central Weed Science Society, the Western Society of Weed Science, and the Council on Agricultural Science and Technology. He has served on numerous committees and in various capacities, including the Board of Directors for WSSA and NCWSS, Board of Representatives for CAST, and the Presidential leadership sequences for both WSSA and NCWSS. He also has served on the Kansas Certified Crop Advisors board of directors and worked in an advisory role with the Kansas Department of Agriculture and the Kansas Noxious Weed Programs on herbicide registrations and weed management programs.

Dallas supervised 10 graduate students and served on numerous graduate committees. He helped coach the KSU weeds teams to several high finishes at the summer student contest. Dallas has been previously recognized with the Outstanding Extension Award from WSSA, Fellow Award from WSSA and NCWSS, the Horizon Early-Career and Mid-Career Awards from the Kansas chapter of Epsilon Sigma Phi, and the Excellence in Extension Award from Gamma Sigma Delta at Kansas State University.

When colleagues and students, both former and current, speak about Dallas's career, several qualities are repeated over and over.

- "His knowledge of weed science is vast and he relates to producers on their level."
- "He is well-respected in all sectors of agriculture (industry, university, and the farming community)."
- "Dallas is one of the most respected Extension Specialist's K-State has ever had. He was usually the highlight of any extension program he was involved with."
- "Dallas has a knack for delivering a take-home message that is backed by research and his years of experience in the field."
- "I am a better agronomist and weed scientist because of the time Dallas has spent teaching me."
- "Dallas is a great ambassador for K-State Research and Extension and his impact will be felt for years to come."

His friends and colleagues extend this token of appreciation to Dallas for his service to the Department of Agronomy, the College of Agriculture, K-State Research and Extension, and Kansas State University.

5. Kansas Insect Survey - Producer input requested

The Department of Entomology at Kansas State University needs your help!

Do you farm? Do you want to help our K-State Bug Lady get BETTER pest information to you? Do you have 6-8 minutes to help the pollinators of Kansas? If you answered "yes" to those questions, please take our brief survey here: Farmer Insect Pest Decision Survey.

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