

# Pest & Crop newsletter

**Purdue Cooperative Extension Service and USDA-NIFA Extension IPM Grant**

This work is supported in part by Extension Implementation Grant 2017-70006-27140/ IND011460G4-1013877 from the USDA National Institute of Food and Agriculture

## In This Issue

- [Keep In Mind Soil Test K And pH Are Affected By Low Soil Moisture](#)
- [Dry Weather Continues And Is Expected To Continue](#)

## Keep In Mind Soil Test K And pH Are Affected By Low Soil Moisture

(Jim Camberato)

### SUMMARY

Sample to the proper depth and retain the whole soil core to get a representative soil sample.

Sampling fields that have been dry since the crop reached maturity may have low soil test potassium (K) levels because K still remains in the crop residues and/or low soil moisture caused 2:1 clays to trap some of the potentially available K in soils that are adequate or higher in K.

Soil pH may also be lower than expected if low soil moisture limited the reaction of limestone applied in the spring.

Soil pH determined in water may also be lower than expected if more than the usual amounts of fertilizer salts remain in the sample. Some laboratories avoid this issue by determining soil pH in a salt solution, rather than water, and convert the results to a 'salt-free' water pH. Check with the laboratory to determine which method they use to decide whether soil pH was likely affected by the dry soil conditions.

### INTRODUCTION

The accurate analysis of representative soil samples to determine lime and fertilizer needs is fundamental to crop production. Dry soils are hard soils, so be sure to sample the full 8" depth, otherwise soil test results will be higher than actual values. The opposite will occur if surface soil is lost from the sample core. When soils are excessively dry it is more difficult to keep the entire core in the probe with the surface soil likely to fall out of the probe. In most soils the highest pH and nutrient values are in the upper inches of soil, so if this soil does not make it into the sampling bucket soil test values will be lower than actual values.

Unfortunately, even if soil sampling is accurate persistent dry weather resulting in prolonged periods of low soil moisture can affect soil test potassium (K) and pH, resulting in misleading soil test values. Dry weather soil tests can still be useful if one understands the potential impact of low soil moisture on soil test K and pH and uses this knowledge to adjust the interpretation of soil test results.

### SOIL TEST POTASSIUM

Typically soil test K levels are lower than expected in a dry fall. One factor contributing to low soil test K is more than half of the K taken up by the crop during the growing season remains in the residue and has not been returned to the soil by rainfall. Soybean and corn tissues at harvest contain about 80 pounds  $K_2O$  per acre at grain yields of 60 and 200 bushels per acre, respectively (Table 1). Tissue K is returned to the soil as plant tissue decays and falls to the ground and as rainfall leaches the K out of this tissue and the standing crop. Research conducted in Iowa<sup>2</sup> showed that most of the K in soybean tissue is removed from the residues with 5-10 inches of rainfall, and only 12% of the original K content remained after 20 inches of rainfall (an amount typical of an Indiana fall and winter). In contrast, K removal from corn residues was much slower and less complete - 10 to 15 inches of rainfall were needed to remove approximately 50% of the original tissue K content, and 31% of the K in corn tissue at physiological maturity still remained in the tissue after 20 inches of rainfall. In the Iowa study every 10 pounds of  $K_2O$  per acre returned to the soil increased soil test 4 parts per million (8 pounds per acre). Therefore, the difference in soil test K in a dry fall could be approximately 32 parts per million (64 pounds per acre) if all the tissue K at maturity remained in the residues of 60 and 200 bushel per acre soybean and corn crops.

**Table 1. Approximate potassium ( $K_2O$ ) content of soybean and corn grain and tissue at maturity<sup>1</sup>.**

	Soybean	Soybean (60 bu/a)	Corn	Corn (200 bu/a)
Crop	lb $K_2O$ /bu	lb $K_2O$ /a	lb $K_2O$ /bu	lb $K_2O$ /a
Grain	1.15	69	0.20	40
Residue	1.4	84	0.4	80

In addition to dry weather reducing the return of K in plant tissue to the soil, the availability of soil K as measured by soil test methods is also affected by low soil moisture. Most Indiana soils contain 2:1 clays that vary in soil test K with soil moisture. When field moist soil high in K is dried for analysis, soil test K decreases. In contrast, when soil testing low in K is dried, an increase in soil test K occurs. If persistent dry conditions continue prior to soil sampling, K availability will likely be overestimated in low testing soils and underestimated in high testing soils. In Indiana topsoils the change in soil test K with drying has been approximately  $\pm 15\%$  at the highest and lowest soil test K levels examined.

### SOIL pH

Low soil moisture can also affect soil pH. If soil moisture has been insufficient for normal amounts of limestone reaction in soils limed this past spring, then soil pH may be lower than expected. The limestone

remains in the soil, however, and with good winter moisture it will react and continue to increase soil pH.

Additionally, soil pH measured in water can also be affected by dry soil conditions. If higher than normal levels of fertilizer salts remain in the soil sample due to dry weather, then the pH reading may be about 0.1 to 0.5 pH units lower than the actual pH. This is an artifact of how pH is measured and occurs only if the measurement is made in water. Some soil testing laboratories avoid this problem by measuring soil pH in a salt solution and then calculate what the pH would have been if measured in water, without the influence of salt. Ask the soil testing laboratory what method they use to determine if a low pH measurement may just be an artifact of excess salts remaining in the sample or if it may actually be low.

## REFERENCES

<sup>1</sup> These publications were used to determine the values in Table 1:

Culman, S., A. Fulford, J. Camberato, and K. Steinke. Tri-State Fertilizer Recommendations for Corn, Soybean, Wheat, and Alfalfa. (2020) Bulletin 974.

<https://ag.purdue.edu/agry/soilfertility/Documents/Tri-State%20Fertilizer%20Recommendations.pdf>

Mallarino, A.P., J.E. Sawyer, and S.K. Barnhart. 2013. A General Guide for Crop Nutrient and Limestone Recommendations in Iowa. Iowa State Univ. Extension and Outreach. PM 1688, Revised October 2013.

Bender, R.R., J.W. Haegele, M.L. Ruffo, and F.E. Below. 2013. Nutrient Uptake, Partitioning, and Remobilization in Modern, Transgenic Insect-Protected Maize Hybrids. *Agronomy Journal* 105:161-170.

Bender, R.R., J.W. Haegele, and F.E. Below. 2015. Nutrient Uptake, Partitioning, and Remobilization in Modern Soybean Varieties. *Agronomy Journal* 107:563-573.

Ciampitti, I.A., and T.J. Vyn. 2014. Nitrogen Use Efficiency for Old versus Modern Corn Hybrids. *Better Crops* 98(4):19-21.

<sup>2</sup> A.P. Mallarino and R.R. Oltmans. 2014. Potassium Management, Soil Testing and Crop Response. North Central Extension-Industry Soil Fertility Conference. 2014. 30:45-52.

Climate Division Data by State between Two Dates  
From Midwestern Regional Climate Center

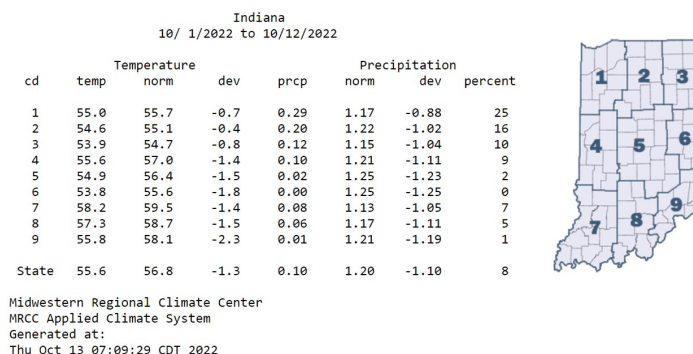


Figure 1: Indiana temperatures, normal temperatures, temperature deviations, precipitation, normal precipitation, precipitation deviations, and percent of normal precipitation by climate division for October 1-12, 2022.

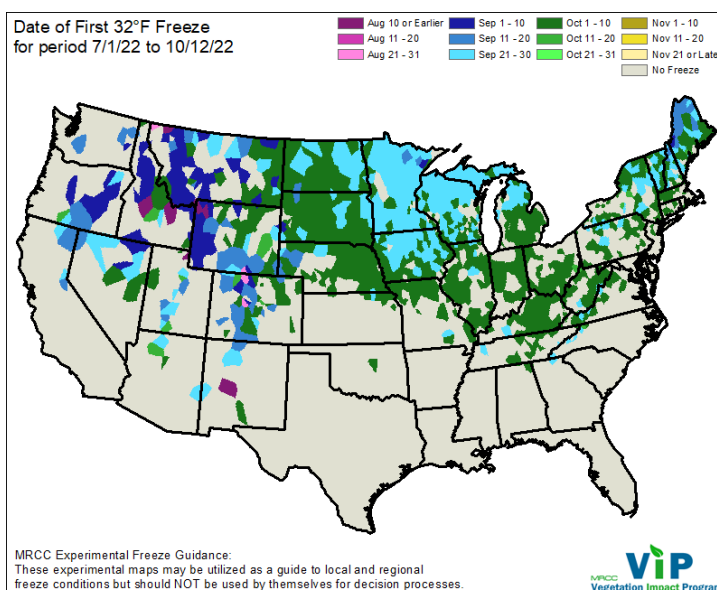
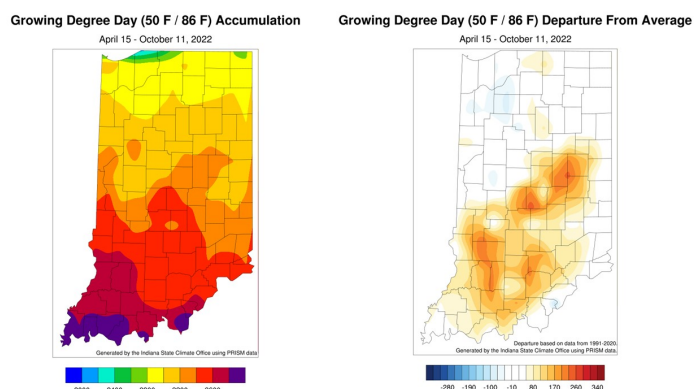


Figure 2: The Midwestern Regional Climate Center's Vegetation Impact Program (VIP) map displaying the date of first 32°F for the United States.

## Dry Weather Continues And Is Expected To Continue

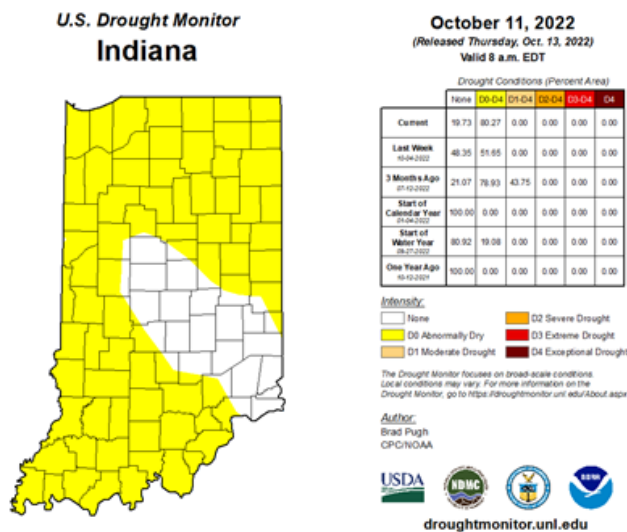
(Austin Pearson)

Fall has brought cooler weather through the first twelve days of October. The entire state has run below normal with an average temperature of 55.6°F, which was 1.3°F below normal (Figure 1). Central and southern Indiana's temperatures ranged from 1.4-2.3°F below normal and northern Indiana was a little closer to normal with temperatures ranging from 0.4-0.8°F below normal. Many areas in central and northern Indiana saw the first 32°F temperature with frost, which was about a week earlier than the average first freeze date (Figure 2). Randolph County measured a low temperature of 27°F on October 6 and almost a week later, Jasper County recorded a low temperature of 27°F on October 11. These temperatures were about two to three weeks earlier than average. It was definitely cold enough to light the fire place! Modified Growing Degree Days were still above normal for most of central and southern Indiana (Figure 3), as most locations exceeded 3,000 MGDDs since April 15.



Monitor has over 80 percent of the state in abnormally dry (D0) conditions (Figure 4). Red Flag Warnings have been issued for a large portion of the state, which means that the risk of wildfires is high. The primary factors contributing to this are the lack of rainfall, strong winds, and low relative humidity. The dry weather has helped harvest, but the NASS Crop Weather report indicated that the corn harvested for grain and soybeans harvested were slightly behind the five-year average (Figure 5). The dry weather certainly helps with harvest progress and should benefit from the forecasted dry conditions.

Figure 4: October 11, 2022 US Drought Monitor.



Crop Progress: Week Ending 10/09/22				
Crop/Activity	Percent Completed			
	This week	Last week	Last year	5 Year average
Days Suitable for Fieldwork.....	6.8	6.7	NA	NA
Corn Mature .....	84	67	93	85
Corn Harvested for Grain .....	27	16	35	30
Corn Harvested for Silage .....	96	90	97	98
Soybeans Dropping Leaves .....	91	82	94	89
Soybeans Harvested .....	36	17	37	38
Winter Wheat Planted .....	27	11	32	33
Winter Wheat Emerged.....	5	3	11	9
Alfalfa Hay 4th Cutting .....	81	73	88	79
Other Hay 3rd Cutting.....	87	82	95	95
Other Hay 4th Cutting.....	37	29	60	NA

Figure 5: Crop Progress ending 10/09/2022, obtained from the USDA NASS Crop Weather Report.

Most of the state does not have precipitation forecasted through October 20th, and the Climate Prediction Center outlooks highlight elevated chances for below-normal temperatures. These outlooks indicate higher chances for above-normal temperatures toward the latter part of the month. Dry conditions are expected to continue through the end of October.

It is the policy of the Purdue University that all persons have equal opportunity and access to its educational programs, services, activities, and facilities without regard to race, religion, color, sex, age, national origin or ancestry, marital status, parental status, sexual orientation, disability or status as a veteran. Purdue is an Affirmative Action Institution. This material may be available in alternative formats. 1-888-EXT-INFO Disclaimer: Reference to products in this publication is not intended to be an endorsement to the exclusion of others which may have similar uses. Any person using products listed in this publication assumes full responsibility for their use in accordance with current directions of the manufacturer.

Pest&Crop newsletter © Purdue University - [extension.entm.purdue.edu/newsletters/pestandcrop](https://extension.entm.purdue.edu/newsletters/pestandcrop)  
Editor: Tammy Luck | Department of Entomology, Purdue University, 901 W. State St., West Lafayette, IN 47907