Corn & Soybean News

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Martin-Gatton College of Agriculture, Food and Environment | Grain and Forage Center of Excellence

Triple Super Phosphate (TSP, 0-46-0): A Good Source of P Nutrition

Dr. John Grove, UK Extension Soil Specialist

Triple super phosphate (TSP, typically 0-46-0) is reemerging as a dry fertilizer P source. This calcium phosphate material was widely used post WWII, until the early 1970's, when technology for monoammonium and diammonium phosphate (MAP, typically 11-52-0; and DAP, typically 18-46-0; respectively) manufacture was widely adopted (Englestad, 1985). The half century of MAP/DAP dominance means that TSP is no longer familiar to growers, and this has resulted in several questions.

These phosphate fertilizers all readily dissolve in moist soil as shown below:

$TSP = Ca(H_2PO_4)_2 >> Ca^{2+} + 2H_2PO_4^-$

$MAP = NH_4H_2PO_4 >> NH_4^+ + H_2PO_4^-$

$DAP = (NH_4)_2HPO_4 >> 2NH_4^+ + HPO_4^{2-}$

With fertilizer granule dissolution, different soil chemical reactions do occur, depending on the fertilizer material. The initial pH near the dissolving TSP or MAP granule is acid, between 1.5 and 3.5, because the $H_2PO_4^-$ ion is itself a moderately strong acid. The low pH may increase the solubility of certain micronutrients (copper, iron, manganese, and zinc). Near a dissolving DAP granule, the pH is much higher, around 8.5, because the HPO_4^{2-} ion is a moderately good base. The higher pH may have the opposite impact on micronutrient solubility. The higher pH with DAP may also cause some temporary ammonia (NH_3) release. The initial soil pH condition around the position of granule dissolution lasts from a few days to a few weeks, depending on the soil buffer capacity. The volume of soil influenced by these initial pH conditions is small – the larger impact is the significant soil acidity from the biological nitrification of the ammonium (NH_4^+) ion in MAP and DAP.

Is the P from TSP as soluble/plant available as that from the ammonium phosphates? The short answer is 'yes'. This answer does depend a bit on bulk soil pH, with TSP and MAP a bit better when the pH is 6.0 and above. In-furrow DAP rates greater than 15 to 20 lb N/acre (need to consider crop species, row width, soil pH, soil texture, application rate) can cause ammonia injury to seeds/seedlings

in high pH/calcareous soils. Differences in P source availability to plants are small compared with differences caused by other P management practices, especially placement (Havlin et al., 2014).

One question I've had is whether the calcium in TSP is a "problem". An application of 100 lb TSP per acre delivers 46 lb P_2O_5 and 13 lb Ca per acre. Against background extractable soil Ca levels between 2000 and 6000 lb per acre, additions of calcium phosphate fertilizer cause negligible increases in soil Ca levels. These Ca additions will not interfere with potassium (K) and magnesium (Mg) nutrition.

What about rate, placement and timing of TSP, relative to the ammonium phosphates? Given that P availability is equal, rates are based simply on the P_2O_5 content of the TSP, which can range from 44 to 52%, but is typically 46%. Placement, whether surface, surface-incorporated, or banded, will deliver P nutrition equivalent to the ammonium phosphates.

Are there differences in the timing of TSP and the ammonium phosphates? Not in terms of P nutrition to the crop, though soil differences in P fixation/clay mineralogy and soil pH may drive some subtle short-term P fixation differences. Considering seasonal decision-making, MAP or DAP might be favored over TSP for fall applications to winter barley, canola, wheat and rye, as well as the cool season grasses (fescue, orchard grass) – crops that can use the fall applied N. Fall application of TSP might be favored for next spring's crop of corn and soybean, where fall applied N from MAP or DAP is more likely to be lost/less efficient. In the spring, I'd favor TSP over MAP or DAP for direct application ahead of full-season soybean (which doesn't need the N in MAP/DAP). Corn can benefit from a synergism between the ammoniacal N and phosphate often occurring after spring applied DAP or MAP.

In summary, TSP management is about the same as that for DAP, MAP and other similar fertilizer materials (e.g. MES, etc.), though there are situations where one or the other might be favored. TSP is indeed a good source of P nutrition.

References:

Englestad, O.P. (ed.). 1985. Fertilizer Technology and Use, 3rd ed.. Soil Sci. Soc. Am. Madison, WI.

Havlin, J.L., S.L. Tisdale, W.L. Nelson and J.D. Beaton. 2014. Soil Fertility and Fertilizers, 8th ed. Pearson, Inc. Saddle River, NJ.

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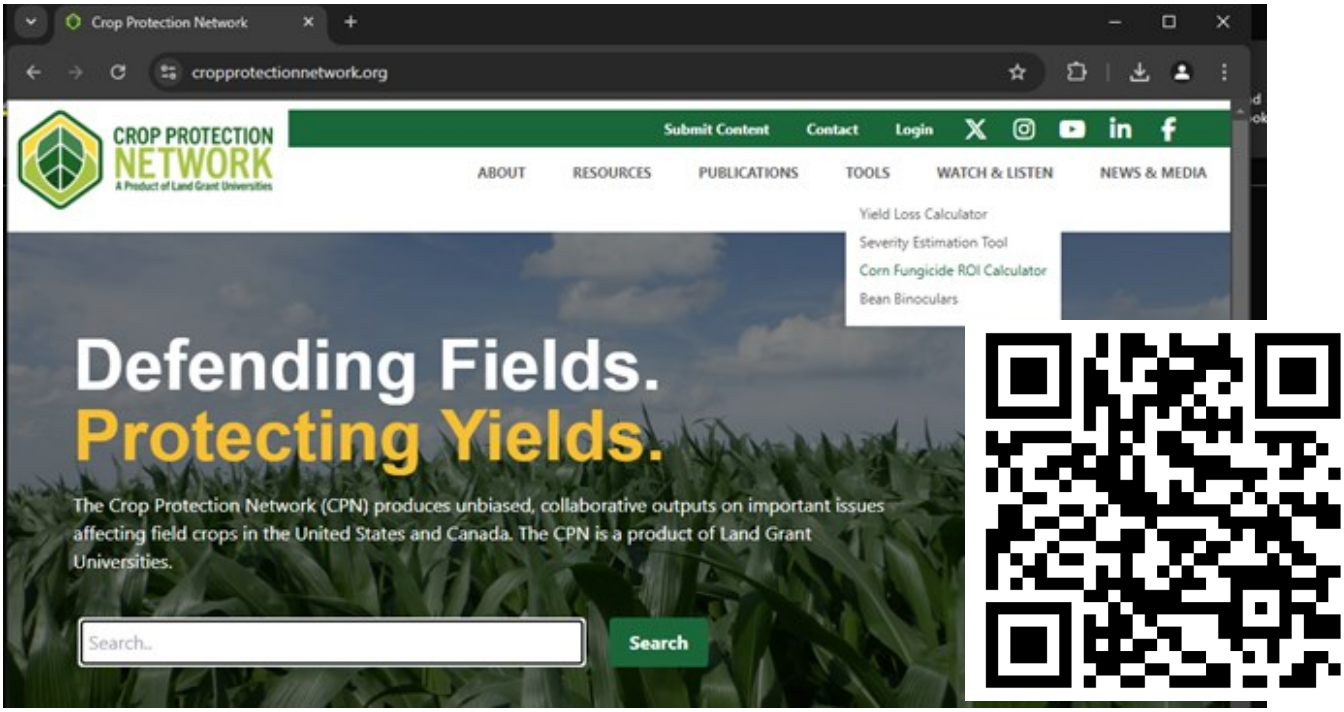
A New Tool to Help with Corn Fungicide Decisions in 2025

Dr. Kiersten Wise, Extension Plant Pathology

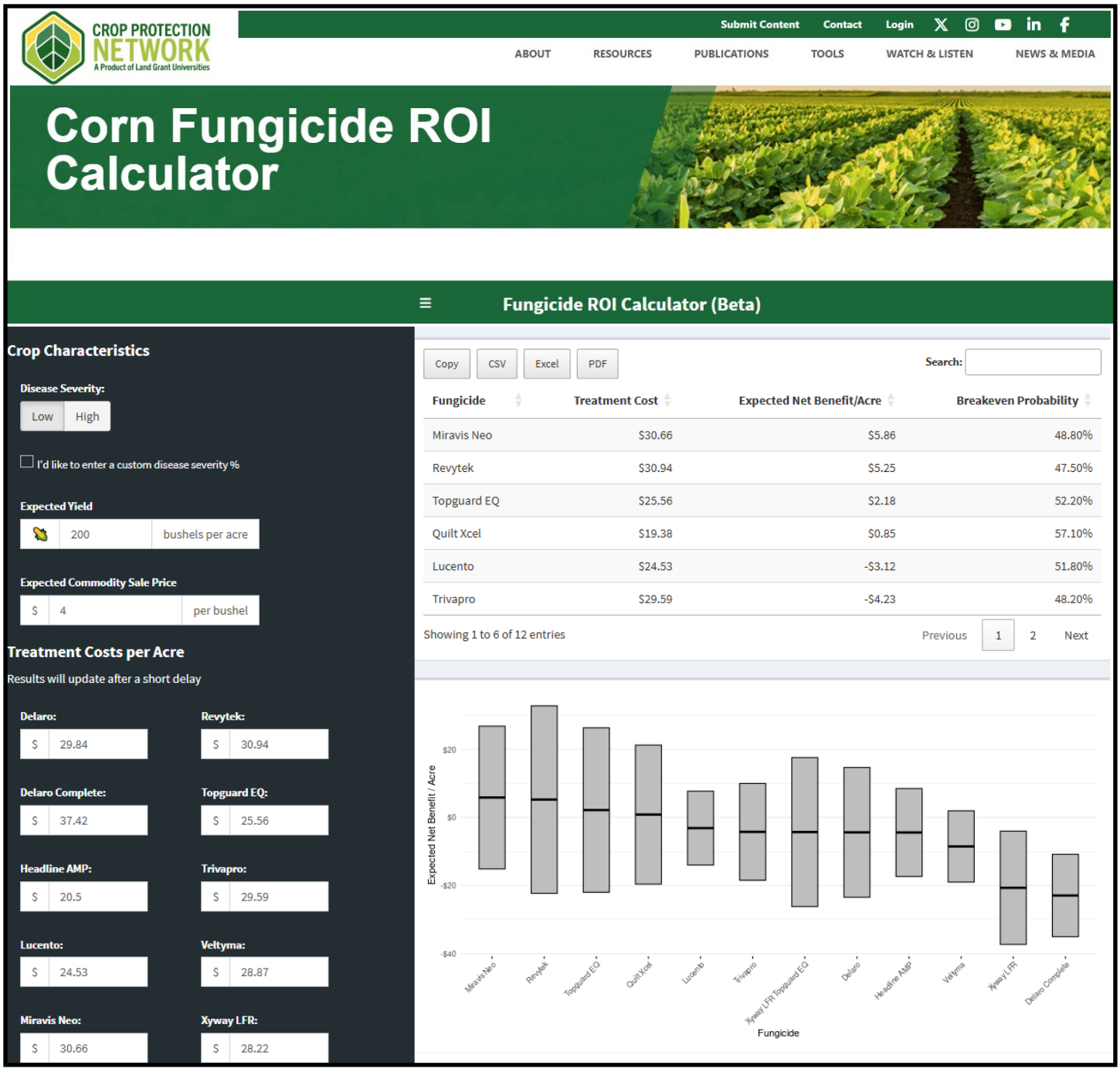
Farmers and other stakeholders have a new resource to help them make fungicide input decisions in corn. The interactive Corn Fungicide ROI Calculator is available through the Crop Protection Network website, https://cropprotectionnetwork.org/fungicide-roi-calculator. This calculator uses multiple years of University corn fungicide datasets from across 19 U.S. states and Ontario Canada to help predict the probability of a positive return on investment (ROI) for a range of fungicide products and economic scenarios in corn.



The tool, built in collaboration with the Crop Protection Network and the University of Wisconsin-Madison Data Science Institute, has over 1,100 data points and multiple Kentucky trials incorporated into the data set used for analysis. Southern rust and tar spot were prominent diseases in many of the trials included in the data set, which also increases the relevancy to Kentucky farmers, as these are diseases that can be economically important in Kentucky.

The tool can be customized to reflect the user's expected yield, contracted or expected corn pricing, and actual fungicide costs from retailers or industry representatives. These customized numbers are used to calculate real estimates of ROI and the breakeven probability of specific products and expected yields, based on robust fungicide data sets. Results are based on a single fungicide application that occurs at tasseling/silking (VT/R1). The calculator will be updated annually with additional University data sets, improving its prediction accuracy and relevance over a broad geography. For questions on the calculator, contact Kiersten Wise, Extension Plant Pathologist at Kiersten.wise@uky.edu.

Figure 2. Example ROI calculated for an expected yield of 200 bushels per acre and an expected commodity sale price of $4/bushel at a range of default fungicide prices.



Optional Citation: Wise K. 2024. A New Tool to Help with Corn Fungicide Decisions in 2025. *Corn & Soybean News, Vol 6, Issue 12.* University of Kentucky, December 13, 2024.

Dr. Kiersten Wise
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Kentucky Crop Health Conference

Take the lead against pest management issues with a supercharged agriculture conference designed to get you on the right track before the spring planting season shifts into high gear.

Tickets are now available for the Kentucky Crop Health Conference scheduled from 9 a.m. to 3 p.m., Thursday, **Feb. 6, 2025**, at the National Corvette Museum's conference center in Bowling Green, Ky. Sign-in will begin at 8 a.m. CST and breakfast and lunch will be included.

This unique conference celebrates its third year at the corvette museum and offers guidance on integrated pest management through University of Kentucky extension specialists as well as extension specialists from across the United States. Guest speakers for 2025 include Alyssa Essman from Ohio State University; Justin McMechan from the University of Nebraska-Lincoln; and Wade Webster from North Dakota State University. They will join University of Kentucky Extension Specialists Travis Legleiter, Carl Bradley, Kiersten Wise and Raul Villanueva for in-depth and enhanced discussions in the disciplines of weed science, plant pathology, and entomology.

"The Kentucky Crop Health Conference provides top-tier pest management insights, empowering agronomic professionals and farmers in Kentucky to make data-driven pest management decisions in corn, soybean, and wheat. Our distinguished speakers share valuable pest management strategies from across the United States, inspiring innovative approaches for our professionals here in Kentucky," said Dr. Travis Legleiter, University of Kentucky Associate Extension Professor - Weed Science.

For conference tickets, visit https://kchc2025.eventbrite.com. Tickets sales close on Jan. 30, 2025, and refunds will not be issued after that date.

Educational credits will be available. Certified Crop Advisors will receive 4.5 CEUs in IPM. Kentucky pesticide applicators will receive 3 CEUs for Category 1A (Agricultural Plant) and 1 CEU for Category 10 (Demonstration and Research). Tennessee pesticide applicator credits are pending.

For more information on the Kentucky Crop Health Conference contact (859) 562-2569 or email jason.travis@uky.edu.

2025 WINTER WHEAT MEETING

February 4, 2025

Bruce Convention Center
Hopkinsville, KY 42240

9am-3pm central

Registration 8:30 ct

CCA and Pesticide Credits pending.

What are We Learning From YEN in KY? - Phil Needham

Herbicide Residual Application Timing for Ryegrass Control - Dr. Travis Legleiter

On-farm Grain Fumigation Options - Josh Wilhelm

Dealing with DON: Management of Fusarium Head Blight and DON in Wheat - Dr. Carl Bradley

How Nitrogen and Sulfur Fertility Influences Wheat Grain Yield and Protein Content - Dr. Edwin Ritchey

Current Wheat Crop Update - Dr. Chad Lee

Wheat Varieties Tolerance to Metribuzin and Opportunities to Improve Italian Ryegrass Management - Dr. Samuel Revolinski

Overview of Kentucky Wheat Yield Contest 2015-2024 - Dr. Mohammad Shamim

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KENTUCKY Small Grain GROWERS' ASSOCIATION

Cooperative Extension Service

Agriculture and Natural Resources
Family and Consumer Sciences
4-H Youth Development
Community and Economic Development

MARTIN-GATTON COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT

Italian Ryegrass Control Field Tour

SAVE THE DATE:

Thursday, March 27, 2025

9 a.m. to 11:30 a.m.

Please meet at the Caldwell County Extension Office

1025 U.S. Highway 62 West, Princeton, KY

Sign-in begins at 8:30 a.m. CDT

A caravan will proceed to the UKREC in Princeton for plot tours of Italian ryegrass research.

Presented by Dr. Travis Legleiter, UK Extension Associate Professor - Weed Science, this field tour will highlight the options available to Kentucky farmers for maximum control of this problematic weed in the fall and spring prior to corn and soybean planting. For more information about the field tour call (859) 562-2569.

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UPCOMING EVENTS

2025

Kentucky Commodity all Crop Protection Webinar Series
January 16, 2025

Winter Wheat Meeting
February 4, 2025

2025 Kentucky Crop Health Conference
February 6, 2025

Wheat Field Day
May 13, 2025

Pest Management Field Day
June 26, 2025

Corn, Soybean & Tobacco Field Day
July 22 or July 29, 2025

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