**NCERA 103** Specialized Soil Amendments and Products, Growth Stimulants and Soil Fertility Management Programs

Virtual Meeting: November 19, 2020

Present:

Carl Rosen (Administrator) – University of Minnesota

Edwin Lentz (Chair) – The Ohio State University

Bijesh Maharjan (Secretary) – University of Nebraska-Lincoln

Peter Scharf – University of Missouri

Matt Ruark – University of Wisconsin-Madison

Kurt Steinke – Michigan State University

John Sawyer – Iowa State University

Jim Camberato – Purdue University

Jason Clark – South Dakota State University

Emerson Nafziger – University of Illinois

Edwin Ritchey – University of Kentucky

Dorivar Ruiz Diaz – Kansas State University

David Franzen – North Dakota State University

Dan Kaiser – University of Minnesota

Administrator Report

* Carl Rosen gave the administrative report.
* Renewal due in 2 years
* In the department heads meeting in January 2020, favorable comments were received on this working group.

Rotation update

* Bijesh Maharjan (UNL) chair, Dorivar Ruiz Diaz (KSU) secretary, 2019-2020

State reports

* Given by each member. Detailed written reports are included below. The state reports constitute most of the meeting time which involve recaps of current product trials, identification of new products on the market and their potential effectiveness, and extension publications and programming in the area of non-conventional products.

Previous business

* Compendium website
  + There were 3 reports added since the last meeting. Discussion took place around moving the Compendium away from Iowa server. A few contacts will be made for potential server and upkeep service.

New business

* Big emphasis was given to continue and improve the compendium. It is the biggest impacting factor of the group. Given the retirement of John Sawyer and changes in IA policy on server usage, it is imperative to find a new home for the compendium. Bijesh will check with PAQ if they will be interested in the project. Peter will check with DTN and Emerson with U of Illinois. If necessary, all members can contribute towards maintenance fee or, we may have to reach out to NIMSS for fund.
* Discussion on biostimulants/biologicals
  + We ought to keep generating field trial data and enrich the Compendium database for producers use.
  + Dan will put a report on ProveN.
  + Have presentations on this topic at North Central meeting in 2021.

**Publication**

Dave Franzen et al., Effectiveness of using low rate of plant nutrients. (added to the Compendium)

Dan will work on P biological products. Others are asked to contribute to it.

**Adjourn**

**State reports**

**Emerson Nafziger**

**University of Illinois**

*List of new products this year that you've come across, with short description of what they are and any potential concerns you may have.*

A local Nutrien retail outlet sold most (or all?) of their dry P and K in the fall of 2020 impregnated with 2 pt/ton of the Loveland product Titan XC. Customers were told that they could use 10% less fertilizer due to having this product applied. Titan XC lists “microbes” as the active ingredient, and according to the label has 1 x 103 cfus per mL of *Bacillus licheniformis*, which is found in most soils. At the labeled rate and 200 lb dry fertilizer per acre, this would apply less than 100,000 cfus per acre, a tiny number. The concern is this tiny number of microbes and the fact that using 10% less P/K fertilizer would produce no measureable effect. Commercial preparations of microbes to add to soil continue to appear, most claiming effects that are unprovable.

*What products are people asking about (current or new products) and if there specific questions asked about a product.*

The nitrification inhibitor Centuro from Koch is gaining market share with retailers due to its being noncorrosive and able to be added to other N forms besides anhydrous ammonia.

Numerous microbe-containing products such as the one described above, including several purported to fix some amount of the N required by corn, continue to appear on the market, from both startup companies and, increasingly, from major retailers. The expected “do these really work?” question for such products is difficult to address. We do know that microbial activity in productive soils is already high, and it makes sense that adding tiny numbers of “novel” microbes to the microbial mix would be unlikely to produce a measurable effect. “Demonstration” designs commonly used in company-directed “testing” of such products are typically incapable of showing any “effect” besides that of random variability.

Accomplishments:

Working on an upgrade of the database and also the website for the N rate calculator

1. Reports submitted to the compendium: None
2. Presentations given: Several that contained some of the data generated in our N timing/form trials. These included speaking at the Illinois Fertilizer and Chemical Association annual meeting, at four regional UI Extension Crop Management Conferences, and at several other meetings in Illinois.
3. Reports (proceeding papers, industry reports, etc.): Made a presentation at the 2020 North Central Extension-Industry Soil Fertility Conference (virtual) in November 2020, on the paper listed below.
4. Peer-reviewed publications:

Preza-Fontes G, Nafziger ED, Christianson LE, Pittelkow CM. 2020. Relationship of in-season soil nitrogen concentration with corn yield and potential nitrogen losses. Soil Sci. Soc. Am. J. 2020; 84:1296–1306. https://doi.org/10.1002/saj2.20117

1. Grants (non-gifts): none to report.

Impact Statement:

With the wet fall and late-planted crops in 2019, fall N applications prior to the 2020 corn crop were less than normal. Spring weather was better than in 2020, but there were wet periods and delayed planting, which contributed to challenges in nutrient (mostly nitrogen) management again in 2020. Our information on N timing was again used to help manage N. Our ongoing work with IFCA in on-farm N rate trials continued in 2020, and results will be used to update the MRTN/N rate calculator. The value of the Compendium and other information about how non-traditional products perform is a valuable counter to the flood of marketing information on such products, but at least in the short run, large expenditures to promote such products seem to be winning the “contest.”

**John Sawyer**

**University: Iowa State University**

List of new products this year that you've come across, with short description of what they are and any potential concerns you may have.

*See below.*

What products are people asking about (current or new products) and if there specific questions asked about a product.

*I did not keep a listing of specific products this year. Several non-traditional products, microbials, and various nitrification inhibitor products. Efficacy is a continued question.*

*Also, questions about N fixation in corn, like N-Fix/Envita (Azotic Technologies), PROVEN by Pivot Bio, and corn that oozes slime at nodes and harbors N fixing microbes. Question of course is; do they work and why would they increase yield (as promoted) but not reduce N fertilization. Research is underway (2019-2020) at Iowa State University (researchers in Agronomy) with PROVEN, and some field strip trials by the ISU FARM program. The 2019 ISU FARM strip trials did not find any yield advantage. Other research data not yet available for that product. Our study on use of Instinct with liquid swine manure was recently published in SSSAJ. The 2020 crop year was the final year for a drainage study looking at the effect of Centuro on nitrate-N loss and crop yield. No report is yet available for that project.*

*The compendium web site continues to be housed at Iowa State University, Department of Agronomy. However, support is limited. The department will be going to a cloud based server approach. The compendium site may need to move and/or be reconfigured.*

Impact Statements:

The compendium web site (Compendium of Research Reports on Use of Non-Traditional Materials for Crop Production, <http://extension.agron.iastate.edu/compendium/index.aspx>) has 251 research reports, with three new reports added since the last committee meeting. Clientele use of the site stopped in December 2018. There should be committee discussion about the future of the compendium web site and support.

**Edwin Ritchey**

**University of Kentucky**

*General Comments:*

We received the most questions regarding biological products in Kentucky for 2020. We also receive questions about fertility products that likely have little to no benefit, like foliar macronutrient fertilizers, liquid “lime” (liquid calcium), starter fertilizers with micronutrient packages that probably aren’t providing any benefit. I can’t tell if there are more of these products being pushed or if I just hear about the new ones.

Specific products questioned are reported below with website and claims or marketing angles.

<https://piksidust.com/> (You’ve already tried Snake Oil and Foo Foo Juice, why not give PiKSi Dust a try?)

[https://www.sound-ag.com/products/source/](https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.sound-ag.com%2Fproducts%2Fsource%2F&data=02%7C01%7Cedwin.ritchey%40uky.edu%7Cb8210b4103854d6acd7408d859a2c446%7C2b30530b69b64457b818481cb53d42ae%7C0%7C0%7C637357902894880691&sdata=c08grAtXU3r9eDKB%2Bxgkn6TTd5Gfweu4fA5v%2BrLRioE%3D&reserved=0) (“Sounds like Magic.  Works like Science.“)

<https://biovante.com/project/biored/> (BioRed, BioCore, BioMate, Micro-X

Envita <https://www.azotic-na.com/science-behind-envita/> (N-fixing bacteria for corn, soybean, wheat)

Agri-Cal / Agritec (Bioactivated Liquid Calcium) <https://www.agritecint.com/liquidcalciumlime>

Agroliquid: e.g. Pro-germinator ([Liquid Fertilizer | Agriculture & Farm Fertilizer | AgroLiquid](https://www.agroliquid.com/)) I have three site years of data, should have 5 next year and will provide to the committee

Loveland products: e.g. Titan XC ([Titan XC | Loveland Products - Dry Fertilizer (cropfertility.com)](https://cropfertility.com/titan-xc/)

Wind River Microbes (<https://www.windrivermicrobes.com/collections/farmer>) Our tobacco specialist will put out a trial next year. Mark Coyne, UK microbiologists summarized his thoughts as: *“Using this material is unlikely to do harm, but is unlikely to have a sufficient beneficial effect in an otherwise healthy soil. What they say about the microbes is generically true, but the specific ones in their mix don’t come to mind as benefitting those functions. To stimulate microbial growth – add more organic matter.”*

*Accomplishments:*

I use and refer agents to the compendium website for questions regarding product questions – very helpful resource. The producers and agents that get this information often will not utilize most products with negative reviews. We wrote a blog article on agri-cal in 2016 ([Grain Crops Update: Buyer beware when it comes to “alternatives” to ag lime](https://graincrops.blogspot.com/2015/04/buyer-beware-when-it-comes-to_8.html)). They changed their website based on the article. No-Till Farmer wrote an article this year: ([Liquid Calcium Study Shows Little pH Effect | No-Till Farmer (no-tillfarmer.com)](https://www.no-tillfarmer.com/articles/9286-liquid-calcium-study-shows-little-ph-effect?v=preview). Although we still hear about it, the agents are steering producers away from these products.

**Peter Scharf**

**University of Missouri**

I heard from a farmer that Pivot Bio was advertising heavily on radio in Missouri this spring and he thought we should test it.

I had an inquiry from a person who was considering working for Concept Agri-Tek. I had never heard of them but they are located in southeast Missouri. Their website shows four categories of products: 1) seed treatment, 2) foliar, 3) planting, 4) full-season. I looked at one of their seed treatments which contained N-fixing bacteria, P-mineralizing bacteria, root stimulant, and microbial food source.

Their best product name is Buncha Bugs.

In an inquiry originating from Europe about level of biologicals use in U.S. agriculture, I ended up in contact with the Bayer SeedGrowth Technical Manager who told me that 100% of their corn now gets biological seed treatment for “fertility benefits and mycorrhizae stimulation and…nematode control.” That was a big surprise to me.

I recently received a text from a farmer asking about using Homestretch MaintaiN (from Meristem Crop Performance) or FunctioN in his anhydrous ammonia. Again products and companies I had never heard of. I was unable to track down the source of FunctioN. He sent a label for Homestretch MaintaiN and it is a bunch of different polymers I had not heard of and a little ammonium thiosulfate.

In 2019, I conducted a first-year test for AgXplore to test the effect of their NZone Max product on corn yield and on nitrate concentration in drainage water. Active ingredients are two long-chain polymers and aminoethylpiperazine. N source was preplant injected UAN with and without NZone Max at 120 and 160 lb N/acre rates, along with an unfertilized control treatment. Soils were generally wet April through July. Averaged over the two N rates, yield was 16 bushels/acre higher with NZone Max than without. This result was significant with 95% confidence. Whole-plant N at V5 and ear leaf N at VT were not different for any of the fertilized treatments. Nitrate concentration in drainage water was similarly not different for any of the fertilized treatments. Ammonium concentration in drainage water was lower for the 160 lb N rate with NZone Max than the same rate without NZone Max, but ammonium concentration was much lower than nitrate concentration. Soil nitrate and ammonium values during the growing season were low and not significantly different between any of the fertilized treatments.

This test was repeated again in 2020 but neither yield nor soil or drainage nitrate results are analyzed at this date.

**Dan Kaiser**

**University of Minnesota**

Exact sales of products are not tracked in Minnesota. Over the last year I have received more questions related to biological products. In 2019 I started a nitrogen rate trial testing ProveN at two locations. The ProveN testing continued into 2020. In 2019 there was no yield increase to ProveN at the two locations. There was a significant yield response to ProveN at one location in 2020 while there was no yield response at the second 2020 location. The exact reason for the 2020 response is not clear but I am hoping to repeat research with the product at the same responsive 2020 location.

I also had two sugarbeet locations testing two biologicals, BioRed and BioMate which are sold by Biovante and consiste of beneficial bacterial along with sugar. I also tested a product called Tidal Grow which I purchased on Amazon.com and is a chitosan product. Neither trial exhibited a yield increase to either of the products.

The only other research I was able to start in 2020 was an evaluation of the leaching potential of ortho-ortho EDDHA chelates in three soils. This chelate is contained in several 6% Fe EDDHA iron sources sold for the correction of iron chlorosis and is also being sold by West Central Inc and CHS as a fertilizer additive for in-furrow and foliar placement called Levesol. I also am working with CHS to test a new product called Trivar. I have spoken to a few companies about phosphorus enhancers so there may be a few products coming in the near future.

My outreach work was limited due to COVID travel restrictions. In 2020 I did give a presentation on biologicals at the Minnesota Nutrient Management Conference on February 4. In this presentation I advertised the online compendium of products. I did not generate any extension or peer reviewed publications on specialty fertilizer products in 2020.

**Kurt Steinke**

**Michigan State University**

COVID-related measures limited my program’s capacity to conduct field research in 2020. Despite all of the restrictions, inquiries regarding products and amendments was up slightly from 2019. Tissue testing inappropriately continues to drive or guide which nutrient(s) to apply to cropping systems. Sulfur related products saw increased marketing across field cropping systems. These products ranged from alternative S sources to changes in co-granulated particle sizes to multiple S sources. Biologicals continue to increase in discussion, and inquiries into utilizing biologicals to improve soil health increased. Many unsubstantiated claims on biologicals or growth promoting fertilizers intended to “balance” the microbiome and improve plant nutrition.

SymTRX20S (16-1-0-20S) and SymTRX12S (16-20-0-12S) are two N, P, S replacement products that were tested on S-deficient sugarbeet soils with STP below 30 ppm. The two N, P, S replacement products evaluated appear to perform similarly to other conventional products using MAP as a base in co-granulated fertilizers or AMS. One of these products is now being marketed as Susterra.

Micronized sulfur products including MAP-MST, MOP-MST, ASM-MST, UAN-MST were tested in corn and wheat. Mixed results in corn and wheat with some positive and negative significant differences.

Inquiries into alternative K sources for specialty crops including potassium nitrate increased.

Biologicals continue to increase in discussion whether applied at coatings on seed, impregnated on fertilizer, or applied directly to soil. Focused remains on improving soil health with usage. Solutions with humic and fulvic acids in combinations with biologicals discussed.

Calcium products as a means to improve grain quality or for “pH adjustments” also increased.

What products did you test in 2020?

* SymTRX20S and SymTRX12S
* MAP-MST, MOP-MST, AMS-MST, UAN-MST
* Anvol, Centuro, Tribune
* Krista K, QROP KN, Sulfate of Potash
* Humic and fulvic acid combinations and bacterial and fungal solutions

Accomplishments:

1. 2020 product trials – See above list with additional products and yield data available at [soil.msu.edu](file:///C:\Users\Kurt%20Steinke\Desktop\Michigan%20Files\Regional%20Groups%20Projects\NCERA%20103\soil.msu.edu)
2. Twelve presentations involving at least some product testing data
3. Purucker, T., and K. Steinke. 2020. Comparing nitrogen timing and sidedress placement strategies on corn growth and yield in Michigan. Crop, Forage, and Turfgrass Mgmt. Vol.6. 13pp. doi: 10.1002/cft2.20033.
4. Purucker, T., and K. Steinke. 2020. Soybean seeding rate and fertilizer effects on growth, partitioning, and yield. Agron. J. 112: 2288-2301. doi:10.1002/agj2.20208.
5. Culman, S., Fulford, A., Camberato, J., and Steinke, K. 2020. Tri-State Fertilizer Recommendations. Bulletin 974. College of Food, Agricultural, and Environmental Sciences. Columbus, OH: Ohio State University.

**Bijesh Maharjan**

**University of Nebraska-Lincoln**

*General Comments:*

Like anywhere else, there is a general push on biologicals. One of the companies even conducted Ag Summit although it attracted only a small number of growers.

More questions on sulfur, micronutrients, and nitrogen stabilizers.

*Accomplishments:*

Nebraska has an on-farm research program which had several on-farm trials on various products this year. Final report is being drafted and is planned to be submitted to the Compendium.

Despite of COVID-19 restrictions, there were a few plot-scale field evaluation of a number of products: Neptunion - drought tolerant products from the Plant Response, AgConcept Products; AgZyme and SuperHume, P solubilizing biological products from Wilber Ellis.

There is a Nebraska Department of Ag funded project on use of N stabilizers in potato production. More N stabilizer projects in sugar beet and corn were continued.

*Impact Statements:*

University evaluation of biological product is generated much-need research-based data to inform growers in their decisions pertaining to non-traditional products. Particularly, on-farm trials on non-traditional products involve growers directly and therefore, provide them first-hand knowledge on products.

**Dave Franzen**

**North Dakota State University**

The use of non-effective urease and nitrification inhibitors has decreased in the state. A recent ND study provided data supporting the general recommendation that low rates of foliar fertilizer on soybean has no effect on yield. Also, use of Co on soybean did not result in protein increase, which has been alleged by some as an aid to soybean/*Bradyrhizobium* N production. Many ND farmers use ‘biologicals’ in their operation due to ubiquitous use on the seed that they purchase. Many/most seed companies include biologicals as seed treatments on their products. The vast majority of these biologicals have never been subjected to Land Grant University screening, so we have no idea if any of these are effective. The number of these biologicals available for sale are so many that there is no way to test even a small number of them. This is a general frustration.

With the help of other NCERA-103 representatives, I revised the publication ‘Use of Low Rates of Plant Nutrients’. It was released as an NDSU Extension Publication available on the web at: <https://www.ndsu.edu/fileadmin/snrs/Files/sf1978.pd.pdf>

**Edwin Lentz**

**Ohio State University**

*General Comments:*

More marketing push on biostimulants. Farmers continue to ask questions about starter fertilizers, sulfur, and micronutrients in Ohio. Big topic was on the efficacy of nitrogen stabilizers and biostimulants*.*

*Accomplishments:*

Ohio restricted university activities because of the coronavirus pandemic, thus minimal field investigated research was allowed in 2020. There were some corn and wheats plots investigating N stabilizers and biostimulants. However, results were inclusive because of abnormally dry conditions.

15 presentations were given on reducing P and N losses from fields in the Lake Erie watershed

1 national presentation was given on N management for wheat

Revised and updated publication of the Universities’ Tri-State Soil Fertility Recommendations for Corn, Soybean, and Wheat. Cooperative publication among Michigan State University, Ohio State University and Purdue University

*Impact Statements:*

Completed research on non-traditional products has assisted Ohio growers in determining the efficacy potential of these products for their production systems and assisted them in their purchasing decisions for these products.

Producers have reduced their total fertilizer rates and reduced nutrient losses from fields based on the 4R Principles by participating in one of the 15 soil fertility programs given in Ohio.

Producers have confidence in university recommendations as the new Tri-State Fertilizer Recommendations has completed and released in 2020. The Tri-State is a multistate publication from Michigan State University, Ohio State University, and Purdue University.

Producers have the most recent information on nutrient management, diagnosing nutrient deficiencies, and field methods to measure nutrient availability for corn, soybean, wheat, and forages in the updated and expanded publication: Corn, Soybean, Wheat and Forages Field Guide. This is a multi-state publication with Penn State University. Publication received the 2019 First Place Award in educational publications from the American Society of Agronomy and a 2020 National Award from the National Association of County Agriculture Agents.

**Jason Clark**

**South Dakota State University**

*General Comments:*

We continue to get questions regarding urease and nitrification inhibitors on the market along with their efficacy. An increase in the interest regarding biologicals has also occurred. Two specific products I have been asked about are Levesol and Pivot Bio.

*Accomplishments:*

Due to COVID-19 research restrictions we were not able to complete any research trials regarding specialty fertilizers and other biological fertilizers.

Ten presentations given related to soil fertility.

*Impact Statement:*

Results in the NCERA-13 compendium as well as other specialty fertilizer research has been used in extension presentations throughout South Dakota this past year. Information given in these presentations help farmers make science-based management decisions regarding soil fertilizer sources that help improve their economic return.

**Matt Ruark**

**University of Wisconsin-Madison**

List of new products this year that you've come across, with short description of what they are and any potential concerns you may have.

What products are people asking about (current or new products) and if there specific questions asked about a product.

Most of the questions I get about products are related to free-living N fixers. There’s a lot of questions and excitement about these products. They appear to have been tested in Wisconsin by an independent (non-University) entity.

Accomplishments:

1. 2020 product trials – (with short description of experimental design)
   1. All product trials were postponed until 2021
2. Reports submitted to the compendium
3. Presentations given
4. Reports (proceeding papers, industry reports, etc.)
5. Peer-reviewed publications
6. Grants (non-gifts)

Impact Statements:

The value of the NCERA 59 is in the meeting itself. This meeting provides an opportunity to get together and discuss new products and how they are being marketed. It serves to help prepare us all better in our state extension effforts.