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

Committee Minutes: November 15, 2018.

Holiday Inn, Des Moines, IA

Present:

Present:

Jim Camberato – Purdue University

Jason Clark – South Dakota State University

Dorivar Ruiz Diaz – Kansas State University

David Franzen – North Dakota State University

Dan Kaiser – University of Minnesota

Edwin Lentz (Secretary) – The Ohio State University

Bijesh Maharjan – University of Nebraska-Lincoln

Emerson Nafziger – University of Illinois

Edwin Ritchey – University of Kentucky

Matt Ruark (chair) – University of Wisconsin-Madison

John Sawyer – Iowa State University

Peter Scharf – University of Missouri

Kurt Steinke – Michigan State University

None absent

Administrator Report

* Carl Rosen gave the administrative report.

Rotation update

* Edwin Lentz (OSU) will be chair and Bijesh Maharian (UNL) will be secretary in 2019 and 2020
* Edwin Lentz (OSU) will be chair and Bijesh Maharjan (UNL) will be secretary in 2020 and 2021

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.

Old business

* Compendium website: Iowa State will update the template of the website, will add link to committee website. We are unable to track hits at this time.
* Regional publications are still a priority for this group. Dan Kaiser is still interested in leading a regional publication on P extenders.

New business

* Discussion of new methods being used to market non-conventional products.
* We will tentatively plan on November 6th as the meeting time for 2019

Adjourn

**State reports**

**Illinois – University of Illinois**

General Information:

*As a note, the product Fortalis, which was heavily promoted as an additive to foliar fungicide on soybean, was not marketed—at least visibly—in Illinois in 2018.*

*The most novel “product” I encountered in 2018 was “Bolt” (with the “l” is fashioned into a bolt of lightning). This device is fitted to a UAN injector and uses a hydraulic pump-driven alternator to generate a charge that is discharged through a pair of coulters in either side of the injection knife. This supposedly kills (stuns?) bacteria to slow nitrification. The company y is in Lafayette, Indiana, website* [*http://www.boden.ag/*](http://www.boden.ag/) *I heard that a retailer in Illinois was using this. The website gives results of a trial in “Southern Illinois” showing 7 or so more bushels from Bolt than from treatments with other (or no) inhibitors.*

*At every turn, it seems, we hear about the benefits of adding microbial preparations to seed or soils. It is not at all clear that any one such product is gaining prominence over other such products. With products like this that will almost certainly never produce visual evidence of a response, it is not clear how such products will look like good investments to producers.*

*There was a lot of activity in marketing of new (or newly renamed) products one can assume that there are a lot of these coming and going, with some likely to attract some attention.*

Accomplishments:

1. *2018 product trials:*

*a) After hearing that at least one retailer was suggesting the use of Instinct HL (microencapsulated nitrapyrin; HL means “high load”) on DAP for fall application, we tested Instinct HL on both urea and DAP, applied on November 1, 2017 at Urbana. Data consisted of extractable N (NH4+ and NO3-) measured in samples taken in the top foot of soil on November 13, March 6, and April 18. We recovered more than 80% of the applied N in the November sample, but found in the April samples only 40 and 50% of the N applied as DAP with and without Instinct HL, respectively. Net recovery of N applied as urea was only 25% without Instinct, and was significantly higher, at 54%, with Instinct. So, there was no benefit from adding Instinct HL to DAP, and it did increase the amount of N recovered form fall-applied urea, but not to levels making fall-applied urea a good management practice.*

*b) We tested the Koch Industries urease inhibitor ANVOL in two replicated studies in Illinois, comparing N rates applied as surface-broadcast urea treated with Anvol, Agrotain Advanced, or untreated. Both inhibitors were effective in increasing the amount of N available to the crop.*

*c) Our N research trials at four Illinois sites included treatments comparing corn yields with and without Agrotain, N-Serve, SuperU, and Nutrisphere added to or comprising the N source.*

1. *Several presentations given that contained some of the data generated in our N timing/form trials.*
2. *Reports written included NREC reports on inhibitor effects on corn yield and on soil N; these data were also included in my presentation (with a proceedings paper) at the North Central Soil Fertility Extension-Industry Conference in Des Moines in November 2018.*
3. *Received funding support from Koch industries for the inhibitor study. N research including inhibitor comparisons was funded by NREC (IL fertilizer checkoff.)*

Impact Statement:

*Low prices for corn and soybean persist, and many producers in Illinois got high or very high yields of these crops in 2018 without using “non-traditional” products. While this is a signal that such products don’t raise profitability, or don’t raise it by a noticeable amount, the ubiquity of marketing efforts on such products, likely fueled by their profitability to retailers, keeps these products in front of producers, and some buy them. It’s hard to tell how much impact “neutral voices” have on sale of such products, but our ongoing skepticism, resulting from data showing no visible response to such inputs, must be better than having no such information available to producers at all.*

**Indiana – Purdue University**

Accomplishment:

*Several purported biological stimulant products and a plant growth regulator product that are commercially available were examined for their effects on corn growth and development and yield for 3 years at 5 locations in Indiana. Biological products were: 1) 3 species of bacteria of the same genera, 2) 7 bacterial species of multiple genera, 3) a species of Trichoderma fungus, and 4) a bacteria/Trichoderma combination. The plant growth regulator contained 3 growth regulators. All products were applied in furrow at planting in accordance with product recommendations and all treatments including the control had starter fertilizer applied to the side and below the seed. Compared to the control; biological 1 produced a higher yield in 1 of 8 site-years, biological 2 increased yield in 1 of 11 site-years and decreased yield in 1 of 11 site-years, biological 3 had no effect in 7 site-years, and product 4 increased yield in 2 of 6 site-years while decreasing yield in 1 of 6 site-years. The plant growth regulator product increased yield in 2 of 10 site-years. Yield increases averaged over responsive and non-responsive site-years was 0.8, 0.2, 0.0, 1.6, and 1.3 bushels corn grain per acre for biologicals 1 through 4, and the plant growth regulator, respectively. This research was funded by the Indiana Corn Marketing Council. Product was provided by some of the companies, but no funding was received from them.*

**Iowa – Iowa State University**

General Information

*I did not keep a listing of specific products this year. Besides several non-traditional products, the more common questions were about products that contain DCD or NBPT. Seems there are an increasing number of products now that contain some amount of those materials. Therefore, efficacy is a continued question.*

Accomplishments:

*The compendium web site was revised and updated. It will continue to be housed at Iowa State University, Department of Agronomy.*

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*](http://extension.agron.iastate.edu/compendium/index.aspx)*) has 246 research reports, with eight new reports added since the last committee meeting. Clientele use of the site was not tracked in 2017-2018.*

**Kansas – Kansas State University**

General Information:

*Several products based on “biologicals” including extracts and “live organism”, product names and composition are highly variable, and difficult to establish research that would have broad applicability.*

*New products for N management: Centuro and Anvol, questions are generally regarding local research and potential benefit under our conditions.*

 Accomplishments:

1. *2017 product trials: Factor (NBPT): preliminary results were similar to other NBPT products.*
2. *Presentations given approximately 12 presentations during the year included data/discussion on non-traditional products*

**Kentucky – University of Kentucky**

*General Information:*

*The following non-traditional products were active in Kentucky:*

*Prevent (Ag Xplore) is a phosphorus management aid for dry, liquid, and manure. The CrossLink technology prevents P fixation in the soil, enhances P uptake, and increases P availability and efficiency. It is also reported to improve soil structure.*

[*https://www.agxplore.com/product/prevent/*](https://www.agxplore.com/product/prevent/)

*Wolftrax boron. Our tobacco specialist was told that the Woldtrax product is way more efficient than regular boron. Based on this they recommended a highly reduced rate 5-10X below recommended rate. Boron deficiency was then noticed on the tobacco in question.*

*Helena Products – no particular products mentioned, just general and several foliar products that just don’t sound like they can live up to their claims.* [*https://helenaagri.com/products/*](https://helenaagri.com/products/)

*Agr-Gro – tobacco specialists had a couple of products in his tests. Pretty big claims, no yield response thus far in tobacco when testing AgriCal. SuperCal.*

[*https://www.agrigro.com/crops/*](https://www.agrigro.com/crops/)

[*https://www.agrigro.com/home-garden/products/supercal/*](https://www.agrigro.com/home-garden/products/supercal/)

*Monty’s Stuff in general, nothing new that is specific*

*Biostimulants – are they really what they claim in the field?*

*Total low salt starter packages, macros +/- micros. Are they really needed? A couple of board members on the Corn Board is interested in having these tested to see if they are any good.*

*Soil tests for sulfur recommendations. Probably not needed in most of the places, but soil tests show that almost everything is needing a S addition.*

*Liquid lime. Not sure if it is truly liquid lime or if it is Calcium Chloride. We have had both around. The liquid lime is probably legit, if they followed decent rate, but claims are that one gallon is equal to 1,300 lbs of ag lime. The other product keeps changing names but is CaCl. I have attached an article we wrote.*

**Michigan – Michigan State University**

General Information:

*Low crop pricing has again created fewer inquiries (similar to 2017) on soil amendments and nonconventional products. Tissue testing inappropriately used to identify which nutrient(s) to apply to cropping systems garnered significant attention. Continued statewide emphasis on water quality has created interest in gypsum applications for retaining soil test phosphorus on site (not much data to support this practice, however). A large percentage of marketing has shifted towards biologicals and or including biologicals with starter nutrient applications.*

*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 near 40 ppm. The two N, P, S replacement products evaluated resulted in non-significant gains in yield, recoverable white sugar per ton, and recoverable white sugar per acre as compared to P applied individually and the P and S combination using MAP and AMS as the P and S sources, respectively, similar to 2017.*

Starter fertilizer amended with micronutrients and or citric acid chelated micronutrients for soybean production tested in 2018. Product evaluations included: MicroZMB, Micronourish, *Overpass, Phosfix; Non-significant data with many results decreased from check plots. The 2018 field season with a prolonged dry season mid-summer likely impacted result.*

*Liquid carbon-based fertilizers (L-CBF) made from cane molasses and containing different levels of sucrose. Multiple formulations are then combined with different starter fertilizers (7-21-3, 10-14-1, etc.) with the idea that the sucrose will stimulate the soil biology to enhance nutrient uptake. Products were applied as either in-furrow or 2x2 applications in sugarbeet. Mostly non-statistically significant differences in yield and recoverable sugar that were similar in content to check or N-only plots.*

*Silica as an essential plant nutrient continues to be brought up. MSU research has not found any significant response to Si nor any reason to believe Si is deficient in cropping systems tested.*

*Biologicals; Tested different bacterial and fungal solutions; humic and fulvic acids individually and in combination; humic and fulvic acids with seaweed; Products tested in-furrow on corn and soybean; No significant results with any product; starter-only plots or check plots often yielding equal to or greater than biological treatments;*

*Products tested in 2018:*

 *• SymTRX20S and SymTRX12S • Multiple Liquid Carbon-Based Fertilizers (L-CBFs) • MicroZMB, Micronourish, Overpass, and Phosfix • Humic and fulvic acid combinations and bacterial and fungal solutions*

Accomplishments:

*1) 2018 product trials – See above list with additional products and yield data available at soil.msu.edu*

*2) Ten presentations involving at least some product testing data*

*3) Quinn, D., and K. Steinke. 2018. Soft red and white winter wheat response to input intensive management. Agron. J. (In Press).*

*4) Rutan, J., and K. Steinke. 2018. Pre-plant and in-season nitrogen combinations for the Northern Corn Belt. Agron J. 110:2059-2069. doi:10.2134/agronj2018.03.0153.*

 *5) Rutan, J., and K. Steinke. 2017. Determining corn nitrogen rates using multiple prediction models. J. Crop Improv. 31(6):780-800.*

**Minnesota – University of Minnesota**

General Information:

*I have not seen major pushes for sales of certain products across Minnesota. Most companies are still actively promoting products, but most are micronutrient fertilizer sources and do not fall within the specialty product or amendment category.*

*My primary questions have been on inhibitors. One major push we are currently working with on new releases centers on inhibitors. We still have products like N-zone and Nutrisphere which are* *being marketed across the state without good un-biased research backing their use. I anticipate more questions on biological products as they seem to be the hot item right now, but I have not received many at this point either due to many not knowing they are using them, or farmers have already adopted their use. There has not been as much contact regarding product testing at the University of Minnesota. In talking to many companies, research budgets have been tighter, so most of the product testing currently is for sources of fertilizer providing major macro- or micronutrients needed by crops and not for enhancers.*

**Nebraska – University of Nebraska**

*List of new products this year:*

1. *Neptunion - drought tolerant products from the Plant Response*

*I tested these products in the field trial.*

1. *AgConcept Products; AgZyme and SuperHume. I tested the products.*
2. *PolyHalite from Sirius Minerals. Although I suggested that we do not recommend much K in NE, still the company wanted to test it.*

*We are getting calls on urease and nitrification inhibitors; which products work, and which do not. This January our soils extension group is presenting on the topic across the State.*

Accomplishments:

1. *A trial was conducted to evaluate plant response products, Neptunion® on irrigated corn and soybean production on University of Nebraska research facilities near Scottsbluff, Nebraska. This experiment used a split-plot randomized complete block design with irrigation levels as the whole plot and Plant Response products (PR) as sub-plot treatments with five replications.*

*The irrigation levels were*

1. *65 % of full irrigation (10 inches)*
2. *100 % of full irrigation (15 inches).*

*Plant Response product treatment in both irrigation regimes included:*

1. *2 g a.i. per kg seed for corn and 1 g a.i. per kg seed for soybean*
2. *Foliar treatment at 0.65 L per ha at corn V4 and soybean R1*
3. *control (water + surfactant) at corn V4 and soybean R1*

*Seeds were treated with the product at suggested rates for seed treatment plots. Foliar treatment plots were sprayed with backpack sprayers. Best agronomic practices including fertilization, insect scouting, and other were same across the plots. Corn stand was counted after corn emergence. A handheld active crop sensor was used to estimate normalized difference vegetative index (NDVI) in corn at VT and in soybean at R4 stages. Crop yields were measured from hand harvesting of two rows of 10 ft length each to evaluate effects of these treatments.*

1. *The trial was conducted on University of Nebraska research farm in Scottsbluff, Nebraska in 2018 to evaluate AgConcept products. This experiment used a randomized complete block design in four replications with fertilizer treatment as the main plot. Fertilizer treatments included*
2. *Check – Grower standard practice (GSP) fertilization*
3. *Control – No fertilization*
4. *Full GSP fertility + 12.8oz/a at planting*
5. *Full GSP fertility + 4qts/a at planting*
6. *Full GSP fertility + 12.8oz/a + 4 qts/a at planting*
7. *20% GSP reduction + 12.8oz/a + 4 qts/a at planting*
8. *40% GSP reduction + 12.8oz/a + 4 qts/a at planting*

*Nitrogen fertilizers need was determined based on spring soil test and were hand broadcast and incorporated (disking ~ 10 – 15 cm depth). Corn stand was counted after corn emergence. Best agronomic practices including irrigation, insect scouting, and other were same across the plots. Treatment plots were georeferenced to determine locations with varying fertility rates, and to be used in subsequent years for product evaluation. Crop yields were measured to evaluate effects of the fertilizer treatments.*

1. *The trial was conducted to evaluate Polyhalite in two corn fields on University of Nebraska research facilities near Scottsbluff, Nebraska and one corn field in farmer/co-operator’s field in Morrill county, Nebraska in 2018. This experiment used a randomized complete block design in four replications with fertilizer treatment as the main plot. Fertilizer treatments included*
2. *Control – no K or S applied*
3. *KCl applied at 100% of recommended rate*
4. *Polyhalite applied at 100% of recommended rate*
5. *KCl applied at recommended rate plus 30 kg S ha-1 applied as gypsum*
6. *Polyhalite applied to give 30 kg S ha-1 with the remainder of K2O applied as KCl.*

*All fertilizers were hand broadcast and incorporated (disking ~ 10 – 15 cm depth) after spring soil sampling. Corn stand was counted after corn emergence. Best agronomic practices including fertilization, insect scouting, and other were the same for all plots. Crop tissue was sampled from each plot for chemical analysis at corn R1 stage. Crop yields were measured by harvesting two 10 ft length row sections by hand to evaluate effects of the fertilizer treatments.*

*Reports on their product tests were submitted to AgConcept, Sirius, and Plant Response.*

**Missouri – University of Missouri**

General Information:

*Grower's Secret Soluble Corn Steep Powder. Has guaranteed fertilizer analysis but also claims to “support abundant root formation and soil microbial activity.”*

*I received several inquiries about phosphorus fertilizer additives. I tell people that soil-test-based P management does not require this year’s P fertilizer addition to achieve full crop yield. Reducing tie-up of the P applied this year thus will not affect yield, and it’s unlikely that the additive’s effect (if there is one) will last for multiple years. In a very lean P management system, an additive that reduces tie-up could improve efficiency of applied P that is essential to this year’s yields.*

*I received an inquiry from a regional Extension agronomist about:*

 *Quick Roots*

 *Impact*

 *Nema-Strike*

*I referred her to the research compendium after checking that there are results in the compendium for Quick Roots.*

Accomplishments:

1. *2017 product trials – (with short description of experimental design) see below*
2. *Presentations given 3 presentations, total audience 400, including my results with Agrotain treatment of urea*
3. *Grants (non-gifts) grant/contract with Koch for $20,615 for the trial shown below (also same amount in 2017 but separate grant)*

*Conducted a trial with three different inhibitors of ammonia volatilization to determine effectives and compare relative effectiveness.*

*My program conducted a test this year (and last year) for Koch Agronomic Services on urease inhibitors comparing theirs to a competitor’s product (ContaiN). Experimental design was a randomized complete block with four replications. We had extended periods with little rain after fertilizer application in both years, ideal conditions for ammonia loss, and yield response both years. Koch supplied all tested products. They had ContaiN tested several years ago and it contained 5% NBPT which is the active ingredient. Most urease inhibitor products contain 20 to 25% NBPT.*

*Impact Statements:*

*Helped farmers make purchase decisions by referring them to the research compendium so they could evaluate chance for return on investment.*

*Used results from several different projects to answer questions about phosphorus fertilizer stabilizers.*

*Presented results showing benefits of Agrotain treatment of urea to audiences totaling 400.*

**North Dakota – North Dakota State University**

*Questions still arise regarding efficacy of nitrification inhibitors and urease inhibitors. Most of the N transformation inhibitors sold in the state have proven efficacy and a scientifically supportable mode of action, but there are some products sold in certain areas that have a poor efficacy record, and no scientifically supportable mode of action. NDSU educational activities focus on promoting awareness of chemistries that have value to farmers. There are a very large number of ‘biologicals’ that are sold by companies large and small. There is remarkably little independent research on any of these products, and the number of products sold is so overwhelming that it will be impossible to test them all even if all other research were dropped to perform the studies. The promotion of these products is troubling, because it means that the movement of R&D from research with independent, unbiased partners (Universities) before development to research, if any, in-house then marketing, is complete. The result is a message of ‘Buyer Beware’ more important than ever. Experiments adding mycorrhiza at seeding resulted in no yield improvement with the added organisms.*

**Ohio State University**

General Information:

*Questions relating to sulfur and micronutrients were common throughout the year as producers try to reduce input costs to offset low grain prices. Except in special situations Ohio research has found little benefit from adding these nutrients.*

*Questions relating to the benefit of adding nitrogen stabilizing products to urea-ammonium nitrate were common, also related to reducing input costs.*

*Many fertilizer retailers still promoting tissue analysis to make micronutrient recommendations.*

*The promotion of biostimulants continues to grow, especially by seed companies. Little to no research is presented on these products. Organic production is driving the use and marketing of these products.*

*Organic systems encourage the use of balancing cations (Mg and Ca) for weed control, general nutrient uptake, soil drainage and general crop production. This philosophy trickles over to traditional farming practices.*

Accomplishments

1. *Sulfur research study on wheat. No benefit.*
2. *Investigation of Mosaic premium phosphorus and potassium with micronutrients on soybean. No benefit.*
3. *Sulfur data presented at local producer meetings.*
4. *Nitrogen rate research in wheat presented at national meeting.*

**South Dakota – South Dakota State University**

*No report for 2018*

**Wisconsin – University of Wisconsin**

General Information:

*New product: Azotic Technologies – “N-fix” – it’s a free N fixer seed treatment inoculant. Seems to be promoted for potato. There are various product trials in the Midwest in the company brochure.*

Accomplishments:

1. *2018 product trials*
	1. *Mycoapply – testing on potato with various rates of P to see if it improves P uptake*
	2. *Instinct (Dow) (N stabilizer) – testing on potato with various rates and timings of application*
2. *Presentations given*
	1. *The soil rhizosphere and biological additives. 2018 Corn-Soy Expo, 31 Jan. Wisconsin Dells, WI*
3. *Peer-reviewed publications*
	1. *Ruark, M.D., R.P. Soratto, and C.J. Rosen. 2018. Merits and limitations of enhanced efficiency fertilizers. In Soil nitrogen uses and environmental impacts, ed. R. Lal. And B.A. Stewart. Advances in Soil Sciences series, CRC Press, pp. 287-311.*
4. *Grants*
	1. *Enhancing soil health in US potato production systems. USDA-SCRI-CAP. 2018-2022. ~$8,000,000* [*https://www.cfans.umn.edu/researchers-grant-soil-health-impacts-potato-production*](https://www.cfans.umn.edu/researchers-grant-soil-health-impacts-potato-production)

Impact Statements:

*Through extension and research efforts in Wisconsin, agronomists and farmers have a better understanding of soil biological products that are sold to enhance plant health and productivity.*