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Nitrogen Management Update for IN

The yearly nitrogen management update from Jim Camberato, Bob Nielsen and Brad Joern, Purdue University has been published in this newsletter in it's entirety for the past several year, so the following are a few important excerpts from this year's installment.

To date, 81 nitrogen rate trails have been conducted in IN. About 69% of them are corn following soybeans and the remainder are corn following corn. The N rate treatments have ranged from nothing but starter to as much as 256 lb/A actual N. Most of the trials have used side dress liquid UAN simply to facilitate trial logistics. Similar N results would be expected from late pre-plant or sidedress anhydrous ammonia, but not necessarily from early preplant anhydrous or 28% or fall anhydrous. Most of the trials were conducted on fine-textured soils: silt loams, silty clay loams and the like. All the trials have been field scale. Most of the trials have been harvested with the aid of GPS-enabled yield monitors.

Results: The average Agronomic Optimum N Rate (AONR) (The N rate that will produce maximum grain yield) for all our corn/soy sites to date was 184 lb/A total applied N. (with an average yield of 190 bu/A). At the five Purdue locations where paired trials of corn/soy and corn/corn in 2007-08 were conducted the **AONR for corn/corn was 37 lb/A than for corn/soy** while average corn/corn yields were 21 bu/A less.

Based on $0.60 /lb N and $3.00/ bu corn, the average Economic Optimum Nitrogen Rate (EONR) (the N rate that will result in the maximum dollar return to N) for all our corn/soy sites was 149 lb/A total applied N or 35 lb/A less that the average AONR. However the average yield at the EONR was only 5 bu/A less than that at the AONR.

Inside this issue:

Ear Development Problems from Late (Pre-Tassel) Applications of Pesticides and Spray Additive Combinations—Bob Nielsen, Kiersten Wise, and Cory Gerber, Purdue

Back in late summer of 2007, ear development problems called arrested ear development was reported by a number of corn growers in Illinois and Indiana. *Both Jeff Nagel and I, Betsy Bower observed ear development problems in the Ceres Solutions trade territory both in 2007 and 2008 (Betsy Bower)*. The severity of the arrested ear symptoms varied both within and across affected fields . The appearance of the arrested ear was distinctly different than that commonly associated with blunt ear syndrome or "beer can" ears.

The most common thread linking affected fields was that the arrested ears were occurring in fields that had been previously treated with various herbicides, fungicides, insecticides, and/or assorted spray additives during the week or two preceding pollination. The most dramatic comparisons with arrested ear symptoms occurred primarily where foliar fungicides had been applied prior to tasseling versus areas left as untreated checks for yield comparisons.

The symptoms of the arrested ears suggested that the causal factor occurred near or soon after the completion of ear size determination. In some cases, the arrested ears appeared similar to baby ears of corn often found in restaurant salad bars. Ear size determination was essentially complete and the beginning of silk development was evident near the butt of the cob. Further development of the ear had simply been arrested.

In response to these reports, we were interested in the prospect of intentionally reproducing the arrested ear symptoms in the field. Therefore, we established a preliminary trial at the Purdue University Crop Diagnostic Training & Research Center in west-central Indiana in 2008, with the purpose of evaluating the effects of a number of pesticides and spray additives on ear development. Three fungicides, one insecticide (I), a commercial non-ionic surfactant (NIS), crop oil concentrate (COC), glyphosate (GLY), ammonium sulfate (AMS), and 2,4-D were applied in various combinations over the canopy of corn on July 18th, at approximately the V14 stage of leaf development (approximately 5 ft tall and 1 - 2 weeks prior to tasseling).

The V14 stage of development was chosen because it best represented the reported timing of fungicide applications in the 2007 problem fields. Ear size determination was essentially complete and silk elongation was beginning to occur near the butt end of the cobs. The tips of the ear shoots were visible in the leaf axils in a majority of the plants. Ear size determination was essentially complete at this stage, with rows of ovules visible nearly to the tip of the ear.

The foliar treatments were applied with a CO_2-pressurized backpack sprayer using a water carrier volume of 15 gpa to the two center rows of each 4-row demonstration plot. The same carrier volume was used for each treatment. Each pesticide or spray additive was applied at concentrations consistent with the respective labeled rates. The applications of glyphosate and 2,4-D were clearly off-label relative to stage

Weed Science Update—Purdue University

The following are a few weed science updates from Weed Science, Purdue Extension.

European Approval of LL Soybean—Liberty Link (LL) corn ahs been around for some time. The trait LL allows over the top applications of glufonisate, the active ingredient in the herbicide Liberty and now Ignite 280 SL. Although, LL soybean had been approved for the US and Canada, it was not approved in Europe. In September the European Commission approved the import of LL soybean for food and feed. The use of LL corn and soybean is marketed as an alternative to glyphosate tolerant (RR) systems. It is a different mode of action that can be used to lower the selection pressure for herbicide resistance by providing another mode of action. Liberty/ Ignite has excellent activity on giant foxtail, black nightshade, cocklebur, common ragweed, giant ragweed, jimsonweed, and smartweed; good control of crabgrass, fall panicum, shattercane, seedling johnsongrass, annual morningglory, burcucumber, common lambsquarter, pigweed, velveltleaf, and waterhemp; and fair control of barnyardgrass, yellow foxtail, and rhizome johnsongrass. Timing will be more crucial to success in controlling weeds with Liberty/ Ignite than with glyphosate. However, weed size is still important with glyphosate.

RR/ Bt Volunteer Corn—Transgenic volunteer corn expressing herbicide resistance traits and insect resistance traits is becoming more problematic in soybean fields. With the increased adoption of double, triple and quad stacked corn growers are not only seeing an increase in volunteer corn plants that can withstand the normal use rate of glyphosate, but they also are experiencing some insect resistance with the expression of Bt traits. Transgenic volunteer corn plants that escape glyphosate treatments are not only economically damaging, but these plants are providing increased selection pressure on insects such as the western corn rootworm (WCR) by exposing WCR to BT toxins out side of mandated insect resistance refuge programs. Preliminary data has shown that more WCR emerge from volunteer corn plants expressing BT than not BT volunteer corn plants, indicating that the toxin, while still present, may be doing little to inhibit the development of WCR. The simple solution is to scout for volunteer corn especially in soybean fields and where present add a grass herbicide to glyphosate to control the volunteer corn problem..

Update on Herbicide Resistant Marestail in Indiana—Marestail has been a weed often discussed and written about since the first glyphosate resistant marestail was found in Indiana in 2002. A marestail survey completed from 2003-05 revealed that about 33% of the marestail in southeast IN was glyphosate resistant. It also revealed that glyphosate resistant marestail could be found in several other areas in Indiana but at a frequency of 2% of randomly sampled fields. Many article and recommendations surfaced as a result of this work and pest managers across Indiana learned how to control mairstail (or so we thought).

However, during the late summer and fall travels throughout the state it was obvious marestail is still a persistent and challenging weed for many soybean farmers. It also appears the problem may be increasing in the other three regions of the state, although late-season in-field surveys were not conducted to make the statement conclusive. The persistence and constant invasion on marestail to new areas is not surprising because marestail can produce hundreds of thousands of seeds. These seeds have appendages that like dandelions allow them to be blown by the wind and infest unsuspecting adjacent no-till fields.

In addition to investigating glyphosate-resistant marestail, Purdue completed herbicide screens on all of their collected marestail populations for resistance to 2,4-D and ALS herbicides. Purdue found populations with plants resistant to chlorimuron (the active ingredient in Classic and one of the active ingredients in Canopy SP, Ex, and several other fall or early spring applied residual herbicides) in 30 Indiana counties. In the Ceres Solutions territory those counties include Newton, Jasper, Benton, Fountain, Tippecanoe, Putnam, Clay and Knox counties. Many of these counties also had populations of glyphosate resistant marestail, but fortunately few populations were found resistant to both chlorimuron and glyphosate.

What about 2,4-D? The good news is Purdue did not find any populations that were resistant to 2,4-D, However, the did find some of the horseweed populations had a remarkable increase in tolerance to 2.4-D though. This leads to some cause for concern about over relying on 2,4-D. Applying 2,4-D on marestail in the rosette stage or under 4" of stem elongation is the best timing for adequate control. This is likely to occur in early April for fall emerging plants and late April to the middle of May for spring emerging plants. Applying 2,4-D to small plants provides the best control and should also allow plenty of time to follow soybean preplant restrictions on the 2,4-D label. If marestail becomes larger than 4", higher rates and tank-mixing other herbicides will be more critical to achieve control. (As an aside, I, Betsy Bower think we had more problems with marestail this year than other years due to our less than ideal spring burndown environment and our cold wet May. Once marestail were greater than 4-6" we did not either add 2.4-D to the tank mix because of the plant back restriction or we did not increase our glyphosate base rate. Our fall and early spring applied preemergence herbicides did a pretty good job of controlling marestail.

For free herbicide label information see the websites www. Greenbook.net and www.cdms.net.

Current PARP Opportunities in January and February

There will be several opportunities to get PARP points this winter. The meetings times, dates, locations and topics are still being developed. I have heard there will be a couple of meetings in January in Clay Co. There were also be meetings in north west and west central IN in January and February. See next months newsletter for more info. Also check the Purdue Pesticide Programs website.

Jan 14th—Vanderburgh 4-H Center, Booneville– New Harmony Rd Evansville—8:00 a.m. CDT—Area Corn and Soybean Day—Contact Jon Neufelder, Posey Co Ext Educator—812-838-1331 for more info.

Jan 14th—Rochester High School Auditorium—7:30 p.m. EDT. Contact Mark Kepler 574-223-3397 for more info.

Jan 19—Frontier School Auditorium, Chalmers—7:00 p.m. EDT. Contact Greg Bossaer 219-984-5115 for more info.

Feb 24—Tri County High School, Wolcott—7:00 p.m. EDT. Contact Greg Bossaer for 219-984-5115 for more info.

Feb 24—Dubois Co Fairgrounds—SW Indiana Crop Production Clinic—8 a.m.-3:45 p.m. Contact Maria Restrepo 812-364-6838.

Just Stuff

Cover Crop Workshop— Purdue Extension, the Indiana Assoc. of Soil and Water Conservation Districts, and the Midwest Cover Crops Council are co-sponsoring a half day workshop entitled "Making Cover Crops Work". The workshop will take place Wednesday January 14th from 9:30 a.m.—12:00 p.m. at the Hyatt Regency Hotel in downtown Indianapolis before the start of the National No-till Conference.

Topics covered will include: **Why Cover Crops?** - by Eileen Kladivko, Purdue University. Dr. Kladivko will discuss the benefits and potential uses of cover crops with an emphasis on improvement in soil and water quality. **Opportunities with Diverse Cover Crops**—Keith Johnson, Purdue University. Dr. Johnson will cover the strengths and weaknesses of different cover crops, reasonable expectations of cover crops when seeded for livestock utilization or as a nitrogen resource for the next crop and some of the relative costs and benefits to cover crops. **Manage for Success**—Barry Fisher—USDA NRCS. Barry will discuss the practical guidelines and tips for including cover crops in a cropping system, seeding rates and dates, seeding methods, kill methods,, and selection issues of cover crops along with the Indiana NRCS Cover Crop Standard, Job Sheet and Seeding Tool.

The cost of the workshop is $40 and you can register online by visiting https://2009covercrops.theregistrationsystem.com/ and then clicking on the Conference Registration on the right hand side of the page.

WinField Solutions Offers $1000 Scholarships to Ag Students - Winfield Solutions, LLC is keeping with the tradition of the Careers in Agriculture scholarship program, officials of Land O' Lakes, wholly-owned subsidiary announced. Scholarships worth $1,000 will be awarded to 20 high school seniors who demonstrate scholastic achievement, leadership in agriculture and a perceived ability to contribute to agriculture in the future.

The Careers in Agriculture scholarship program is available to high school graduates pursuing two or four year degrees in agronomy, crop production, or closely related fields.

To qualify for the program, a student must:

- Be a high school senior, graduating in the spring of 2009;
- Demonstrate leadership abilities and academic performance;
- Complete an application including two character references; and
- Write essays describing the importance of farmer cooperatives, and why he or she is interested in an agriculture career.

Applications are available in the internet at AgriSolutionsinfo.com and CROPLANGENETICS.com. All applications must be postmarked by Feb 1, 2009. Winners will be notified by mail April 2009.

Land O Lakes and Purina Feed LLC will award five $1,000 scholarships—Land O Lakes and Purina Feed LLC will award five $1,000 scholarships to high school seniors who demonstrate scholastic achievement, leadership in agriculture and perceived ability to contribute to agriculture in the future.

The Propel Energy Nugget scholarship program is available to high school graduates pursuing a two or four year degree in dairy science or dairy nutrition and management.

To qualify for the program, a student must:

- Be a high school senior, graduating in the spring of 2009;
- Demonstrate leadership abilities and academic performance;
- Complete an application; and
- Write essays describing why he or she is interested in dairy science or dairy nutrition and management career.

An application is available on the internet at www.propelnugget.com and must be postmarked by March 14, 2009. Winners will be notified by mail on or before April 30, 2009.

Compaction is Costly in No Matter the Tillage System

This article was written by Martha Ostendorf, Contributing Editor of ***No-till Farmer*** Magazine (Only parts of the article reported here) .—Compaction is a no-till farmers kryptonite. The benefits that no-till provides—reduced soil erosion, increased organic matter, efficient biological ecosystems, improved soil quality, higher infiltration rates, yield boosts and more—can quickly be reclaimed by compaction.

Ohio State University scientists Randall Reeder, OSU ag engineer, Alan Sundermeyer, Wood Co. Extension educator, and Rafiq Islam, OSU soil and water specialists recently crunched 17 years of soil compaction data and came up with some numbers that should encourage producers of all tillage types to avoid compaction.

The data was collected from 1988-2006 at the Northwestern Branch of the OSU Agricultural Research Center, Custer, OH. While plots were traditionally tilled from 1988-2002, not-till practices were implemented in 2003 to allow for additional eye-opening comparisons of compaction impacts between no-till, subsoiling and a combination of the two practices.

Crop Response—Prior to switching to no-till, data showed that subsoiling to break up compaction increased yields. But when they stopped doing chisel work and started using no-till as the control, the compaction yield data went in a different direction.

"Data shows that subsoiling for the last 4-5 years did not help. It was of no value," says Sundermeier, adding data was gathered in comparison to a no-till control. "In one case, when comparing subsoiling to the no-till control, we reduced yields by 3% in soybeans and 9% in corn by subsoiling."

That's not to say compaction doesn't impact no-till yields. Sundermeier says it just shows that no-till acres may not benefit from subsoiling as a way to reverse the impacts of compaction. He says improved soil structure achieved through continuous no-till provides better support for heavy axle loads.

Data from 2003 through 2007 showed that no-till plots compacted by 20 tons of pressure saw 10% yield reduction in soybean and an 8% yield reduction on corn when compared to the no-till control.

Prevent Compaction—"Controlled traffic is the way to minimize compaction," Reeder says. "With controlled traffic, you compact about 20% of the ground. But that compaction is always going to be between the corn rows and the other 80% is going to be ideal for crop growth. Even if tracks cover 30%, it's far better than random traffic." Where corn demand is pushing farmers to continuous corn, no-tillers may have to accept more compaction to avoid planting in the same row year after year.

"In this situation move the row in one direction this year and right back the next, so you only move it back and forth 4", Reeder says. "

Reeder says the best way to control traffic is with RTK auto-steering to keep accuracy within an inch.

Ideal Farming System— From the data they've gathered, the group has come up with their version of the ideal farming system.

"Use continuous no-till to maximize carbon, control traffic to minimize compaction, use RTK technology to be precise, rotate crops and utilize cover crops," Reeder says. "The key takeaway, though, is you can't quickly bring soil back to where it was to begin with by using iron.

Grain Update

USDA Summary—Dec 11, 2008

Estimates in Million Bushels

Corn	**Jan USDA—08/09**	**Dec USDA-08/09**
Carry-in	1624	1624
Production	12,101	12,020
Total Supply	13,740	13,659
Feed and Residual	5300	5,350
Ethanol	3600	3700
Exports	1,750	1,800
Total Use	11,950	12,185
Carry-out	1,790	1,474
Soybeans		
Carry-in	205	205
Production	2,959	2,921
Total Supply	3173	3,133
Crush	1,685	1,715
Exports	1,10	1,050
Seed	90	90
Residual	73	72
Total Use	2,948	2,927
Carry-out	225	205
Wheat		
Carry-in	306	306
Production	2,500	2,500
Total Supply	2,915	2,915
Food	950	950
Seed	80	80
Feed & Resid	230	260
Exports	1000	1,000
Total Use	2,260	2,292
Carry-out	655	623

Ear Development problems cont.

of crop development, but nevertheless are known to be made occasionally by growers.

Each fungicide was applied alone, with COC, with NIS, with insecticide, with insecticide + COC, with insecticide + NIS, with insecticide + NIS + glyphosate, or with insecticide + NIS & glyphosate + AMS. Other foliar treatments were glyphosate alone, glyphosate + AMS, glyphosate + 2,4-D, 2,4-D alone, NIS alone, COC alone, and AMS alone.

Ear Symptoms Five days after the foliar treatments were applied, several random ear shoots were removed from plants in plots where NIS was included in the treatment. It was apparent that the surfactant had penetrated to the inner husk leaves of the ear shoot and to the upper end of the young cob itself. What was most interesting was that the plant tissue at the upper end of the cob (ovules and glumes) had begun to dissolve or were otherwise physically damaged. Three weeks after the foliar applications, it was clear that arrested ear development had occurred in some of the treatments. The physical damage to the cob tissue was clearly evident at this time.

In mid-October, mature ears from 20 consecutive plants were removed and dried on greenhouse benches. Varying degrees of severity of arrested and abnormal ear development occurred across the treatments in the demonstration plots. Each ear was visually rated (yes/no) for abnormal ear development and severe arrested ear development.

Measurements were taken for length of total cob, the arrested portion of a cob, and the abnormal portion of a cob. Numbers of kernel rows and kernels per row were counted and recorded. Total kernels per ear were calculated from the row and kernels/row numbers. Where kernel set was jumbled or simply sparse, total kernel number was counted for the entire ear. Each ear was shelled and total kernel weight per ear measured, from which 1000 kernel weights were calculated. The results that follow are summarized over the three fungicides where applicable.

Fungicide Combinations Neither fungicides alone or in combination with just an insecticide resulted in any severely arrested ears . However, the addition of COC or NIS to fungicides alone or fungicide + insecticide resulted in a frequency of severely arrested ears ranging from 3 to 35%. The further addition of glyphosate with a fungicide-insecticide-NIS combination resulted in 60% or greater arrested ears.

The range in frequency of arrested ears was similarly reflected in the average length of cob among the various foliar treatments relative to the control treatment. Reductions in cob length ranged from 6 to 48% with the application of the various foliar pesticide and additive combinations

The short cobs were similarly reflected in fewer number of kernels per ear among the various foliar treatments relative to the control treatment. It was interesting to note that although no severely arrested ears were documented in the [fungicide alone] or [fungicide + insecticide] treatments, fewer kernels per ear were recorded for those treatments relative to the control which may be a reflection of the fact that these treatments exhibited minor degrees of ear abnormalities.

Herbicides and Spray Additives Severely arrested ears also occurred in some of the foliar herbicide or spray additive treatments. The treatments [glyphosate + 2,4-D], [NIS alone], [COC alone], and [AMS alone] resulted in frequencies of severely arrested ears ranging from 5 to 40%. The relationship with average cob length is obvious for the [NIS alone] treatment, but cob length was noticeably shorter for a number of the other treatments as well. The relative cob lengths correlated rather well with the relative numbers of kernels per 20 ears, although the [glyphosate + AMS] treatment seemed to have unusually low kernel numbers given the absence of severely arrested ears. However, 100% of the ears from the [glyphosate + AMS] treatment were rated as "abnormal" in the sense that all the ears exhibited jumbled kernel set.

Bottom Line? The results from this preliminary trial indicate that certain combinations of foliar pesticides and spray additives applied at approximately growth stage V14 have the potential to arrest or otherwise deform ear development in corn. The data suggest that spray additives such as non-ionic surfactants and crop oil concentrate may contribute strongly to the potential for such damage.

Further research is needed to better understand the nature and mechanism of the causal factor(s) that contribute to arrested or malformed ear development. We intend to establish more comprehensive field trials in 2009 to more thoroughly investigate the effects and interactions of pre-tassel foliar applied pesticides and spray additives on ear development of corn.

To read the full article and see pictures of arrested ear development go to the Chat N Chew Café (just put Chat N Chew Café in your web browser). The full article can be found in the December 2008 articles.

N Management Update Cont.

In fields with low soil N supplying capacity or high N loss potential, consider increasing the N rate by 20-30 lb/A. In fields with high soil N supplying capacity or minimal N loss potential, consider decreasing the N rate by 20-30 lb/A.

The following table indicates the range of EONR values (lb/A applied N) for corn following soybeans as influenced by nitrogen cost per pound and grain price per bushel. Grain price along top and nitrogen price along left side.

	$3	**$3.50**	**$4**	**$4.5**	**$5**	**$5.5**	**$6**
$0.50	155	159	162	164	166	168	169
$0.60	149	154	157	160	163	165	166
$0.70	143	149	153	156	159	161	163
$0.80	137	144	149	153	156	158	160
$0.90	131	134	140	145	149	152	155