It's rained again, what should I do about nitrogen?

Carrie Laboski, Professor and Extension Soil Fertility/Nutrient Management Specialist, UW-Madison

With continued precipitation and water lying on fields in many areas, growers are becoming concerned about nitrogen loss. This article will explain how to determine if N loss from excessive rainfall has occurred and what corrective measures may be taken.

Once N is in the soil, nitrate is the form of N that can be lost via leaching or denitrification. Nitrogen in the form of ammonium or organic-N will not be lost. The first step is to determine how much of your applied N may be nitrate. It takes 1 to 2 weeks for ammonium forms of nitrogen to transform to nitrate, while it takes 1.25 to 2.5 weeks for urea, and 3 to 8 weeks for anhydrous ammonia. Urea ammonium nitrate, UAN (28% or 32%), is 50% urea, 25% ammonium, and 25% nitrate. This means that 25% of the N applied in UAN may be lost immediately.

Nitrate leaching will occur when precipitation (or irrigation) exceeds the soil's ability to hold water in the crop root zone. Leaching is a much bigger issue on sandy, coarse-textured soils that typically hold 1 inch of water per foot of soil compared to medium- and fine-textured soils that hold 2.5 to 3 inches of water per foot of soil. To determine if nitrate could leach out of the root zone, compare the rainfall totals in your area to the number of inches of water that your soil can hold in the crop root zone.

Losses of N through denitrification can occur on medium- and fine-textured soils when the following conditions are present: 1) N is in the nitrate form. 2) The soil is saturated with low oxygen content. A glistening soil surface can indicate soil saturation. The longer the soil is saturated the more N may be lost. 3) Denitrification proceeds faster on warmer soils, especially when soil temperatures are greater than 75°F. The following is an example of how length of time the soil is saturated and soil temperature impact N loss. When soil temperature is 50°F, 3% of the nitrate may be lost when the soil is saturated for 4 days compared to 6% lost when saturated to 10 days. By comparison, when the soil temperature is 75°F, 20% of the nitrate is lost after 4 days of saturation and 43% is lost after 20 days of saturation.

Keep in mind that soil saturation causes physiological damage to a corn crop. Bob Nielsen from Purdue explains that young corn can survive 4 days of ponding if temperatures are below the mid-60’s °F, but if temperatures are over the mid-70’s °F, then corn survival will be less than 4 days. Thus, depending on the temperature it may not matter how much N has been lost, the corn crop may never fully recover even if supplemental N is applied.

By assessing soil texture and drainage, form of N applied, time between N application and heavy rainfall(s), you can make an educated guess about if and how much N may have been lost. For a more detailed explanation of this please read: http://bit.ly/2teVpRt
If all or most of your N for corn is coming from manure and/or a forage legume, then the PSNT can still be used to estimate N credits. Note, when average May-June soil temperatures are more than 1°F below the long-term average, the N credit is often underestimated and book value estimates of credits are more reliable. The PSNT is not suggested for use on sandy soils. For more details on how to use the PSNT see UWEX Publication A2809 Nutrient application guidelines for field, vegetable, and fruit crops in Wisconsin [http://learningstore.uwex.edu/assets/pdfs/A2809.pdf].

Where the entire crop N requirement has not yet been applied, sidedress or other postemergence applications should contain the balance of the crop N requirement. Additional N to replace 25 to 50% of the fertilizer N that was lost could be applied.

If all of the N was applied prior to the heavy rainfall, try to determine how much N loss may have occurred. The next step is to decide whether or not you need or want to apply supplemental N fertilizer to your corn crop. When making this decision, compare the amount of N loss (in lb N/a) that you think may have occurred to UW’s price adjusted corn N rate guidelines at several different N to corn price ratios. (See UWEX publication A2809 for details).

For each N:corn price ratio, UW guidelines have a target N rate, the maximum return to N rate (MRTN) and a range of N rates that produced profitability within $1/a of the MRTN. The profitable range of N rates will typically produce a yield that is more than 95% of maximum yield. Yield at the MRTN rate is 98 to 99% of maximum yield. Remember maximum yield is not the most profitable yield. Based the estimated amount of N loss, as well as your cost of production, you may not want to replace all of the lost N.

Options for applying supplemental N when it is needed include traditional sidedressing, late/pre-tassel applications, or fertigation. UAN solutions can be applied as a surface band or as a broadcast spray over the growing crop. Dry N fertilizers (urea, ammonium sulfate, or ammonium nitrate) can also be broadcast applied to the crop. Leaf burning from solution or dry broadcast applications should be expected. Applying the dry materials when foliage is dry will help minimize burning. Broadcast N rates should be limited to 90 lb N/a for corn with 4 to 5 leaves and to 60 lb N/a for corn at the 8-leaf stage. Under N deficient conditions, corn will respond to supplemental N applications through the tassel stage of development if the N can be applied. Recent research conducted at Marshfield, WI showed that 40 lb N/a as UAN applied 7 to 10 days prior to tassel was successful at rescuing yield, when preplant applied N was lost because of wet soil conditions.

Cover crops following wheat or other small grains – Selection and management guidelines

By Kevin Shelley, UW Nutrient and Pest Management Program

Following harvest of winter wheat or other small grains in Wisconsin, if not planted to alfalfa, these fields are often left fallow. However, with more than 40 percent of the growing season remaining, planting a cover crop may be a good option. While the economics may not always be clear, many farmers are looking to cover crops to keep the soil covered, suppress some of the weeds that may otherwise grow, recycle and/or fix nutrients and improve soil health, and functioning with additional organic matter. Producing supplemental forages, managing field nutrient budgets and meeting conservation requirements are other objectives for which cover crops can provide value.

The choice of which cover crop(s) depends on a farmer’s objectives and needs and also the farm’s capabilities in terms of planting, management and termination. The cost and availability of good quality seed, versus anticipated benefits, are other factors to consider. Below are a few of the tried and true options for use in most parts of Wisconsin. All can be seeded with light tillage or no-till planting. However, good seed to soil contact at the appropriate depth for the species is essential for good germination and establishment.
Spring cereal grains, oats or barley can provide reliable mid-late summer cover and optional forage potential. They will grow rapidly in late summer and continue until a hard freeze. They will usually not over-winter in Wisconsin. These crops are often the best choice as a sequentially seeded soil cover or if fall-harvested forage is the main goal. They are more forgiving of temporary dry conditions than legume covers. Oats and barley have had equal yields in fall forage trials, 1-3 tons of dry matter (TDM) per-acre, with spring triticale slightly lower.

Winter rye can be planted August-September for a late summer and over-winter cover. Stem elongation will not occur without vernalization (cold temperatures). Planted in August, rye will produce a thick cover but usually less than one TDM biomass before winter dormancy. It will grow rapidly in early spring. Rye as a cover crop should be terminated by late April before it grows too large and at least two weeks prior to planting if followed with corn.

Annual ryegrass (ARG) is actually a southern-US adapted winter annual. It is considered not cold tolerant but will sometimes over-winter in Wisconsin with mild conditions. It has rapid growth with good biomass production when summer seeded on most soil types. It has a shallow, fibrous root system desirable for erosion control. ARG can be a good compliment for brassicas and/or annual clover. However, although a somewhat popular and economical cover crop option, planting ARG is somewhat discouraged due to concerns with its potential to become a difficult to control weed. It can be a prolific seed producer, even in the seeding year, and several glyphosate resistant biotypes have been identified. If it over-winters, it can be difficult to control with herbicides.

Legumes such as berseem clover, crimson clover or field pea (annuals) as well as medium red clover (perennial) will accumulate biologically-fixed nitrogen (N) as they grow. The N is released back into the soil, becoming available for next year’s crop, after the legume plants die or are terminated. All are good choices for a wheat to corn grain crop rotation. Clovers may also be harvestable as forage by mid-late September.

The annual legumes will grow quickly when planted in mid-summer if moisture is sufficient. Berseem and crimson clovers may produce up to 2 TDM per-acre, but 1-1.5 TDM is more common. Research data on N credits is limited. A two-year UWEX field trial in Sheboygan County, Wisconsin has shown either a small credit and/or a 10 bu/acre corn yield increase each subsequent year. Berseem clover has a more upright growth habit and is better suited to mechanical forage harvest. Crimson has lower, more prostrate growth and is often used for winter grazing in southeastern US. If weed pressure is high, it may be advantageous to plant annual clovers in a mixture with oats.

Medium red clover (MRC) can be seeded after wheat harvest but is best when companion seeded early in the spring. A common method for MRC establishment is frost seeding, or broadcast seeding into fall-established wheat early the following spring. Early-planted MRC will normally yield more biomass and creditable N (60-80 lbs/acre) than sequentially seeded annual legumes. As a perennial, with vigorous growth potential the following spring, termination of MRC is best started, chemically or with tillage, in the fall.

Field pea is a large-seeded, cool season annual, best companion-seeded with a spring cereal grain to encourage climbing and minimize lodging. Pea-small grain mixtures can also be harvested as forage, with similar yield, but slightly higher forage quality and palatability than small grain forage alone. Field peas, however, provide only a minimal N credit to a subsequent crop and will increase the cost of the seed mix.

For more complete management and selection information on these and other mid-summer cover crop options, including brassicas (radish, turnips and rapeseed) and species mixtures, see the UW Extension Cover Crop Workgroup’s website, Cover Crops in Wisconsin at http://fyi.uwex.edu/covercrop/. From the home page, click on the Selecting Cover Crops for WI tab and then on Wheat.

Non-Nodulating Soybean
Non-Nodulating Soybean in 2015 and Again in 2016 and Again in 2017

Shawn Conley, WI State Soybean and Wheat Extension Specialist

I have received a deluge (pun intended) of questions regarding the overall lack of soybean nodulation and general pale green coloration of the crop. As a doctor… well Ph.D….I prescribe less rain, sunshine, and call me in two weeks if the problem still exits… Outside of this obvious issue here are the four most common questions I have received and my responses for your consideration.
1. Why is nodulation such a problem this year? Abiotic stress such as low pH (≤ 6.0), saturated or droughty soils and cool soil temperatures can negatively impact nodulation (Valentine et al. 2011). Duzan et al. (2004) reported that root hair deformations (a physiological precursor to rhizobia infection and nodulation) was 64 and 82% of the control when rhizosphere (root zone) temperatures were 59 and 63 degree F when compared to 77 degrees F. This suggests that the cool soil temperatures we have been experiencing have likely limited the infection sites available for nodulation to occur. This effect has likely been exacerbated in no-till or compacted conditions. In short less nodulation sites on the roots means increased likelihood for less nodules.

2. I double inoculated my soybeans on virgin ground and my nodule count is really low? First, please refer to #1 above regarding abiotic stress on soybean nodulation. Secondly remember to read and follow the application, compatibility, and planting timing of inoculants. In reading through various inoculant labels today, I saw everything from ‘not tested’ to ‘not compatible to plant within hours to weeks to months of application’ Lastly remember there is a poor correlation between nodule number and N2 fixation, so don’t get overly concerned about nodule count; it is nodule efficiency that matters and you can’t measure that by counting. In short, read the labels and make sure everything is compatible and your application and planting window is adequate prior to purchasing the product.

3. How long will soybeans continue to put on new nodules? Dr. Purcell indicated that they can measure very active N2 fixation almost until the end of seedfill (personal communication). Given the normal life span of an active nodule is 4-5 weeks, this would suggest that soybean will continue to put on new nodules (if the environment is conducive and rhizobia are present) until R6 soybean (late pod fill).

4. Should I apply nitrogen to these poorly nodulating soybeans, and if so, how much? My general answer is no and none. First of all, the application of nitrogen to soybean beyond a “starter” rate (≤~30 pounds) will lead to a rapid and dramatic inhibition of N fixation (Sinclair, 2004). Though it does not appear that the applied nitrogen is directly damaging to the N fixation machinery (nodules), it will reduce or stop fixation. If the soil NO3 levels drop, then N fixation can resume in about a week (Sinclair, 2004). Over-application of N will shut down whatever rhizobia is actively working. Furthermore, our 2014 and 2015 data shows that a soybean plant takes up 3.75 pounds of N in above-ground tissue per bushel of grain. So a 80 bu/a crop removed 302 pounds of N/a. This does not account for below-ground uptake or nitrogen loss and efficiency from the applied nitrogen. In short, that is tough math to get a positive ROI on.

Literature cited:

Dr. Larry Purcell (personal communication 7/16/15)


Plant Disease Diagnostic Clinic (PDDC) Update, 6-29-17

Plant Disease Diagnostic Clinic (PDDC) Update, 6-29-17

Posted on June 30, 2017 by rwschmidt

The PDDC receives samples of many plant and soil samples from around the state. The following diseases/disorders have been identified at the PDDC from June 24, 2017 through June 30, 2017.

**FIELD CROPS**

Wheat, Stripe Rust, Puccinia striiformis, Dane

**FRUIT CROPS**

Apple, Phomopsis Canker, Phomopsis sp., Winona (MN)

Cherry, *Bacterial Canker*, Pseudomonas syringae, Dane

Cherry, Phomopsis Canker, Phomopsis sp., Dane

Pear, *Pear Scab*, Venturia pirina, Outagamie

Strawberry, Botrytis Fruit Rot, Botrytis cinerea, Clark

Strawberry, Tan-Brown Rot, Hainesia lythri, Clark
VEGETABLE CROPS

Bean (Pole), Rust, Uromyces appendiculatus, Brown
Potato, Black Leg, Dickeya dianthicola, Portage
Pepper, Fusarium Stem Rot, Fusarium sp., Washburn
Pepper, Pythium Stem Rot, Pythium sp., Washburn
Tomato, Myrothecium Leaf Blight, Myrothecium sp., Portage
SOIL
Alfalfa Soil, Aphanomyces Root Rot/Seedling Blight, Aphanomyces euteiches race 2, Green

Vegetable Crop Update 10, June 23, 2017

Amanda Gevens, Associate Professor & Extension Specialist, Potato & Vegetable Pathology, Plant Pathology Department, University of Wisconsin-Madison

Newsletter No 10 June 23, 2017

• late blight and early blight disease threshold/forecast updates (several locations at/over threshold for late blight DSVs)
• national late blight updates
• national cucurbit downy mildew updates

Wisconsin Pest Bulletin 6/29/17

Krista Hamilton, Entomologist, WI Dept of Agriculture, Trade and Consumer Protection

Volume 62 Issue No. 10 of the Wisconsin Pest Bulletin is now available at:

https://datcpservices.wisconsin.gov/pb/pdf/06-29-17.pdf

LOOKING AHEAD: Spotted wing drosophila flies appearing in more survey traps

FORAGES & GRAINS: Potato leafhopper counts near-threshold in western WI fields

CORN: Annual western bean cutworm moth flight now underway

SOYBEANS: Rose chafers, sand chafers and bean leaf beetles common in soybeans

FRUITS: First flight of codling moths subsiding across much of the state

VEGETABLES: Squash bugs appearing in vegetable gardens

NURSERY & FOREST: Assorted observations from this week’s nursery inspections

DEGREE DAYS: Degree day accumulations through June 28, 2017

Western Bean Cutworm

Bryan Jensen, UW Extension and IPM Program

Hopefully, most of you have seen DATCP’s Pest Survey Report (subscribe) which indicates some Western bean cutworm have emerged in Wisconsin. I know some of you have because it has prompted a few calls regarding the potential mismatch between western bean cutworm activity and corn growth and development.

Although corn appears behind “normal” I am not sure at this point if we will have a large scale mismatch. Let me explain. Yes, adults have started to emerge, however, this is just the start of a flight which will not peak until approximately 1400 degree days (base 500 F). Once the adults do emerge, time is needed for these adults to reach sexual maturity, to find a mate and for those eggs to develop within a female. Furthermore, once the eggs have been deposited an additional 5-7 days are required before those eggs will hatch. That will help close the gap between egg hatch and susceptible corn.

Likely, there will be geographical areas where WBC eggs will be laid and hatched on vegetative corn. From the references I have seen, it is probable that they will feed on newly emerging leaves until tassels and ears emerge. I do not know if extensive feeding on corn leaves will affect survival. Could other hosts be attractive in the event that only vegetative corn is available? The references aren’t clear but soybeans may/may not be a host and snap beans are a possibility. Either way, I would not expect significant egg laying in other crops.

Be mindful that delayed planting may make the earliest planted fields more attractive to WBC egg laying. These would be fields to watch early and may serve as a sentinel fields to gauge WBC activity.

Scouting

Although we don’t know for sure what the outcome will
be, scouting will help determine the need for treatment. Concentrate your efforts on the earliest planted corn fields as we approach the peak flight period.

- Examine 20 consecutive plants in each of five locations to get a representative sample.
- Observe the upper 3-4 leaves for larvae and/or eggs.
- Consider treating if 5% of the plants are infested with eggs and/or larvae.
- Once larvae have entered the ear they cannot be controlled.

Continue scouting for at least 7-10 days after peak flight. Infestations may be patchy within fields and this pattern may be accentuated by variability in corn development. Scout fields with above ground Bt proteins. These hybrids may have significant feeding depending on the protein used.

WBC eggs are dome-shaped and laid in clusters on the upper leaf surface. Initially they are cream-colored but will turn purple prior to hatch. Larvae will consume their egg shells after hatching making late scouting more difficult. Early instar larvae are dark colored with black heads. Initially larvae will migrate to the tassel to feed on anthers and/or pollen and are capable of dispersing several feet.

**Western bean cutworm egg mass near/at hatch. Egg mass turns from cream colored to purple 24-48 hours before hatch. Newly hatched larvae consume the egg shell, so egg masses are most evident before or immediately after hatch.**

*Photo: E. Cullen, Univ. of Wisconsin-Madison*

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**Weed Identification Series, Wild Buckwheat**

Mark Renz, UW Madison Associate Professor and Extension Specialist, and Chelsea Zegler, UW Madison Associate Research Specialist

Wild buckwheat is also known as black-bindweed or false buckwheat. While this species has been in Wisconsin for well over a century and documented in nearly all counties (exceptions are Barron and Washburn counties) it is frequently misidentified as a bindweed (either hedge or field). It is important to differentiate between these species, as wild buckwheat is an annual, therefore management method and timing can differ with respect to management.

As with most weeds it likes disturbed areas, so I typically see populations in corn and soybean fields but it can also be found along roadsides, and other right of way areas. It begins germinating in April, but can continue to germinate throughout the summer, and can be easily missed by post-emergent applications in crop. This results in significant vining and if populations are large increase harvest time in the fall. Plants can start to flower in June and depending on when they germinate flower later into the summer.

Due to a series of factors, this species is being seen more commonly in production fields throughout the Midwest. To view the identification sheet click here….

*http://ipcm.wisc.edu/download/weeds/Wild-Buckwheat.pdf*
Wild Buckwheat

Summer annual vine that is common in annual cropping systems and disturbed non-crop areas. Can increase harvest time in crops and is a host for several crop diseases.

**Leaves:** Heart-shaped leaves 1.0-2.5 in long that alternate along the stem. Basal lobes point towards the stem and the tip is elongated and slender.

**Stem:** Vines can be 8 to 60 in long. While young plants look upright, vines develop as plants mature and grow over other plants/objects. Stems have an ocrea (membranous sheath) where the leaf attaches to the stem (node).

**Flower:** Flowers lack petals, but have 5 white to greenish 0.2 in long sepals in small clusters at the base of leaves or stem tips. Plants bloom from June – August.

**Similar Plants:** This plant is often confused with field bindweed (vine-like perennial). Wild buckwheat can be distinguished by its annual root system, presence of an ocrea at each node and small flowers. Wild Buckwheat leaves are also heart-shaped compared to field bindweed’s arrowhead shaped leaves. Morninglory species can also be confused with this species as they are annuals with heart-shaped leaves, but flowers are large and not white.
Crop Diagnostic Training Center Workshop
July 25, 2017

The best of all workshops! This year our crop & pest management workshop and diagnostic troubleshooting workshop have been combined into a single day. The day starts with 2 hours of multi-disciplinary agronomic topics and culminates with 6 separate diagnostic troubleshooting scenarios.

Tuesday – July 25, 2017
Lunch is provided at noon
Tiered fee: $90 before 7/15/17, $100 after 7/15/17
Location: Arlington Ag Research Station
CCA CEU’s: 5.0*

Pigweed Species Identification & Control – Mark Renz, Extension Weed Science Specialist
• Is it pigweed? Waterhemp? Some other Amaranth species?
• This session will provide you with the tools to positively identify these troublesome weeds and discuss control options while considering herbicide resistance and recent technologies

Spray Drift Mitigation – Dan Heider, UW Integrated Pest Management Specialist
• Rain followed by more rain. When the rain stops, the wind seems to start with few good spray windows between. Are you confidently spraying on target?
• Nozzles and drift control additives will be demonstrated so you can really see what’s happening behind the spray boom

Diagnostic Troubleshooting – UW Specialists from multiple disciplines
• Fine tune your crop diagnostic skills in a fun and interactive setting. Small groups will rotate through field problems with UW Specialists role playing as farmers. Through digging up plants, asking questions and consulting references participants will make a diagnosis of the problem being observed and a recommendation for correction. Each participant will experience 6 separate diagnostic scenarios

Schedule:
8:30 - 8:50 registration
8:50 - 9:00 introduction/orientation
9:00 - 11:00 agronomic topics 1-2
11:00 - 12:00 troubleshooting sessions 1-2
12:00 - 12:45 lunch (provided)
12:45 - 2:45 troubleshooting sessions 3-6

Workshops begin in the Public Events Facility of the Arlington Agricultural Research Station. Be aware that this is not a “traditional” field day. Training sessions are designed to be in-field and hands-on. Therefore we advise that you come prepared for all types of weather.

*CCA CEU’s: Continuing education units/categories are subject to change pending approval from the Certified Crop Advisor Program.