IOWA STATE UNIVERSITY
Extension and Outreach

CROP NOTES for August 17, 2020
Iowa State University Extension Information for Northeast Iowa
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http://www.extension.iastate.edu/winneshiek/page/crop-notes-brian-lang
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GROWTH & DEVELOPMENT

Corn

Stage	Description of stage	Comments	Time to next stage
R3	Milk (white liquid in developing kernel)	Outside of kernel is yellow. Starch accumulation increasing.	~ 6 days to R4
R4	Dough	Starch accumulation increasing. Kernel moisture starts decreasing. Once corn reaches R4 stage, kernel number is established and yield reductions caused by stress would be from a decrease in kernel size. Time to start in-field yield estimates.	~ 7 days to initial R5 and 3 more days to ¼ milk line
R5	Dent	Hardening starch causes a depression (dent) in the butt end of kernel. The kernel hardens from butt to tip causing a visual horizontal "milk line" on the kernel face that progressively moves from the butt end to the tip end of the kernel.	
	¼ milk line 	Often begin silage harvest for bunkers. Whole plant is ~70% moisture. 65% DM in the kernel. Grain is ~52% moisture.	~6 days or 120 GDD to ½ milk line
	½ milk line 	Often a silage harvest target for upright stave silos. Whole plant is ~65% moisture. 90% DM in the kernel. Grain is ~40% moisture.	~10 days or 175 GDD to ¾ milk line
	¾ milk line	97% DM in the kernel. Grain is ~37% moisture.	~12 days or 175 GDD to R6
R6	Physiological maturity (black layer)	100% DM in the kernel. Grain is ~35% moisture. This is also good timing for aerial cover crop seeding.	R1 to R6 is ~31 days or 545 GDD

Soybeans

Stage	Description of stage	Comments	Time to next stage
R5	Seeds are 1/8-inch long in the pod at 1 of the 4 uppermost nodes on the main stem with a fully developed leaf.	By R5.5, plants obtain maximum height, leaf area and node number. Rapid and steady seed dry weight accumulation.	About 16 days to R6

R6	Pods contain green seeds that fill the pod to capacity at 1 of the 4 uppermost nodes on the main stem with a fully developed leaf.	Period of rapid, steady seed dry weight accumulation continues until R6.5 stage. Shortly after R6 stage begins, rapid leaf yellowing starts from the lower canopy spreading upward. R6.5 is good timing for aerial cover crop seeding, applying seed to the ground before extensive leaf drop occurs.	About 20 days to R7, which is near physiologic al maturity
R7	One normal pod on the main stem reached a mature tan or brown color. Plant is near physiological maturity.	Seed and pod abortion or reduced seed size can occur all the way through R7 stage. That is one more reason why early yield estimates for soybean fields are not very accurate.	About 10 days to R8 which is 95% of pods reach a mature tan or brown color

Estimating Yield in the Field

Corn

Kernel Count Method: Once corn reaches R4 stage, it will not abort kernels, so the kernel count method could be used. However, if the crop is under stress from R4 stage to maturity, kernel size could be affected and the standard kernel weight of 90,000 kernels per bushel used in this formula could over estimate yield.
Yield estimate formula: [(number of primary ears per 1/1000th acre) x (number of kernels per row) x (number of rows of kernels)] x 0.01116 = bushels per acre
Primary ear population per 1/1000th acre:

26 feet 2 inches for 20-inch rows
17 feet 5 inches for 30-inch rows
14 feet 6 inches for 36-inch rows
13 feet 9 inches for 38-inch rows

This method assumes a standard kernel weight of 90,000 kernels per bushel, so results can vary with the hybrid, test weight, kernel depth, etc. For a complete description of this process please read the following article: https://crops.extension.iastate.edu/cropnews/2017/08/estimating-corn-yields-using-yield-components

Soybeans

Seed and pod abortion can occur all the way through R7 stage which is one more reason why early yield estimates for soybean fields is not very accurate.
Yield estimate formula: [(number of plants/ac) x (avg. number of pods/plant on 10 random plants)] x [(2.5 seeds/pod ÷ 2500 seeds/lb.)] ÷ 60 lbs./bu. = bu./ac.

- This equation uses 2.5 seeds/pod; 2500 seeds/lb.; 60 lbs./bu. You can substitute whatever you think are appropriate numbers for bushel weight, seed size, etc. *Because of the difficulty in estimating these factors, most intelligent people don't take soybean yield estimates too seriously.*
- Examples: With a plant population of 130,000 per acre, 25 pods/plant, 2500 seeds/lb., and 60 lbs./bu.
  1. With 2.5 seeds/pod the estimated yield = 54 bu./ac.
  2. With 3 seeds/pod the estimated yield = 65 bu./ac.

CORN SILAGE

Harvest Tips (*compiled from articles by the University of Wisconsin and University of Minnesota*)

- Optimum silage moisture harvest ranges for different structures are: 50-60% for upright oxygen-limiting silos, 60-65% for upright stave silos, 60-70% for bags, and 65-70% for bunkers. Silage too wet may not

ferment properly and can lose nutrients through seepage. Silage is too dry when harvested has lower digestibility because of harder kernels and more lignified stover. It also does not pack as well.

- Due to variability among hybrids and growing conditions, use of a commercial forage moisture tester or microwave oven is highly recommended. The kernel milk line can still be used as a guideline when to start sampling plants from the field for more accurate moisture testing. A chipper-shredder and commercial forage moisture tester work well for this. Begin moisture testing when the milk line is 20% of the way down the kernel for horizontal silos, and 40% of the way down the kernel for vertical stave silos. An approximate dry-down rate per day is about 0.5-0.6% per day.
- For unprocessed corn, recommended chop length is 0.375" theoretical length of cut.
- For processed corn, recommended settings are a 0.75" theoretical length of cut with 0.08 to 0.12" roll clearance. The increased cut length reduces horsepower requirements while maintaining optimum particle size. Breakage of cobs and kernels increases surface area which improves digestibility, reduces cob sorting, and results in higher density silage that packs better. A crop processors greatest benefit may be when there are harder kernels resulting from delayed harvest or drought. While crop processors are not cheap, they generally provide a higher-quality silage product that can increase milk production by about 300 pounds per cow per year.
- Recommended cutting height is generally 4 to 6", as it maximizes silage yield and milk per acre. Cutting height can be used to adjust moisture content. Cutting at 12 inches decreases forage moisture 3-4%, decreases yield 10-15%, but increases forage quality 8-12%. So overall Milk per acre is only reduced by about 3-4%. This type of management could be significant when working with a custom chopper on their schedule.
- There is potential for high nitrates in drought-stressed silage, especially if harvested within 10 days of rainfall (since rainfall increases crop uptake of soil N). If there is any doubt about nitrate content, test the feed. Silage with high nitrate levels can be managed by dilution with other feeds and also by increasing the cutting height to 12".
- When harvest begins, fill silos rapidly to reduce exposure of silage to oxygen and to reduce fungal growth. For bunker silos, pack silage as tightly as possible in progressive wedges in depths of 6" or less.

Pricing Corn Silage

1. For a ballpark estimate of pricing silage based on corn grain value see the ISU Extension publication "Pricing Forage in the Field" http://www.extension.iastate.edu/agdm/crops/pdf/a1-65.pdf
2. For a more detailed approach to pricing corn silage, there is an Excel spreadsheet from ISU Extension called "Silage Pricer". It is on the following Ag Decision Maker website about two-thirds of the way down the page: http://www.extension.iastate.edu/agdm/decisionaidscd.html
3. There is also a mobile app from the University of Wisconsin for pricing corn silage. For details and the app links go to: https://fyi.uwex.edu/forage/new-extension-mobile-app-for-pricing-standing-corn-silage/

Use of Inoculants in Corn Silage

By Kevin Panke-Buisse, USDA-ARS Dairy Forage Research Center, published in the Midwest Forage Association *Forage Focus August 2020.*

Inoculating a forage crop with specific bacteria prior to ensiling can boost the population of desirable species, which may result in better fermentation, aerobic stability, and animal performance. The inoculant industry has grown to the point that the number and diversity of inoculant products available can be overwhelming. This article summarizes inoculant types and benefits as well as provides guidance on what types might be helpful in your corn silage crop.

Homofermentative LAB. The earliest commercial inoculants consisted solely of homofermentative Lactic Acid Bacteria (LAB). Examples include *Lactobacillus plantarum, Enterococcus faecium*, and select *Pediococcus species*. They take sugars and convert them to a single product – lactic acid – without CO2 or other undesirable byproducts evolving. They grow quickly and lower pH, suppressing undesirable and spoilage organisms quickly. They produce minimal waste (e.g., shrink) and conserve more

energy. Despite their strengths, homofermenters alone don't solve all of the issues associated with making corn silage. Often, inoculating with LAB does not necessarily improve silage quality. Corn plants often have enough naturally occurring LAB on their surface, to support adequate fermentation. Inoculation with homofermentative LAB can even decrease aerobic stability when compared to uninoculated corn silage. This makes sense when we consider that lactic acid alone does a poor job of inhibiting yeasts and molds contributing to aerobic deterioration of silage. If inoculation with homofermentative LAB shifts the acid profile too far from acetic acid production in favor of lactic acid, then decreased aerobic stability may be a consequence.

Heterofermentative LAB. In contrast, heterofermentative LAB are less rigid and can produce a variety of fermentation products. Commercial heterofermenters primarily produce lactic and acetic acid, but the amount and ratios of fermentation products depend on species and strain. They generally ensile more slowly than homofermenters and produce some undesirable byproducts, including carbon dioxide. Loss of dry matter as CO_2 is the primary reason for silage "shrink," and is also a source of energy loss. Sometimes ethanol can also be produced, but it is generally lost from the face after opening the silo, representing a loss of energy. When undesirable products are minimal, heterofermenters can impart increased aerobic stability, but will not lower pH as much as homofermenters. Historically, several species of heterofermenters appeared in commercial inoculants, but by far the most common today are strains of *Lactobacillus buchneri*. *L. buchneri* avoids many of the negative qualities of other heterofermenters since it uses a unique metabolic pathway. Discovered in the mid-'90s, it slowly converts a small portion of the lactic acid in a preserved crop to acetic acid and 1, 2-propanediol. This process does not produce significant waste and both acetic acid and 1, 2-propanediol contribute to aerobic stability and can prevent silage heating for several days following oxygen exposure. Unfortunately, this conversion of lactic acid only begins after ensiling has progressed enough for sufficient lactic acid to be produced in the silo. Consequently, *L. buchneri*-inoculated silage needs at least 45-60 days to have an increase in aerobic stability.

Mixed LAB. There's no need to choose between hetero- or homo-fermentative LAB species. Many inoculants are formulated with both, sometimes containing a handful of different species. Most commonly, we see the pairing of a fast, efficient homofermenter with the slower *L. buchneri* to provide a rapid pH decrease and maximum aerobic stability. While this seems like an ideal solution, it is not necessarily optimal. A recent review in the Journal of Dairy Science found several studies demonstrate that mixed inoculants often, but not always, perform better than the native LAB in uninoculated silages. These silages sometimes perform worse than those inoculated solely with *L. buchneri*.

Should I inoculate my corn silage? This will depend on region, management, economics, weather, risk aversion, etc. Research alone can't answer this, but it can guide decision-making. Inoculation can have an effect on initial ensiling, aerobic stability, and animal performance – each should be weighed when deciding on an inoculant. For corn silage, available evidence suggests inoculation does not provide noticeable benefit to silage quality during initial ensiling. Native LAB population on the forage surface is often more than equal to the task of ensiling under ideal conditions. It is important to remember, potential benefits of inoculation are greater in cases where sub-optimal conditions (poor yield, wet year) inhibit the native LAB population and/or favor spoilage organisms like clostridia, yeasts, and molds.

Corn silage aerobic stability can be influenced by inoculation. Benefits are largely conferred by *L. buchneri*, but benefits from *L. hilgardii* and *L. brevis* have also been observed. While inoculation is not a guaranteed benefit, it is generally accepted that *L. buchneri*, alone or in a mix, can increase aerobic stability, but dose is important. A meta-analysis reported corn silage stability was 25 hours when uninoculated, 35 hours when inoculated with 100,000 cfu or less *L. buchneri*/g of fresh forage, and an impressive 503 hours when inoculated above 100,000 cfu/g of fresh forage [*J. Dairy Sci.* (2006) 89:4005-4013]. In many cases, inoculation with *L. buchneri* alone produced the best results, but outcomes depended on the native LAB community, which is difficult to predict.

I've written previously about the animal performance benefits of silage inoculation (*Forage Focus August 2019*). This is still an active area of research, but a meta-analysis of previously published studies revealed significant and consistent improvements in milk yield and numerical increases in milk fat and protein associated with bacterial inoculation of ensiled forages [*J. Dairy Sci.* (2017) 100:4587-4603]. Studies detailing animal-performance benefits largely focus on homofermentative inoculants. There have been too few feeding

trials using silage made with mixed inoculants to draw solid conclusions at this time. Ultimately, when it comes to making a decision about whether or not to inoculate corn silage, be sure to consider the conditions that year, how important aerobic stability is to you, and if potential animal performance benefits might tip your cost:benefit calculations. If you are consistently getting good, uninoculated fermentation in your corn silage, but want to reduce yeasts and molds and increase aerobic stability, adding an *L. buchneri* inoculant will likely help. If you want to hedge your bets because you're concerned about a wet spring, a mixed inoculant might help and shouldn't hurt.

INSECTS

Potato Leafhopper (PLH) – *stay on top of this pest for 2 more weeks*

Continue scouting through August. Scouting and management tips are available at: http://www.extension.iastate.edu/CropNews/2009/0615hodgson.htm The only way to properly scout for PLH is with a 15-inch diameter sweep net. Once we get into late August with 2 or 3 consecutive cool night temperatures the potato leafhopper populations will drop-off.

Spider Mites

Be aware of this pest all the way into R6 stage (seed fill), but treatments by R5 stage are more effective. Some droughty areas in northeast Iowa have been treating for spider mites. The following link provides tips on scouting and treatments: https://crops.extension.iastate.edu/cropnews/2020/07/scouting-reminders-spider-mites Organophosphate insecticides control adult and immature spider mites but not the eggs, so it is not uncommon to see a resurgence of the pest in 7 to 10 days after treatment. Miticides like Zeal control the eggs and immature spider mites but not the adults. So, again, a resurgence is possible if the residual runs out before the next egg laying. Most pyrethroids are not effective against two-spotted mite except bifenthrin. For a list of products on mites in corn and soybeans go to the University of Nebraska article at: https://cropwatch.unl.edu/2016/managing-spider-mites-corn-and-soybean?utm_source=University+of+Nebraska-Lincoln+CropWatch&utm_campaign=171b888260-EMAIL_CAMPAIGN_2019_12_22_11_28_COPY_01&utm_medium=email&utm_term=0_d184080585-171b888260-137128221

Flare up in infestations often start at a field edge.


Stippling on leaf surface (right) with mites on leaf underside (left).

Soybean Aphid – *spotty high population outbreaks*

I just had a report of high soybean aphid populations in northern Winneshiek County. Higher than the numbers I have reported in the table below. And a greater concern since those fields are not as far along in maturity as for the field reported below. Consider using an oganophosphate insecticide rather than a pyrethroid since a pyrethroid application could help spider mites flare up, and some soybean aphid populations are showing resistance to some pyrethroid products. Neither pyrethroids or organophosphates kill spider mite eggs, so watch for a later potential flare up of spider mites following the insecticide treatment.

Our typical window for scouting of soybean aphid in northeast Iowa is mid-July through August. ***Speed scouting is the preferred method for scouting. It's simple and quick.*** A free scouting card with instructions is available at:
https://www.ent.iastate.edu/soybeanresearch/files/page/files/2009_speed_scouting_blank_form.pdf When scouting, it is easiest to randomly pull a plant out of the ground and hold it underside down to view aphid presence throughout the plant.

FYI, here's my aphid counts per week for 30 random plants in a local field near Decorah. This field has a considerably higher infestation then for all other fields that I have scouted in the area. There are always a few 'hot spots' relative to the general pest distribution, thus another reason to scout rather than just treat a field with an insecticide. The majority of the aphids will be in the mid- to lower canopy on the underside of leaves and will be rather small with a whitish color. FYI, photo below. If the 250 threshold is not reached by R6 stage, the field is usually safe from a significant economic loss without treatment.

Date	Crop stage	% infestation	Avg. aphids/plant of infested plants
July 20	R4	96	12
July 27	R4	100	54
Aug. 3	R5	100	189
Aug. 10	R5.5	100	507
Aug. 17	R6	100	854

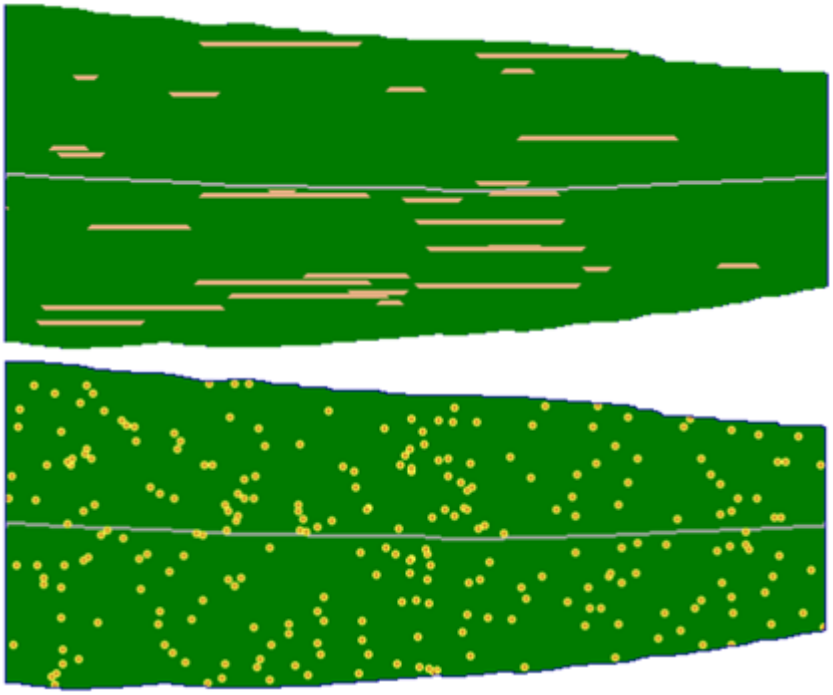
Threshold is >80% infestation with >250 aphids/plant.

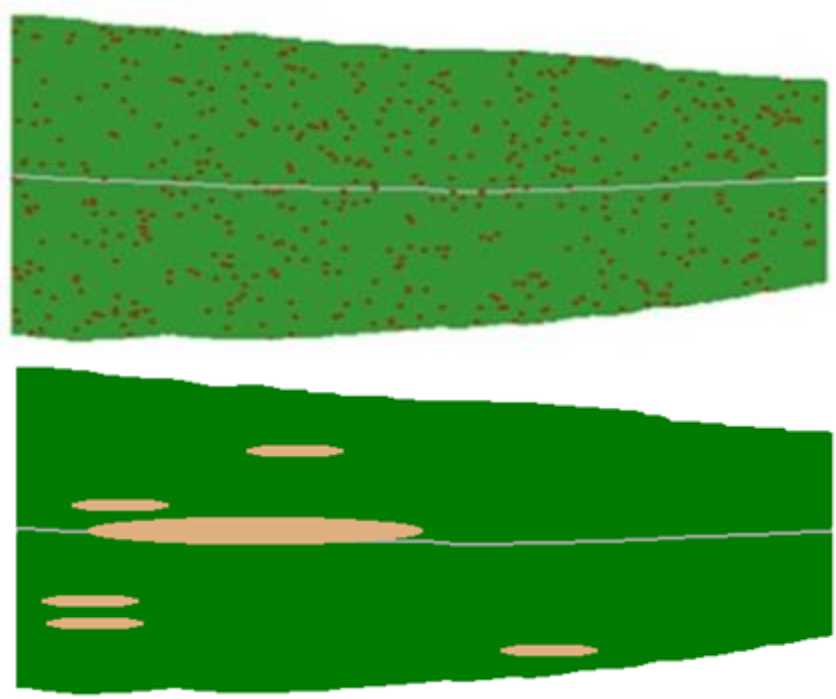
Small white aphids on mature leaves (above) vs. more active aphid activity on developing leaves (below). We count all of them to determine threshold.

DISEASES

Rate Corn Leaf Disease Level at R5

A good hind-site evaluation tool for foliar diseases in corn is to assess percent leaf disease of the ear leaf at R5 stage. In general, if the ear leaf is rated at >5% leaf disease, the disease pressure in the field is likely causing a significant yield reduction. If the ear leaf is rated at <5% leaf disease, the disease pressure in the field is likely insignificant. Below are images (top to bottom) of 5% for Gray leaf spot, Eyespot, Rust and Northern corn leaf blight?





FORAGES

Are You Planning a Late Summer Perennial Forage Seeding?

Obviously this is a location by location judgement call based on available moisture to establish a stand. Planting in the first half of August is the usual target in northeast Iowa to start a new alfalfa, alfalfa-grass, or perennial grass stand for forage for next year. The typical steps in the process are provided in a recent ICM News article at: https://crops.extension.iastate.edu/cropnews/2020/07/planning-late-summer-perennial-forage-seeding

Timing Your Last Alfalfa Harvest of the Season

Heading into fall there are always questions on when that last cutting for the growing season should be made and still allow enough time for alfalfa plants to build carbohydrate reserves in the crown before the first killing frost. The most common answer to this question is to harvest at least 6 weeks before the killing frost of 25 degrees F. The average occurrence of an alfalfa killing frost in northern, central and southern Iowa is October 25, October 28 and November 1, respectively. This means there is minimal risk harvesting alfalfa through about September 10 in northern Iowa, September 13 in central Iowa and September 17 in southern Iowa.

While the '6 week' answer works well, the more correct answer uses alfalfa growing degree days (GDD) rather than a calendar date. Researchers have found that as long as alfalfa plants harvested in September can accumulate at least 500 GDD (base 41 degrees F) before the occurrence of a killing frost, the plants will have sufficient time to store adequate carbohydrate reserves to survive the winter. However, since we do not the actual date of the killing frost, both the 500 GDD method and the '6 weeks' method are still guesswork. But at least we have a better understanding as to why this rest period is important for alfalfa overwintering.

If you choose the option to harvest after the killing frost, the GDD research suggests that you do not have to wait for the actual killing frost to occur before harvesting. Waiting for the frost causes leaf drop, reducing forage quality and yield. As long as less than 200 GDD occur from harvest to killing frost the plant should still have adequate root carbohydrate reserves for overwintering. Once again, its guesswork as to when the killing frost will occur, but watching the 7 to 10 day forecast could provide a pretty good idea. Historically, a good target date in northern Iowa to harvest with 'less than 200 GDD before the killing frost' is October 15. If the killing frost has not occurred by October 15 it likely will occur soon, and the weather in late October is

usually cold enough that the killing frost will occur before 200 GDDs accumulate. Similar suggested dates for central and southern Iowa would be October 18 and 24, respectively.

Cutting height is important when taking a late fall harvest. Leave about 6 inches of stubble to help trap snow and insulate the plants over winter. This help reduce stress on the stand by more than what most give it credit for. For example, photo 1 taken on April 8, 2008 shows half of the field was harvested in late fall 2007 and half was not. The harvested half was cut short, so there was no stubble for insulation for the winter. The 2007-2008 winter was a bit on the harsh side. Photo 2 and Photo 3 taken April 22, 2008 show initial spring regrowth of the alfalfa stand. The right side of the field survived the winter and shows healthy spring growth. The left side of the field never recovered sufficiently from winter injury and was rotated to corn. It's likely that if the left side was allowed at least 6 inches of stubble height when harvested it would have fared better. Most situations are not this dramatic such that you may not lose the entire stand, but rather would likely lose a percentage of plants and have a slower recovery in spring resulting in a lower first crop yield in spring.

Photo 1 taken April 8 shows half of an alfalfa field that was harvested late in the fall to half that was not harvested. The harvested half was cut short, leaving no stubble for insulation for winter.

Photos 2 and 3 taken April 22 show initial spring regrowth of the alfalfa field. The right side of the field survived the winter and has healthy spring regrowth. The left side did not recover sufficiently from winter injury and was rotated to corn.

COVER CROPS

Aerial Seeding Window

As mentioned under *Growth & Development*, aerial seeding of cover crops is usually timed for R6.5 stage in soybeans (leaf yellowing, but before significant leaf drop), and R6 stage in corn (Black layer, leaves drooping and opening up the canopy for sunlight to reach the ground). If soil conditions are dry, we usually delay seeding the cover crop until soil conditions become more favorable.

Testing Cover Crop Seed for Farm Use

1. What tests to have a testing lab run for farm-use cover crop seed?
   - For sale to others: Mechanical Purity, Noxious Weed Exam, Standard Warm Germination
   - For the NRCS cover crop program: Purity, Germination
   - For Own Use: Germination
2. How much seed to send the testing lab?
   - About 2 pounds or a gallon size zip-lock bag ¾ full of cereals, vetches, sorghums, or seeds of similar size.
3. More details on seed testing, mailing, ISU Seed Lab address, etc. are provided in the attachment titled "2020 Testing Cover Crops for Farm Use".
4. Addition details on "Sampling Seed in Bulk Containers" is included in the second attachment.

UPCOMING EVENTS

Aug. 6 - Aug. 20, Drought Webinar Series

More than half of Iowa is considered "abnormally dry" and nearly 40% of the state is in moderate to severe drought, with the worst conditions in the west central portion of the state. The webinars will run from 1:00 to 2:00 PM on Aug. 6, Aug. 13 and Aug. 20. Topics will include a general weather update, drought monitor updates, pasture and hay shortages, preparing for silage and nitrates, yield estimates, and end-of-year considerations related to grain quality and storage. Registration is free but is required for participation. For more details, please go to: https://www.extension.iastate.edu/news/drought-webinars-begin-iowa-july-30

Aug. 19-28, Swine Building Maintenance Webinar Series

ISU Extension is joining industry partners to offer a 5-part webinar series on the maintenance issues faced by facility managers and maintenance crews. The sessions are geared toward livestock producers, livestock building owners and contractors, facility managers, maintenance crew members, engineers, designers and others interested in techniques for better ventilation, concrete and truss management, and maintenance of swine buildings. Each session is offered from 1:00 to 2:00 PM by Zoom videoconference.

- Aug. 19 – It Is Your Concrete Pit as Well.
- Aug. 21 – Maintenance of Concrete Pits and What to Look For.
- Aug. 24 – Gable End Attic Air Intakes for Roof and Moisture Management.
- Aug. 26 – General Maintenance Tips for Swine Buildings.
- Aug. 28 – Building Truss Management.

The series is offered in collaboration with the Iowa Department of Natural Resources and sponsored by Ag Property Solutions, AgVICE, Hills Bank, Hog Slat, Iowa Pork Producers Association, Marcus Lumber and Pinnacle. Advance registration is required to participate and must be completed by midnight, Aug. 17. Registration is $20 for all 5 sessions. Payment is online with credit card only. Online registration and additional information is available at www.aep.iastate.edu/building

Aug. 25, Industry Experts Discuss Dairy Outlook, Webinar

Free program, no registration required, starts at noon. The I-29 Moo University Consortium welcomes Rabobank's global dairy strategist Mary Ledman and Vice President of Dairy Research Ben Laine for a discussion on the outlook for the global and United States dairy markets. For more information and the Zoom link go to: https://www.morningagclips.com/industry-experts-to-discuss-dairy-outlook/

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