Agronomy Newsletter: February 2024

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Thank you all for excellent 2023 season, and for a great start to the 2024 season. We are finally settled into the new warehouse and office, and we are looking forward to another year of servicing you all. We couldn't do what we do without the support of all of our farmer customers, and we are always looking for new ways to bring value to your operations. Also, this newsletter and all of our previous newsletters, as well as our test plot data from the last 3 years are posted on our website. Go check it out at emenhisercropsolutions.com.

Dane and Alex

2023 Season Recap: Where Did the Yields Come From?

As we look back on another growing season, we were dealt another challenging year and lots of "learning opportunities". Despite the challenges, much of our area experienced yields that outpaced our expectations. There are several key reasons we were able to raise good, and in some cases exceptional yields, in a growing season that presented many challenges. I will give breif recap of the growing season, and highlight how we were able to overcome some of the tough conditions we faced this year.

The 2023 planting season started off with an abnormally dry April. Cool temperatures and forecasted rains kept some operations from planting, while many others took advantage of some of the best soil conditions we have seen in mid-April. A few rain spells kept most planters sitting from the end of April through the first part of May. There were many beans planted in the April window, but the majority of corn acres were planted after mid-May. In general, emergence and stand uniformity was excellent on both corn and soybeans despite some seeds laying in the cool soil for several weeks. The rain shut off in mid-May and we stayed dry through June and the first part of July. The dry weather created some uneven emergence and growth in later planted crops, especially where tillage or weed pressure left seeds in dry soil waiting for rain. In late June and early July we experienced the smoke and haze from wildfires, as well as many cloudy days. We received very few rain events throughout the rest of the growing season, but the few we got came very timely.

Now I will examine some of the key factors that helped us reach yields well above many of our expectations.

- Timely rains helped to keep the crop from experiencing any really severe moisture stress.

- Cool cloudy (and smokey) days following the rain events minimized evaporation, and helped to take advantage of all the moisture we got.
- Mild temperatures lowered water use requirements (will discuss this more in the next section).
- Very few days outside of optimal growing temperature for corn. Only 3-4 days over 90 degress, cool nighttime temperatures, and few windy and low humidity days.
- Excellent plant stands and very little tip-back, paired with favorable weather for extending grain fill gave us more kernels per acre and larger than anticipated kernels.
- Very little disease pressure enabled plants to stay healthy through maturity (outside of any areas that experienced premature death due to moisture stress or Anthracnose)

All of these factors and more led us to yields that were at the minimum 20 bushels per acre higher than we expected. While there were areas that didn't see these higher yields due to more localized conditions, I think we all were surprised at the resiliency of the crop to handle the tough environment this year.

Corn Water Use

One of the biggest questions we had this year was how we were able to grow the corn crop we did with the small amount of rain we received. We have shared the chart to the right many times, which shows what the average water demands are for a corn crop. The consensus among the industry is that a corn requires about 26" of water to raise an average crop. Water demands between the V8 stage and Full Dent are 18-20". In that same time span this year, we received about 10" of rain. So how did we raise an above average crop with about half the rainfall it would typically require? I will discuss several things that affect corn water use, and also how some assumptions in the research have led to the numbers that they advertise.

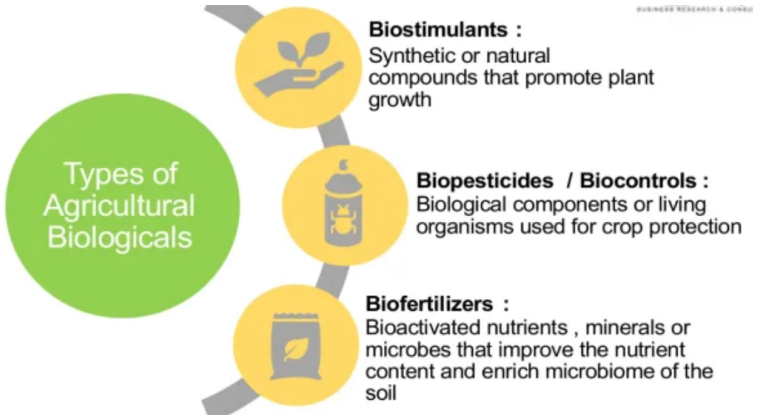
Growth Stage	Daily Water Use Rate	Water Use Per Stage	Cumulative Water Use
	inches		
Emergence (VE)	0.08	0.8	0.8
4-leaf (V4)	0.10	1.8	2.6
8-leaf (V8)	0.18	2.9	5.5
12-leaf	0.26	1.8	7.3
Early tassel (R1)	0.32	3.8	11.1
Silking (R2)	0.35	4.1	15.2
Blister Kernel (R3)	0.32	1.9	17.1
Beginning Dent (R4.7)	0.24	3.8	20.9
Full Dent (R5.5)	0.20	3.8	24.7
Maturity (R6)	0.10	1.4	26.1

To start, water serves 4 main functions in the plant: evaporative cooling to maintain a steady plant temperature, as a carrier for nutrient and sugar transport, aids in cell growth and expansion, and as a source of hydrogen for photosynthetic products and plant structures. **What is not stated in most research is that these requirements for plant growth make up only about 60% (15") of the total water use. The other 40% (11") is attributed to evaporation from the soil.** With that understanding, it is now much easier to see how we were able to grow the crop we did on very little water. Below, I will discuss a few of the environmental and management factors that led to the extremely efficient water use in 2023.

- **Very little evaporation:** No large rain events with extensive runoff or ponding, coupled with cool and cloudy days allowed us to capture and use the vast majority of rain we received. If evaporation accounts for 40% or more of water requirements, eliminating or reducing that cuts water needs drastically.
- **Mild Temperatures:** Cool daytime and nighttime temps greatly reduce total water required. An increase in temps from 80 degrees to 95 degrees doubles the water requirements of the crop. Daytime temps above 86 degrees are detrimental to corn growth and require more water, and high nighttime temps only excascerbate the problem. We experienced neither of these to any extent this year.
- **Very few days of sunny, windy, low humidity weather:** Evaporation and water needs for evaporative cooling of the plant increases substantially on hot, sunny, windy and low humidity days. Thinking of previous drought years, these days were common. However, this year we experienced very few.
- **Excellent Ground Conditions:** With no large pounding rains to seal and crust the soil, the vast majority of water we received entered into the soil quickly and efficiently. Minimal tillage and the use of cover crops in some areas also helped to conserve water by reducing evaporation once it was in the soil.

All of the statements above contributed to an extremely efficient use of water this year that allowed us to grow excellent crops in what seemed like a major drought. If a few key environmental conditions were changed, it could have been much different.

Biologicals 101



Biologicals have been a hot topic the last several years, garnering a lot of attention and talk amongst farmers. We get asked a lot about them in general, and about specific products. However, many farmers are still confused as to what all falls under the umbrella of “biologicals”. There is good reason to be confused, because many vastly different types of products are all lumped under that same umbrella, sometimes for ease of discussion and sometimes by lack of knowledge. In this section, I will discuss the different types of products that fall under the “biologicals” name, as well as try to dissect where they might have some utility in your operation.

The three main groups that I will talk about are: Biostimulants, Biopesticides, and Biofertilizers.

Biostimulants: Some examples are humic and fulvic acids, plant hormones, plant extracts such as kelp or seaweed extract, and microbes that stimulate plant growth.

In general, biostimulants are as advertised, compounds or microbes that stimulate plant growth or nutrient uptake. As you can see above, they come in many different forms with many different modes of action. They can work by enhancing root growth, improving nutrient uptake, increasing stress and or disease tolerance.

Biopesticides: Biopesticides use natural compounds, bacteria or fungi, and even predatory insects to protect crops from insects and diseases.

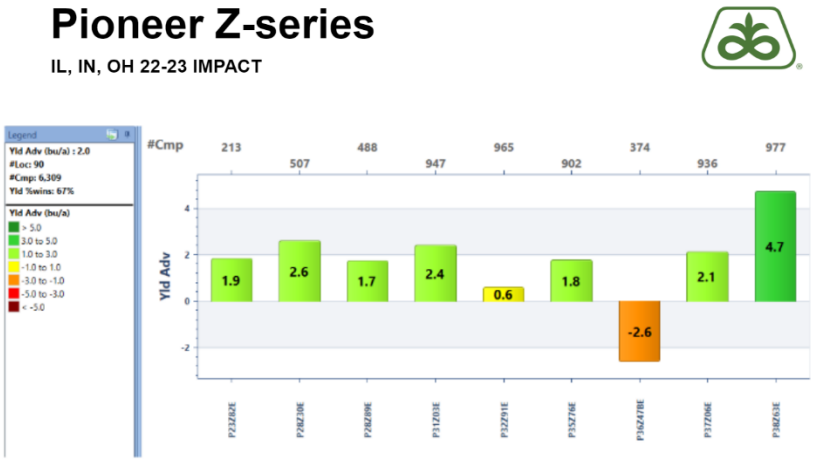
Biopesticides can be very targeted to a certain pest or disease by introducing or treating a plant with microbe or insect known to be predatory or suppressive to the pest or disease. They can also work by priming the plants built in defenses and preparing it for future attacks or diseases. There are several examples of beneficial fungi and microbes that protect plants from diseases by either outcompeting pathogens, or directly inhibiting them. The fungus *trichoderma harzianum* is used as a biofungicide to protect roots against pathogens like pythium, fusarium, and rhizoctonia.

Biofertilizers: Using living microbes to fix atmospheric nitrogen, solubolize nutrients in the soil, or promote nutrient uptake to the plant.

Biofertilizers are what most farmers associate with the term “biologicals”. A common example of a biofertilizer that has been used for many years is the rhizobium bacteria that we innoculate soybeans with. Other examples include the use of phosphorous solubilizing bacteria that can improve phosphorous availability in the soil, or other nitrogen fixing bacteria that work either around the roots or even in the leaves of plants.

In most cases, biologicals are not going to be a direct 1:1 replacement for the standard inputs that we use today. As with any living, breathing organism, they must have the proper environment to thrive. In general they are meant to supplement current practices, and for them to work, the management system as a whole needs to take into account that they are alive. Simply adding a jug of microbes to a system that otherwise is trying to eliminate microbes is not going to lead to consistent successes with these types of products. As always, we are happy to discuss any of these topics in more detail to anyone who is interested.

Product Spotlight: Z Series Soybeans



There is a lot to be excited about for the next class of soybeans we are advancing. **Bringing yield advantages of 2-4 bushels per acre against our current elite lineup**, the new Z Series soybeans will be a game changer. With new varieties from 2.3s to 3.8s, it is essentially a whole new lineup. On top of the added yield, **improvements in white mold, phytophthra, and SDS scores bring even more agronomic stability**. We will be testing these during the 2024 growing season, and showcasing the next great class of Pioneer Soybeans.