THE LEADING EDGE

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A PUBLICATION DEDICATED TO MAXIMIZING YIELD POTENTIAL

In Pursuit of the Perfect Ear

All producers dream of walking into their fields to find stalk after stalk ripe with 16-row, 40-plus kernel-per-row ears. Of course, the high yields this kind of ear will result in are gratifying, but perhaps more so is the knowledge that all the time spent planning, analyzing, gambling, and dealing with the unexpected has paid off. Each field is full of "the perfect ear."

Now, if producers could only follow the same step-by-step process next year and be assured of the same results!

But the business is agriculture and the rule is variability. The fact is that much of what determines yield is out of producers' control. Producers can, however, be aware of the many factors that determine yield, and work to utilize best practices on those factors that can be controlled.

Yield is a function of kernel number and kernel weight. While hybrid plays a critical role in determining the number ears per plant, the health of those plants can be affected long before the seeds are put into the ground.

"Growing the perfect ear of corn is no easy task. We need to align the best cultural practices with the correct hybrid for the field and hope the weather cooperates with our decisions. Moving to continuous corn adds new stresses and risks which potentially dictate a different hybrid selection. The great news is that new technologies, genetics, and information available help us reduce stresses in all situations and reach for the perfect ear."

Doug Clouser, Beck's Hybrids Product Placement Specialist

In The Fall

In reduced tillage and continuous corn situations, fall is the time to begin thinking about residue management. Proper management will result in an improved seedbed, stronger plants, and higher yields. Set your combine head to leave stalks of a manageable height and consider a fall nitrogen application to break down tough hybrid residue.

Emergence

There is not a stage of the spring planting season that is not important for plant development; however, four are more critical than others in connection with determining yield. (Dr. Kurt Thelen, Crop & Soil Sciences, Michigan State University)

With the Yetter 3-coulter system we were able to plant into soybean stubble and corn residue without any broadcast tillage of the soil. The corn planted into bean residue was some of the more even stands that I have ever experienced, and even the corn-on-corn was able to recover from our early wet and cold conditions faster than other corn-on-corn in our area."

Mike Homandberg, Minnesota

The first critical stage of plant development is emergence. Corn does not compensate well for poor stands, so establishing one that is uniform is key. Today's hybrids handle stress associated with high plant populations well, and it is wise to adjust your plant population upward until you reach the optimum level.

The right planter adjustments and attachments contribute significantly to uniform emergence and stands. Use coulters designed to handle your soil conditions for optimum results. Using coulters increases the capacity of the soil to hold moisture and aids germination for uniform emergence. Yetter Manufacturing offers a complete line of coulter attachments to meet all your planting needs.

Ear Size Determination

The second critical stage is when the plant determines the rows and potential kernels per row. Row number and number of kernels per row determine ear size.

Row number is determined strongly by genetics and is generally determined around growth stage V12 (when brace roots are beginning to grow). Environmental stress after this stage will usually affect only the make-up of the kernels themselves, and stress prior to V12 has to be significant to change the pre-determined number of rows on the ear.

Potential kernels-per-row is a more volatile development that can be affected by field conditions. Some researchers estimate there may be as many as 1,000 ovules (potential kernels) per ear. Controlling pests and monitoring plant health are critical during these stages. According to Jerry Baysinger, who has his PhD in Agronomy and farms in Nebraska, the recipe for growing that perfect ear of corn to optimize yields also includes maintaining no-till conditions whenever possible.

However, the most important factor in kernel-per-row development may be nutrient supply. Baysinger pinpoints correct placement as the most important nutrient-management factor. "Mother Nature can throw curve balls, and for that reason, it's important to determine the best placement. You've got to give yourself a chance to get ahead," said Baysinger.

Baysinger has found that in his strip till operations, this means placing nutrients, especially nitrogen, deep below the corn plant. "Conventional tillage operations often utilize a 2x2 placement rule, but we have found that in our strip till, placing nutrients 8 to 9 inches below the seed is best."

Roots need to reside in fertilizer-rich zones. "The backbone of the corn plant is comprised of nitrogen, potassium, and phosphorus," Baysinger says. "Synchronization of these nutrients with corn root development is crucial for maximum yield."

Research investigating the influence of nitrogen timing shows how early-season stresses can also influence ear development (see figure 1 below). A deficiency in nitrogen before V8 caused a decrease in ear diameter and ear length as well as kernels per ear. Applying nitrogen after V8 and supplying it the rest of the season (see treatment N1) still results in a significant yield reduction because the ear parameters were set earlier. (Roger Elmore and Lori Aberdroth, Department of Agronomy, Iowa State University)

Nitrogen deficiency has also been linked to kernel abortion, which results in poor ear-fill. It most often affects kernels near the top of the ear as they are the last to be pollinates and connot compete for nutrients.

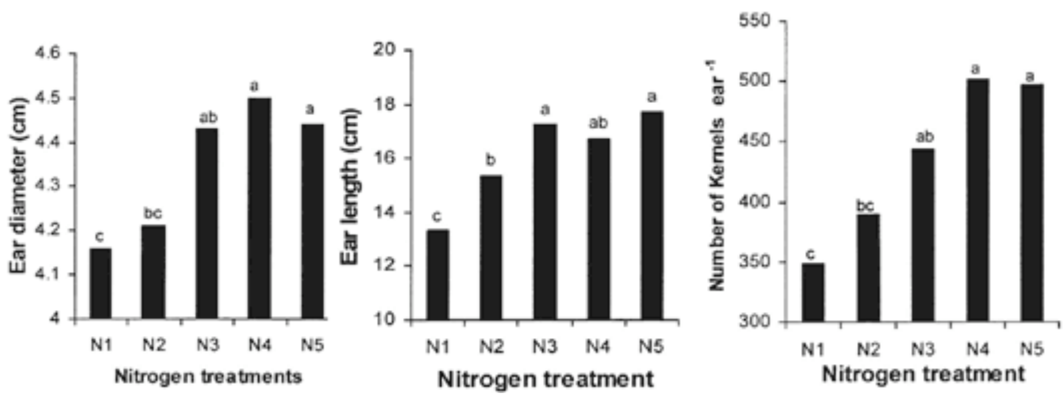

Figure 1: Effect of different nitrogen treatments on ear diameter, ear length, and number of kernels per ear (averaged over three hybrids). Nitrogen treatments are as follows: N1 (N supplied from V8 to maturity); N2 (N supplied from emergence to V8); N3 (N supplied from emergence to silking); N4 (N supplied from emergence to 3 weeks after silking); and N5 (N supplied from emergence to maturity). If columns have the same letter within each parameter, they are not significantly different from one another (at P = 0.05). Source: Subedi, K.D., and B.L. Ma. 2005. Crop Sci. 45:740-747. (2.54 cm = 1 inch)

Because nitrogen deficiency can negatively affect ear development and is linked to kernel abortion, producers should make sure plants have access to enough nitrogen. Choosing the right tools for nitrogen placement and determining the time to apply is critical. Starter fertilizers placed in the optimal location gives young roots access to needed nutrients like nitrogen throughout the growing season. The key to successful starter fertilizer use is in the correct placement.

Yetter Manufacturing Company offers a complete line of fertilizer application equipment to ensure that producers use less fertilizer, save money, and facilitate high yields. All models allow for depth and down-pressure adjustments to satisfy specific conditions.

Pollination

Pollination is the third critical stage that determines whether or not plants produce the perfect ear. The number of ovules that are successfully pollinated will determine the final number of kernels on the ear. A grain of pollen, shed from a tassel, must land on the exposed silk, form a pollen tube, and travel down the length of the silk to fertilize the ovule. Pollen from a plant rarely fertilizes its own ovules.

Pollen shed usually happens during the late morning and begins two to three days before silk emergence and continues for five to eight days after, with a peak on the third day. Incomplete pollination also results in poor ear-fill toward the tip.

The success of pollination depends almost entirely on the weather. Hail can be particularly damaging to emerging silks. One thing producers can do to aid successful pollination is to scout for and control pests such as adult corn rootworm beetles, which feed on emerging silks.

One method of estimating the success rate of pollination is to gently unwrap the husk leaves from an ear whose silks have begun to turn brown, indicating fertilization is in process. Those silks should easily detach and fall from the ear, leaving silks attached to unfertilized tubes behind. Sampling several ears in this manner and gauging the proportion of fertilized silks to those left behind will indicate the level of success. (Mike Rankin, Crops and Soils Agent, University of Wisconsin)

Kernel Development

During the kernel development period, the weight and size of kernels are determined. The many stages the ear progresses through during this period are characterized by terms such as blister, milk, roasting, and dent.

> **Did you know?** More specific terms for the many stages of kernel development have been defined.

The full process takes from 60 to 70 days and ends at kernel black layer formation. Although field and machinery may influence final yields, success during this phase depends on nature. Drought, insects, nutrient deficiencies, and disease can all have significant effects on yield during these stages.

Estimating Corn Grain Yield

Many methods exist for determining yield, both before and after harvest. In today's agriculture industry, planning for the following spring begins long before harvest, so it is beneficial to have an idea of the results of the products and processes put to work before the official yield numbers are returned.

The yield component method is popular because it can be used as early as the roasting ear, or R3, stage of kernel development. It is based on the assertion that yield can be estimated by estimating the components that make up grain yield, including: number of rows per acre, number of kernel rows per ear, number of kernels per row, and weight per kernel.

Weight per kernel cannot be accurately measured until harvest. An average value per kernel weight, 90,000 kernels per 56-pound bushel, is used in the 5-step process outlined below.

1. At each estimation site, measure a length of row equal to 1/1000th acre. For 30-inch (2.5 feet) rows, this equals 17.4 feet.
   TIP: For other row spacings, divide 43,560 by the row spacing (in feet) and then divide that result by 1000 (e.g., [43,560/2.5]/1000 = 17.4 ft).

2. Count and record the number of ears on the plants in the 1/1000th acre of row that you believe to be harvestable.
   TIP: Do not count dropped ears or those on severely lodged plants unless you are confident that the combine header will be able to retrieve them.

3. For every fifth ear in the sample row, record the number of complete kernel rows per ear and average number of kernels per row. Then multiply each ear's row number by its number of kernels per row to calculate the total number of kernels for each ear.

TIPS: Do not sample nubbins or obviously odd ears, unless they fairly represent the sample area. If row number changes from butt to tip (e.g., pinched ears due to stress), estimate an average row number for the ear. Don't count the extreme butt or tip kernels, but rather begin and end where you perceive there are complete "rings" of kernels around the cob. Do not count aborted kernels. If kernel numbers are uneven among the rows of an ear, estimate an average value for kernel number per row.

4. Calculate the average number of kernels per ear by summing the values for all the sampled ears and dividing by the number of ears.
   EXAMPLE: For five sample ears with 480, 500, 450, 600, and 525 kernels per ear, the average number of kernels per ear would be (480 + 500 + 450 + 600 + 525) divided by 5 = 511.

5. Estimate the yield for each site by multiplying the ear number by the average number of kernels per ear, then dividing that result by 90. The value of '90' represents the average number of kernels (90,000) in a bushel of corn.
   TIP: Use a lower value (e.g., 80) if grain fill conditions have been excellent (larger kernels, fewer per bushel) or a larger value (e.g., 100) if grain fill conditions have been stressful (smaller kernels, more per bushel).

EXAMPLE: Let's say you counted 30 harvestable ears at the first sampling site. Let's also assume that the average number of kernels per ear, based on sampling every 5th ear in the sampling row, was 511. The estimated yield for that site would be (30 x 511) divided by 90, which equals 170 bu./ac. Repeat the procedure throughout the field as many times as you deem to be representative. Calculate the average yield for all the sites to estimate the yield for the field.

(Yield Component Method explanation courtesy of R.L. Nielsen, Agronomy Department, Purdue University. “Estimating Corn Grain Yield prior to Harvest,” *The Corny News Network*.)

This method is only an estimate, and it will present more favorable numbers in a drought year than the crop will actually return. For the most accurate estimate, sample fields in mid-September.

Did you know? There are many other ways to measure yield, some more accurate than others.

Visit www.yetterco.com to review past issues of The Leading Edge and Yetter products that maximize your yield potential.

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