Technology Development & Agronomy by MONSANTO

Agronomic SPOTLIGHT

Managing Corn Plant Health to Maximize Yield Potential

- Keeping a corn plant healthy and stress free during critical growth stages can help maximize yield potential.
- Understanding the significance of the growth stages and the effect of stress during any of the stages can help determine management decisions to improve overall plant health and protect yield potential.

Corn Yield Potential Component

The number of ears per acre, the number of kernels per ear, and the weight of each kernel determines corn yield potential. The interaction between factors such as corn product genetics, weather conditions, soil types, pest pressure, and available nutrients at a specific time in the growing season can affect corn yield potential.

Critical Growth Stages

It is important to understand the critical growth stages of corn that help determine final yield potential. Because corn has only a limited ability to compensate for poor stands early in the season, establishing an optimum, uniform stand is crucial in optimizing yield potential. The second critical growth stage occurs when the number of kernel rows per ear and the number of potential kernels per row are determined during the rapid stage of corn vegetative growth. Stress-free corn plants during this time can help maximize the potential number of harvested kernels[1].

The third important stage is the pollination process, which is critical to convert potential kernel numbers to actual developing kernels. The success of pollination is greatly influenced by the weather. Conditions that are too cool, wet, cloudy, hot or dry can all have an impact on pollination success. Drought stress specifically can desiccate silks rendering them unreceptive to viable pollen, which results in barren ears and/or short ears with barren tips.

The grain fill or kernel development period is the final critical growth stage, which begins at pollination and ends at kernel black layer formation. Stress during this stage can reduce kernel number, size, and weight of harvested kernels[1].

Photosynthesis and Yield Potential

During the grain fill stage, any stress on the photosynthetic process can reduce yield potential. Photosynthesis produces the energy (carbohydrates) that a corn plant needs to survive and produce grain. Drought, high temperatures, extended periods of cloudy weather, foliar diseases, hail damage, and nitrogen (N) deficiency can, individually or in combination, significantly reduce photosynthesis[2].

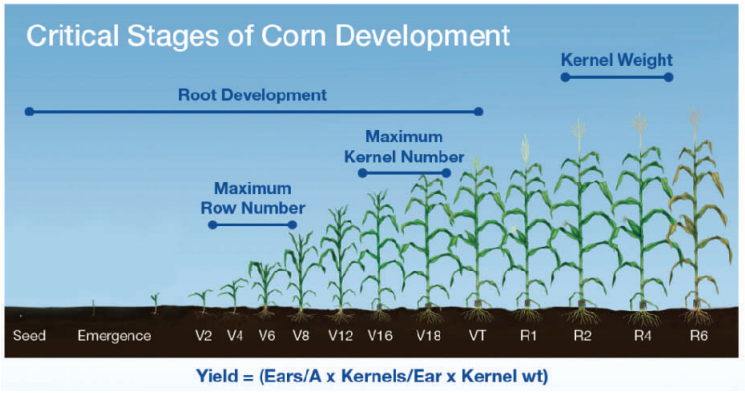

Figure 1. Critical stages of corn development.

After pollination, corn plants redirect carbohydrate movement to fill the developing kernels, while sacrificing the health of the stalk, leaves, and roots[2]. This process not only physically weakens the plant, but also makes the plant more susceptible to stalk and root diseases. Fields at highest risk for stalk rot include those that have developed ears with high yield potential because of ideal conditions during vegetative growth, but experienced severe stress during the grain fill stage.

The effects of plant stress can be intensified by sandy soils that have minimal water-holding capacity or on plants that have a restricted root system, due to compacted soils, nematode damage, or corn rootworm feeding.

Severe stress during the dough and dent stages of grain fill can lead to the premature formation of kernel black layer. This can reduce yield potential due to decreased kernel size and weight[3]. When the black layer forms, no additional nutrients can flow into the kernel and drydown begins.

Managing Stress Conditions

While little can be done to control the stress damage from hail, drought, and high temperatures, the following can be mitigated with proper management and treatment:

Fertility. Adequate fertility is essential to maintain late-season

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plant health. A common photosynthetic stress that can occur during late grain fill is N deficiency, which can cause the leaves to turn yellow and die. Saturated corn fields, due to wet conditions early in the season, may experience a loss of N from denitrification and leaching. Losing leaves during grain fill can reduce the plant's ability to produce photosynthate and also decrease the nutrients that can be remobilized to the ear.

Leaf Diseases. Fungal leaf blights can have a significant effect on corn yield potential through reduced photosynthetic capability and ultimately standability and grain quality.

A timely application of a foliar fungicide can greatly improve overall plant health and help protect yield potential. While maximum yield potential is mostly determined by the tasseling growth stage (VT), kernel fill can be influenced considerably by protecting the crop from diseases.

Fungicide Applications

It is always important to scout fields and evaluate the potential for disease.

Timing. The length of time that foliar fungicides are typically active ranges from 14 to 21 days. The optimum application period accounts for the length of fungicide activity and protection of leaves during grain fill.

The ear leaf and leaves immediately above and below the ear contribute over 75% of the plant's carbohydrates; therefore, protecting these leaves is important. When foliar diseases are controlled, corn is less susceptible to stalk rot pathogens such as *Anthracnose, Gibberella,* and *Fusarium.*

Figure 2. Corn leaf with a cigar-shaped Northern corn leaf blight lesion (top). Corn leaf with typical rectangular grey leaf spot (GLS) lesions (bottom).

A pre tassel application of Priaxor® fungicide followed by Headline AMP® fungicide application between VT and R3 has shown positive results, especially in fields that are planted to continuous corn, fields with a history of foliar diseases, or in no-till or minimum-tillage systems. This treatment helps provide early-season disease control by protecting the lower part of the plant canopy and limiting the ability of the disease to spread to the other parts of the plant. The treatment can also be cost-efficient because a tank-mix with a post-herbicide can be used to make one pass in the field. Research has shown that photosynthesis was enhanced when Priaxor® , versus either Headline AMP® or no-fungicide treatment, was applied before tasseling (Figure 3)[4].

Applying Headline AMP® fungicide at tasseling allows for excellent control of late-season diseases while enabling a healthy plant to better utilize its resources for grain to help maximize yields. The optimum application timing for Headline AMP® fungicide is from VT to R3 growth stage or prior to disease onset. It is always best to look at multiple factors when deciding to spray a fungicide, including seed product disease ratings, yield environment, crop rotation, and plant population.

Adjuvant recommendations for aerial and ground applications include using a surfactant to improve coverage and deposition. However, no adjuvant of any type should be used when applications are made after V8 and prior to VT growth stages, due to the elevated potential for a negative impact on ear development.

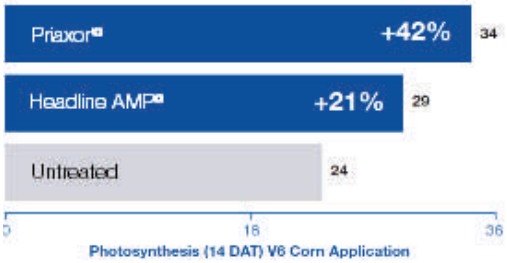

Figure 3. Enhanced photosynthesis with pre-tassel applications of Priaxor®.

For example, if an adjuvant is added when only 50% of a field is tasseled, there is potential for a negative impact on ear development for the other 50% of the crop that is not yet tasseled. The entire field should be close to full tassel if an adjuvant is to be sprayed. If needed, Headline AMP® fungicide may be tank mixed with labeled corn insecticides and/or other labeled corn fungicides.

Sources: [1] Corn yield potential. 2008. eXtension, http://www.extension.org (verified 6/10/14); [2] Top dieback. 2011. http://www.agriculture.com (verified 6/10/14); [3] Nielsen, R.L. 2011. Effects of stress during grain filling in corn. Purdue University Extension, http://www.agry.purdue.edu (verify 6/1/13); [4] Priaxor® fungicide and Headline AMP® fungicide application for disease control, plant health and maximum yield potential in corn. Corn Fungicide Solution Guide, BASF The Chemical Company (verified 6/10/14); Nielsen, R.L. 2011. Stress during grain fill: A harbinger of stalk health problems. Corny News Network. Purdue University. http://www.agry.purdue.edu/ext/corn/ (verified 6/10/14); Wise, K. and D. Mueller. 2011. Are fungicides no longer just for fungi? An analysis of foliar fungicide use in corn. American Phytopathological Society APSnet Features. http://www.apsnet.org/publications/ (verified 6/10/14); Barker, D. et al. 2005. Corn disease control. Ohio Agronomy Guide 14th Edition. Ohio State University Extension (verified 6/10/14); Fernandez, F. 2009. Identifying nutrient deficiencies in corn. The Bulletin: Pest management and crop development information for Illinois. University of Illinois. http://bulletin.ipm.illinois.edu/ (verified 6/10/14).

For additional agronomic information, please contact your local seed representative.