Possibility for Prevalence of Purple Plants

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Don’t be surprised if some of your early-planted fields of corn begin to exhibit noticeable shades of red and purple over the next week or so. The short-range weather forecast calls for conditions that favor the development of a preponderance of perplexing purple plants.

Purpling of corn plant tissue results from the formation of a reddish-purple anthocyanin pigment that occurs in the form of a water-soluble cyanidin glucoside. A hybrid’s genetic makeup greatly determines whether corn plants are able to produce anthocyanin. A hybrid may have none, one, or many genes that can trigger production of anthocyanin. Purpling can also appear in the silks, anthers and even coleoptile tip of a corn plant.

Well, you may say, that’s fine but what triggers the production of the anthocyanin in young corn at this time of year? The answer is not clearly understood, but most agree that these pigments develop in young plants in direct response to a number of stresses. These stresses include cool temperatures, high solar radiation levels, and water stress (both waterlogged and droughty conditions).

There’s no question that many early-planted cornfields throughout the state have suffered through soggy soil conditions during the past several weeks. The additional stresses imposed by the forecasted cool nights (40’s F) and bright sunny days (high levels of visible and UV radiation) may be the final “triggers” that result in fields of pretty purple plants over the coming days. Since the anthocyanin occurs in the form of a sugar-containing glucoside, the availability of high concentrations of sugar in the leaves (photosynthesis during bright, sunny days) further encourages the pigment formation. If fields are stressed by other factors such as soil compaction, herbicide injury, disease damage, or insect injury, the purpling will likely be even more pronounced.

It has been my experience that the combination of bright, sunny days and cool nights when corn ranges from V3 to V6 in development (3- to 6-leaf collar stages) most commonly results in plant purpling. Hybrids with more anthocyanin-producing genes will purple more greatly than those with fewer “purpling” genes. In most cases, the purpling will slowly disappear as temperatures warm and the plants transition into the rapid growth phase (post-V6).

I have rarely diagnosed phosphorus deficiency as the primary cause of purple plants early in the season. Nonetheless, cold or wet soils inhibit root development and can aggravate a true phosphorus deficiency situation, frequently causing even more intense leaf purpling.
What About Yield Losses? Does the leaf purpling lead to yield losses later on? The cause of leaf purpling, not the purpling itself, will determine whether yield loss will occur by harvest time.

If the main cause is the combination of bright, sunny days and cool nights, then the purpling will disappear as the plants develop further with no effects on yield. If the stress of restricted root systems is a major contributor to the purpling, then the potential effects on yield depend on whether the root restriction is temporary (e.g., cool temperatures & wet soils) or more protracted (e.g., soil compaction, herbicide injury). Plants can recover from temporary root restrictions with little to no effect on yield. If the root stress lingers longer, the purpling may continue for some time and some yield loss may result if the plants become stunted. Remember that the effects of early season damage to the seed or root system can be magnified when corn is already developing slowly due to cool, cloudy weather.

One point of possible good news about purpling in young corn plants is that some speculate that the formation of anthocyanin pigments in the leaf tissue may in fact confer a level of cold temperature hardiness by virtue of osmotic control. The result being that purple plants may be less likely to suffer injury from an unexpected late frost.

Related References

- Kim, Jae Hak. 1998. Maize Anthocyanin Pathway. Pennsylvania State Univ. Available online at http://scripts.cac.psu.edu/courses/plphy/plphy597_hef1/mpath.html. [URL verified 5/21/03]. Editorial note: This link is for biochemistry fans!

Don’t forget, this and other timely information about corn can be viewed at the Chat ‘n Chew Café on the Web at http://www.kingcorn.org/cafe. For other information about corn, take a look at the Corn Growers’ Guidebook on the Web at http://www.kingcorn.org.

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