

## CONTROLLING COMMON RUST IN SWEET CORN WITH GENETIC RESISTANCE AND FUNGICIDES

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Common rust is the most serious sweet corn disease in the Midwest vegetable processing region. For every 10% of leaf area damaged yield decreases by 6%. In most years sweet corn planted after late May requires either genetic resistance or fungicide applications to control common rust. Changes in available forms of genetic resistance and newer chemical options will change the decision making process for fungicide application.

Common rust does not overwinter in the Midwest. It overwinters in Mexico and is moves to the upper Midwest on air currents usually arriving in Wisconsin in mid-June. But, once present, rust increases rapidly and if conditions are favorable, the rust population will soon grow to a size that causes economic damage, especially on susceptible hybrids. Rust pustules develop 7 days after infection and can produce 5000 spores over the next four weeks. Because of its rapid reproduction, current control recommendations indicate that sprays should begin as soon as the disease is detected.

Resistance to common rust occurs in two forms. The first form is called monogenic, single gene, race specific, or Rp resistance, in which a hypersensitive reaction restricts pustule development. In most cases, effective monogenic resistance completely prevents the development of rust pustules. Many single genes are known and one form of single gene resistance, *Rp1-d*, is widely available in processing hybrids. For about 15 years *Rp1-d* was quite effective in controlling rust, but in 1999 a new race of rust appeared that could attack *Rp1-d* plants. Hybrids with other single genes are available with more on the way.

The rust population consists of many genetically different strains of the pathogen some of which can attack *Rp1-d* plants and some of which cannot. The proportion of the population that can attack *Rp1-d* plants determines the utility of *Rp1-d* as a form of resistance. If very few individuals in the population can attack *Rp1-d* then the size of the epidemic on an *Rp1-d* hybrid initially will be slow, *Rp1-d* may have some benefit in slowing rust epidemics. On the other if the proportion is higher, *Rp1-d* hybrids will perform as if they had no Rp resistance gene at all. This is also true of some of the other resistance genes.

The other type of resistance is termed general, polygenic, adult plant, or partial resistance, in which rust pustules develop but the speed and size of the epidemic is reduced. The amount of rust observed on hybrids with general resistance will be affected by the environment but will generally be less than 20%. Hybrids with high levels of general resistance are available. In general juvenile (early) leaves are more susceptible than adult (later) leaves. If hybrids have a shorter juvenile phase they should be more resistant and also produce less inoculum for subsequent infection. Since rust usually does not arrive in Wisconsin until June, early-planted hybrids will be less juvenile and therefore more resistant when the rust inoculum is present. Likewise plants with a short juvenile phase will be susceptible for shorter periods of time. Unlike single gene resistance, general resistance, in the presence of the pathogen always results in some pustule development.

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In many environments general resistance (and to a lesser extent *Rp1-d*) can offer enough protection to avoid the use of fungicides. But with both forms of resistance some pustules will develop. This is a major drawback of general resistance because we currently recommend spraying begin as soon as pustules appear. With fungicides such as Tilt and the EBCDs application is recommended at a very low threshold of infection. Therefore there is no chance to assess whether general resistance will offer adequate protection or the size of the *Rp1-d* attacking rust population is small.

The strobilurin fungicides (Quadris), now being registered for use in sweet corn, may present the grower new options. The strobilurins seem to have curative properties, that is, they can actually reverse damage rather than just protect against it. Early data from the University of Florida and the University of Illinois indicate that the decision to apply strobilurins can wait a little longer allowing time to see if general resistance will adequately control the disease or if the population of rust that attack *Rp1-d* is small enough that *Rp1-d* resistance will offer some protection. If the number of pustules reaches a certain threshold then applications can be made. Research is under way to determine the appropriate threshold.

The availability of strobilurins should allow the wide spread use of general resistance, which we believe should be more durable. Under most environmental conditions general resistance should be adequate thus eliminating the extra expense of applying fungicide. But when the rust infestation reaches a certain level strobilurin fungicide can be applied. For such a program to be most effective it is important that hybrids with the highest level of general resistance be used along with regular scouting of fields.