

Yellow Shoulder on Tomato

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Yellow shoulder and Blossom end rot (BER) are the two primary physiological challenges in tomato culture. Yellow shoulder is a physiological disorder of tomatoes that is characterized by discolored regions under the skin that show through and reduce the quality of the fruit. The disorder can range from very mild with some internal spotting to quite severe with large areas that are hardened and yellow to white. This wide variation in symptoms has spawned a number of names for the same primary disorder: yellow shoulder, yellow eye, green shoulder, yellow tag, gray wall, and internal white tissue. It is very important for growers to understand that yellow shoulder is not a delayed ripening, but an actual disorder of the affected tissue. Often, growers find that by focusing more closely on their nutritional program in seeking to prevent Yellow shoulders, they also reduce or eliminate BER.

The cells in the affected sectors of the fruit are generally smaller in size and have a more random arrangement than that of normal cells. Green chlorophyll in these regions fail to develop red pigment. This happens very early in fruit development, which makes early plant tissue analysis extremely important in prevention, as uniform color requires more K⁺ than the amount required to sustain yield.

The cause of the yellow shoulder disorder in tomato fruit has baffled scientists for the last 30 years. Many scientists believe there are several causal factors for yellow shoulder including: environment (specifically, high temperature >90°F), nutrition, genotype (cultivar) and virus. The interaction of these factors under field conditions is very difficult to evaluate.

This disorder can be triggered by insufficient exchangeable K⁺, excess magnesium in relation to calcium, and pH above 6.7. Management options to reduce yellow shoulder include increasing K⁺ to above 3% by dry matter before the fruit is larger than 1", adjusting the soil pH to 6.4-6.7 and increasing the Mg/Ca ratio to 1/6 or better (1/4 is ideal). Tissue analysis at the first flower initiation is extremely important in preventing yellow shoulder as once fruit is hanging and damaged it will not improve. Also, certain cultivars are less susceptible and others at higher risk, so cultivar selection is integral to a program to manage this color disorder. Certain processing varieties have been identified as less susceptible, but much research remains to be done on fresh market varieties in order to identify those that are more or less susceptible. Some growers have anecdotal reports of cultivars that are more or less susceptible, but minimal research has been done to conclusively identify those cultivars.

The practice of letting the fruit hang longer in order to "color up" does not work and has the potential to increase the danger from fruit rots. Increasing K⁺

through the drip lines once there is abundant fruit hanging is also unlikely to lessen symptoms as this disorder shows up very shortly after fruit set.

Quite a bit of work has been done by UC Davis and Ohio State on prevention of this disorder in processing varieties. They have developed the Hartz formula for anticipating the risk of yellow shoulder. This formula can be readily accessed online at www.oardc.ohio-state.edu/tomato. You will need recent soil and leaf analysis results in order to use the formula.

For most growers the best practices to prevent yellow shoulder will be to intensively tissue test tomatoes from first flower cluster for Ca, K⁺ and Mg levels. From this information, a grower could apply Potassium Nitrate, Sulfate of Potash, Potassium Carbonate, Calcium Nitrate, Calcium Chelate, and Magnesium Oxide to reduce the potential for this disorder. Experience has proven that both fertigated and foliar applied nutrients are necessary to prevent Yellow shoulders.

Many growers have been able to increase tomato plants uptake of potassium through adjusting the pH of their drip irrigation water. Keeping the irrigation solution pH at 6.2-6.5 will greatly improve tomato plants ability to move potassium from the soil to plant tissue. Most conventional growers use Sulfuric acid to reduce pH, while many organic growers use powdered Citric acid for this purpose.