

Tomato Ripening Problems and the Role of Potassium

Jerry Brust, IPM Vegetable Specialist, Univ. Maryland, Aug. 2009

Over the last few months in our area there have appeared problems with tomato ripening. The ripening problems are called various names such as blotchy ripening, yellow shoulder, grey wall, internal whitening, etc (fig 1). They all have the same root cause; lower levels of potassium (K⁺) than what is needed by the fruit to ripen properly. But just as with blossom end rot the factors that can lead to the ripening problems are more complex than just reduced levels of K⁺ and that is what I would like to discuss. The first problem I was aware of, mostly because it was happening in my research high tunnel was a problem of internal whitening (fig 2). This is different from grey wall because there are blotches of hard white corky tissue instead of collapsed dark tissue (common in grey wall) in the outer wall of the fruit. In addition the corky white tissue is not confined to the outer wall of the fruit but is found throughout the interior walls of the fruit. Other high tunnel growers in the southern part of Maryland and on the Eastern Shore were also having these same problems at the same time. There were many peculiar factors with this problem; first that it happened over a large geographical area, second that it happened across many varieties and third that the ripening problem occurred much more frequently in a high tunnel than outside. A couple of high tunnel growers and I took soil and foliar samples and consistently found that the soil was at adequate or even high levels for K⁺, but the tissue samples were low to very low in K⁺. What could cause a reduction in K⁺ in the plant when there was plenty in the soil? The best explanation for this is the weather we had in May and June. As you recall we either set records or came close for those two months for rain. This also meant we had very cloudy skies. Whether it was the excess moisture, the cloudy skies or both the plant's ability to take up enough K⁺ was seriously reduced. This may seem odd but anything that interferes with the ability of the plant to take up K⁺ will result in ripening problems, especially when there is a heavy fruit load on the plant (which there was in high tunnels, but not in the field in May and June). What makes me think the fruit load is important, in a small study I removed 50% of the fruit (various sizes of all green fruit) from tomato plants scattered throughout a high tunnel. A month later the incidence of ripening problems was about 20% on the plants in which no fruit was removed and almost 0% for the plants that I had removed the fruit.

Now we are seeing problems in the field as well as high tunnels with yellow shoulder and uneven ripening (fig 3). It comes around in mid to late summer when plants are putting on fruit and temperatures and humidity are high. The cause is the same, K⁺ levels too low in the plant, but for different reasons. Some of the reasons could be a poor tomato root system which results in a plant that cannot take up the proper amount of K⁺. If the roots are concentrated in the top 6 inches of soil and the plant canopy is poor this can expose the black plastic to the sun and raise soil temperatures to the point where water as well as K⁺ uptake is reduced enough to cause ripening problems.

You will notice that I have not mentioned any real solutions to the various factors that cause ripening problems. Saying "be sure you have enough K⁺ in your soil" does not seem to be the best solution any more. I know that some growers use a foliar spray of potassium sulfate or potassium phosphate after flowering to move more K⁺ into the plant. I have no idea whether this will work or not. Some growers use white plastic mulch to reduce soil temperatures and many have fewer problems with yellow shoulder in late summer. What I hope to do is conduct several studies looking at many of the above factors next year.

Fig.1 Various forms of ripening problems for tomatoes in the mid-Atlantic



Fig 2. Internal whitening of tomato fruit, mostly found in high tunnel tomatoes early this summer



Fig. 3 Various forms of yellow shoulder showing up now in the field and high tunnels

