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Tomato Leaf Distortion:
Unintended Herbicide Drift

Drift from herbicide applications can lead to unintended side effects in greenhouse crops. Symptoms of distorted growth on tomato plants are discussed here.

There are a number of risks to applying herbicides in the greenhouse. In addition, herbicide drift and volatilization can cause severe damage to nearby crops (e-GRO Alert 4-14). Symptoms can vary depending on the herbicide and the species in question, but leaf distortion and epinasty are both common plant responses to synthetic auxin herbicides, such as 2,4-D and dicamba (Israel et. al, 2013).

An issue for growers is that herbicides may drift from adjacent fields or neighbors' yards and enter the greenhouse. In this case, even the most careful grower may encounter symptoms of herbicide damage on their crops. This situation was encountered on a recent grower visit. Severe symptoms of distortion were observed on a crop of 1 gallon 'Better Boy' tomatoes. The grower had not applied any herbicides recently, so herbicide damage was not initially considered as a possibility.

The affected plants were located on a single bench nearest the outside wall of the

Figure 1. Many plants exhibited a severe distortion of the new growth.

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Figure 2. Symptomatic plants were twisted and distorted at the apical meristem.

greenhouse. Symptom severity varied from plant to plant, but many plants exhibited at least some symptoms. The most common symptom involved a thickened and distorted appearance to the newest growth (Fig. 1). The apical meristem was also had this appearance, with some twisting of the upper stem (Fig. 2). Symptoms were not as severe on some plants, but the twisting and distortion was still present (Fig. 3). A comparison of healthy to symptomatic leaves may be seen in Fig. 4.

A variety of other common greenhouse problems can lead to distortion similar to what was observed in this crop of tomatoes. For instance, broad mites, boron deficiency, or gas leakage from a cracked heat exchanger could all lead to similar symptomology.

Broad mites are very small and can be difficult to detect without a microscope or powerful hand lens. Upon observation of the affected plants, no signs of these pests were present. With symptoms this severe, there would have been an abundance of broad mite eggs easily seen with the proper magnification. This indicated that the issue was not caused by broad mites are similar arthropod pests.

Although the new growth was distorted, the symptoms were not the same as boron deficiency. One major difference here was that the apical bud was still healthy and growing. With a boron deficiency, death of the apical meristem would have occurred, leading to a plethora of

side shoots emerging. These symptoms were not observed either, indicating that it likely was not nutritional. In addition, all the plants of this cultivar were affected. Widespread damage is not typical for a boron deficiency problem and more probable with a physiological problem such as herbicide drift.

Lastly, there were no cracked heat exchangers present, or other obvious sources of ethylene gas. Tomatoes quickly respond to ethylene with curling and distortion of the leaves and stems, similar to what was observed here. Without any source of ethylene, this potential cause could also be ruled out. In addition, other plants which were transplanted later into the same greenhouse did not exhibit symptoms. One would expect ongoing problems with a heater issue.

With these other issues accounted for, it appeared most likely that the distortion on these tomatoes was the result of herbicide damage. Other details supporting this conclusion include the fact that the plants were located nearest to the outer wall of the greenhouse, and thus would have been the first affected by herbicide drift coming from the outside. Herbicides can easily volatilize and be carried for great distances, so it can be difficult to determine the source.

In this case, we took some of the most symptomatic plants back to our greenhouse for observation. After several weeks, these plants began to develop healthy new growth (Fig. 5). The symptomatic foliage retained its distorted appearance (Fig. 6); however, the new growth was quickly covering the symptoms, indicating that the plants may recover.

Management

Take caution when applying herbicides in or around your crops, and be aware of the mode of action. Synthetic auxin herbicides such as 2,4-D and dicamba can volatilize

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Figure 3. Some plants were less symptomatic, but exhibited twisting and distortion of the new growth nonetheless.

especially easily and should not be applied near sensitive species such as tomatoes. The weather and wind conditions can also make a difference in how easily herbicides may volatilize or drift. For instance, hot and dry conditions favor the volatilization of herbicides, and high winds may carry droplets or vapor for long distances. Depending on the droplet size, herbicides have the potential to drift several hundred feet up to several miles (Dexter, 1995).

Make sure to keep in contact with neighboring farms and other agricultural operations, and request to know when synthetic auxins will be applied to surrounding areas. Knowing when these herbicides are being applied will enable you to take the actions necessary to prevent drift coming into the greenhouse.

These factors can pose challenges to growers, but emphasize the importance knowing the chemicals you are applying and the potential risks they may cause to your crop.

Additional Resources

e-GRO Alert 4.14 by Kristin Getter provides additional information about herbicide damage in greenhouse crops.

Read More: Using herbicides in a greenhouse is risky business

References

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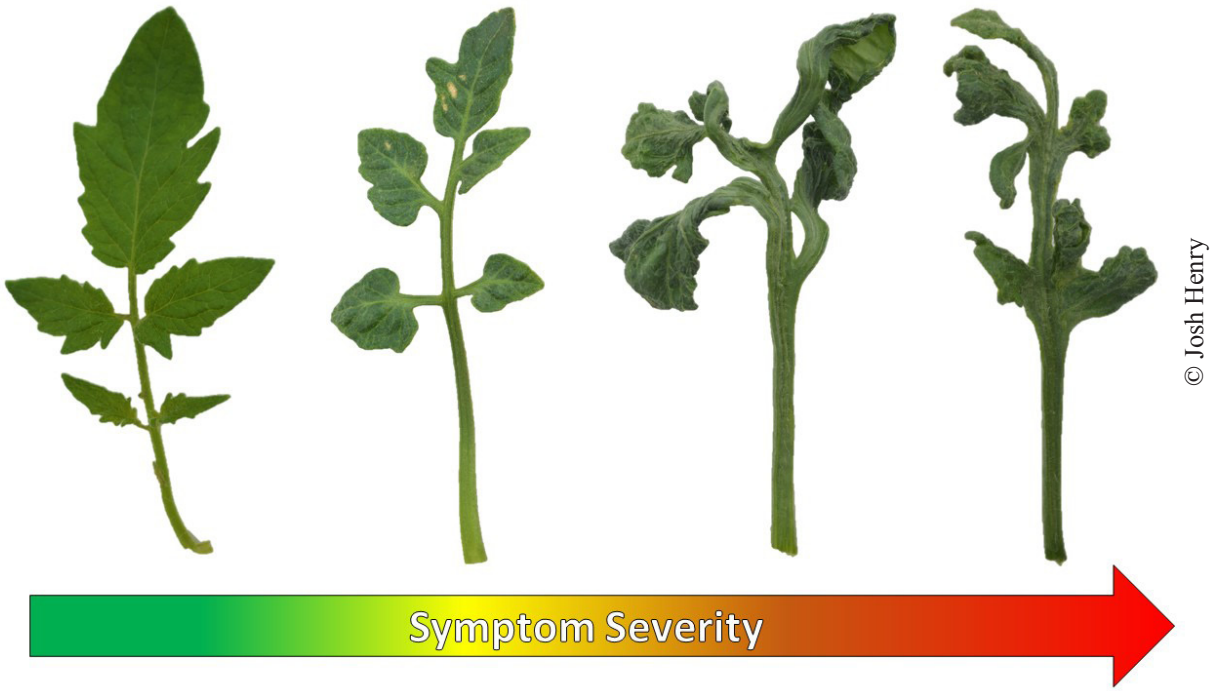

Figure 4. A range of symptoms can be seen here compared to a healthy tomato leaf on the left.

Figure 5. After several weeks, the symptomatic plants began to recover with healthy, normal growth.

Figure 6. Although the new growth was healthy in appearance, the distorted growth remained present further down the plant.