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Tomato Purple Leaf Disorder: A New Challenge for the Tomato Industry in Florida

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Symptoms and Field Distribution

The tomato purple leaf disorder (TPLD) has been observed in several tomato fields in Hillsborough, Manatee and Miami-Dade counties since 2006. Initial symptoms begin between 6 and 8 weeks after transplanting and could be somewhat confused with mild phosphorus (P) deficiencies. Nutritional analysis of leaves obtained from three different affected locations revealed normal values for all essential nutrients, including P. The key diagnostic difference between both symptoms is that P deficiencies first appear in the lower leaf surface causing vein purpling and extending to the whole leaf tissue, whereas TPLD tends to appear primarily on the upper surfaces of leaves without touching the veins and gradually spreading to the entire leaf surface (Figs. 1 and 2).

Often, when two leaves partially overlap, TPLD would only develop on the surfaces exposed to sunlight with the shaded leaf tissues remaining green (Fig. 3). No deformation or bronzing of the leaf has been observed, but affected leaves do appear to decline and senesce prematurely (Fig. 4). This disorder can show in all types of cultivated tomatoes (i.e. grape, cherry, round and Roma types), although the intensity of the damage appears to vary among types and cultivars and its effect on yield needs to be determined.

Field distribution of TPLD remains a subject of further research. However, some preliminary data was collected from impacted fields in south Florida to determine the incidence and distribution of the disorder. At 11 weeks after transplanting, the incidence of TPLD was less than 1% of the plants (1 or 2 plants per 600 ft of row). However, 4
weeks later incidence in the same field increased to more than 90%. An adjacent field under the same management practices, which was 4 weeks younger than the previous one, exhibited mild TPLD infestation with less than 25% incidence. No clear pattern of distribution was observed with respect to incidence within a bush or a row, or in relation to the prevailing sun and wind direction. Further studies need to be conducted to confirm these observations.

**Causal Agent and Epidemiology**

Tests for known pathogens of tomato using standard microbiological, serological, and nucleic acid-based methods were negative. However, preliminary studies suggest that TPLD appears to be transmitted easily through mechanical means. This indicates an infectious agent, like a virus or viroid, is likely responsible for the disorder. Further transmission studies are in progress.

**Preventive Measures and Management**

While it is difficult to make specific management recommendations for TPLD when the exact causative agent is unknown, based on preliminary data, some generalized guidelines could help limit its spread. Mechanically transmitted agents such as viruses or viroids require the use of stringent sanitary measures to exclude from production. Once an infectious agent of this nature is introduced onto a production site, it will easily spread through the use of contaminated tools, on farm machinery, handling by personnel, or through contact between plants.

Personnel moving between farms, such as scouts and extension agents, should try to limit direct contact with the crop and wear disposable gloves that can be changed between fields and especially between farms. Movement of all non-essential equipment and vehicles through fields should be discouraged.

Fields with confirmed cases of TPLD should implement sanitary measures to prevent spread within and between fields: Treating equipment, stakes and work surfaces with sodium hypochlorite (0.5% solution or 10% bleach solution) for 2-3 minutes should deactivate any virus or viroid. For tools that require repeated sterilization, such as pruning tools, knives, or tying sticks, dipping in a 20% solution (1% sodium hypochlorite) should prevent transmission. Such pruning tools or knives should be treated frequently, between rows at minimum. Gloves should be worn during such operations, since sodium hypochlorite is quite caustic and should not be used to treat bare skin. Use quaternary ammonium or ethanol-based sanitizers to sanitize bare skin instead.

All field personnel should be encouraged to wear disposable gloves or gloves that can be sanitized frequently while working in the field, especially during pruning and tying operations. Again, gloves should be changed or sanitized frequently. Coveralls and field clothing should be washed daily. Limit the number of personnel accessing the crop during production to limit movement of TPLD within and between fields. When practical, growers should try to limit handling of plant materials during crop production.
Crops should be destroyed immediately at the end of the season. All plant residues, including roots, could act as potential reservoir for a virus or viroid. Practices, such as using cover crops, should help promote breakdown of plant residues in the soil. Rotating to a non-Solanaceous crop would also be advised. Since some viruses and viroids are seed transmitted, tomato volunteers could act as a potential source of TPLD and should be destroyed immediately.

Adopting the use of determinate grape/cherry type tomato varieties, over indeterminate varieties, may help reduce the potential impact of this disease. In the field, the most severe symptoms of TPLD were associated with fields of indeterminate grape and cherry tomatoes. This may be due to the longer growing periods for these tomato types and the practice topping; referring to the periodic removal of extraneous top shoots to maintain growth on the stakes. Topping would be an ideal manner to mechanically transmit any virus or viroid throughout a field and between fields.

These recommendations are precautionary. Because the causal agent of TPLD is unknown, there is no guarantee that implementation of these sanitary practices will prevent its spread. Regardless of the source, these practices should minimize movement of TPLD in fields. The goal of this publication is to keep the vegetable industry informed of current findings and possible risks associated with TPLD. Subsequent articles and factsheets will follow to update the industry of findings and recommendations as more information becomes available.
Fig. 1. Initial interveinal purpling of tomato leaf. Credits: A. MacRae.
Fig. 2. Severe interveinal purpling of tomato leaf. Credits: A. MacRae.
Fig. 3. A leaf petiole that was partially shaded by the developing fruit. Note that the shaded region remained green. Credits: A. MacRae.
Fig. 4. Apparent decline and premature senescence of affected tomato leaf. Credits: A. MacRae.