

MICHIGAN Potato Diseases



Toxic Seed Piece Syndrome

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Introduction

Toxic seed piece syndrome (TSPS) is a physiological disorder that has been reported in potato production regions worldwide. In the U.S., it has been observed in California, Maine, Michigan and Oregon. No specific pathogen has been identified as a singular causal agent of this disorder, although secondary infection of *Verticillium dahliae*, *Colletotrichum coccodes* and *Fusarium* spp. has been detected in potato roots and stems of symptomatic potatoes grown in Michigan exhibiting TSPS.

Toxic seed piece syndrome occurs as a result of the potato plant absorbing the watery breakdown products from the seed piece. Extended periods of dry weather followed by heavy rain events and standing water contribute to the breakdown of the seed piece, which is then reabsorbed by the plant. The decaying seed piece can be toxic to the plant, increasing the impact of TSPS on the potato crop. Fields with plants showing TSPS exhibit slow emergence, a reduction in total yield of large and marketable tubers, fewer main stems and vigorous large plants as well as delayed senescence. Ultimately, it could result in many nonharvestable under-sized tubers.

Symptoms

Early foliar symptoms include interveinal chlorosis (yellowing of the leaves between the veins) and discoloration or spots in a circular or irregular pattern. These spots could be misidentified with those caused by *Alternaria solani* and *Alternaria alternata*, the pathogens that cause early blight and brown leaf spot, respectively. Marginal and interveinal necrosis (cell death) or bronzing may occur, along with rolling of the leaves (Figure 1). Additionally, necrosis at the leaf edges may be observed, which mimics symptoms of Septoria leaf spot caused by *Septoria lycopersici*.



Figure 1. Expression of Toxic seed piece syndrome (TSPS): Curling of the leaves, interveinal chlorosis, necrosis and bronzing. (Michigan State University)

Plants with TSPS symptoms may be confused with other wilt diseases. Generally, they look wilted near the tops of the plants and have a decaying or rotten seed piece attached to or around the root systems. The seed piece causing TSPS is generally translucent, gelatinous (Figure 2) and odorless, although secondary infection can occur from soft rot bacteria and result in a rotting smell. Symptoms occurring later can include early senescence of the potato plant, similar to that of other wilt diseases (Figure 3). These advanced symptoms normally occur following alternating periods of hot, dry conditions followed by wet conditions, as often occurs in Michigan during July and August.



Figure 2. Potato seed piece with a translucent and gelatinous appearance typically associated with TSPS. (Phil Hamm and Jordan Eggers, Oregon State University).



Figure 4. Vascular discoloration observed on the main root and stem. Discoloration or browning can be seen on the root, where the seed piece was attached to the stem. (Michigan State University)



Figure 3. Early senescence of the potato plant, with minor necrosis. (Michigan State University)



Figure 5. Toxic seed piece syndrome first observed in low areas of a field, where soils are more heavy and saturated. Arrows indicate low-lying areas in the potato field. (Michigan State University)

Vascular discoloration can be seen throughout the primary root and in the stem (Figure 4), similar to symptoms caused by potato early die (PED) complex. Discoloration of the stem due to TSPS tends to be indistinguishable from symptoms caused by PED complex. Discoloration or browning can be seen on roots, where the seed piece was attached to the stem (Figure 4). Remnants of the seed piece are often still attached to the lower stem or root system. Symptoms are commonly first observed in low areas of fields where soils are heavier and saturated with water (Figure 5). Symptoms can rapidly develop in all areas of the field (Figure 6) under favorable environmental conditions, especially when irrigation has been frequent and intensive (for example, 1 inch every 3 to 4 days).



Figure 6. Symptoms of TSPS develop rapidly in the field, causing early plant senescence. (Michigan State University)

TSPS in Michigan

Toxic seed piece syndrome is observed in Michigan although infrequently. During the 2012 growing season, some fields were affected. Weather patterns during this time led to symptom expression. The exact process and pathway of TSPS is unknown. However, in Michigan, fields with rotations of 1 to 3 years between potatoes tend to show more symptomatic expression of the syndrome in the plant and foliage in comparison to fields not in frequent use.

Monitoring and Management

All key symptoms and characteristics mentioned in this bulletin can indicate the presence of TSPS, although definitive diagnosis of the disorder is currently unavailable. No preventive

or curative methods are available for TSPS, although the disorder may be managed through an integrated approach that maintains overall plant and soil health. Maintaining adequate soil moisture at field capacity and fertility levels may not prevent TSPS, but may delay the onset or alleviate the impact on the potato crop. Foliar fertilizers can be used to supplement nutrients to the potato canopy and help maintain plant health and delay early senescence.

Reference

Stevenson, W., Loria, R., Franc, G., & Weingartner, D. (2001). *Compendium of potato diseases*. St. Paul, MN: American Phytopathological Society.