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FACT SHEET

BACTERIAL SPOT OF TOMATO

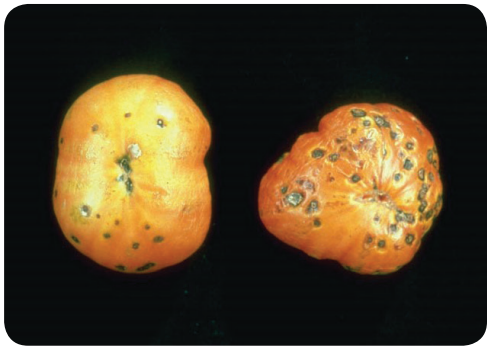
FRESH MARKET AND PROCESSING TOMATOES ARE AN IMPORTANT SEGMENT OF THE U.S. AGRICULTURAL ECONOMY, grossing more than $2.5 billion in 2008 with significant acreage in 16 states (NASS, 2009). Bacterial spot of tomato and pepper is a serious challenge in commercial production fields. U.S. growers who already face limited efficacy of current disease management strategies, increasing production costs, no significant improvement in yield, and increasing foreign competition, cannot continue to commit additional resources towards bacterial spot management without some assurance of a return in improved yields.

Bacterial spot of tomato is a devastating disease worldwide, and in the United States is especially problematic east of the Mississippi River, where it has reemerged in recent years. A recent study estimated losses in tomato production in southwest Florida due to bacterial spot at $3,090 per acre based on 2007-2008 production costs and market values. In the Midwest, the processing industry estimated a loss of $7-8 million due to bacterial spot in 2010.

The disease is associated with four genetic groups within *Xanthomonas* designated A, B, C, and D, differences based on physical and genetic traits and now named *X. euvesicatoria, X. vesicatoria, X. perforans,* and *X. gardneri,* respectively. In a worldwide analysis of *xanthomonads* associated with tomato and pepper, groups A and B comprised overwhelmingly the largest number of strains. However widespread, regional specialization for each group was observed. The ability of *X. perforans* race 3 to produce several bacteriocin-like compounds probably led to the displacement of *X. euvesicatoria* race 1 as the predominant pathogen of tomato in Florida in the 1990s. Surveys of Florida tomato production in 2006 and 2011 have detected additional shifts in race structure. One researcher noted a nearly 1:2 ratio of race 3 to race 4 strains among the 377 strains of *X. perforans* collected in 2006, but by 2011 all 176 strains collected were race 4. The reason for this recent shift is not clearly understood. There has been no apparent selection pressure due to any known genetic resistance in commercial tomato varieties, but the impact on the industry is clear.

Long-distance and regional movement of *Xanthomonas* spp. is a major concern. In recent years, outbreaks of exotic *xanthomonads* have been identified in several major tomato producing regions in the western hemisphere. Outbreaks of *X. gardneri* were reported in Brazil, Canada, and Pennsylvania. In a 2010 study, the majority of *Xanthomonas* strains isolated from fruit lesions at 32 processing tomato fields in southwestern Michigan and northwestern Ohio were identified as *X. gardneri.* A preliminary analysis of fresh market tomatoes and peppers in Ohio in 2012 indicated a high proportion of *X. gardneri* causing bacterial spot. Although *X. gardneri* has not been detected in Florida, it is a major concern, and could, if introduced, undermine resistance genes currently deployed for the management of *X. euvesicatoria* in pepper.

International seed trade was valued at $45 billion in 2011, an incredible increase in value from $3.7 billion in 2000 (ISF, 2012). The United States is a leading importer of vegetable seeds, importing nearly 16,000 metric tons of seed with a value of $318 million in 2011. Valued at $8.5 million in 2005, China was the leading exporter of tomato seeds to the United States, accounting for nearly 30 percent of the total tomato seed imported based on value. Although current data is not readily available, especially for tomato seeds, it is clear that international seed trade is a lucrative industry. Unfortunately, seed is also an efficient vehicle for moving seed-borne pathogens, especially bacteria that attack plants such as *Pseudomonas, Clavibacter,* and *Xanthomonas* spp. While commercial tomato seed is routinely treated to reduce surface microbial contaminants, pathogens still persist at low levels. The introduction of exotic,



Bacterial Spot image courtesy of ipmimages.org

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virulent bacterial strains on seed is often underestimated and can undermine efforts to develop effective disease control strategies.

The National Plant Diagnostic Network (NPDN) is a critical component of the biosecurity infrastructure of the United States. The detection network provided by NPDN helps rapidly recognize and identify wheat blast and minimize economic and yield loses. NPDN trains agricultural professionals, engaging them as citizen scientists to increase the opportunities to detect outbreaks of this and other important pests and diseases, leveraging the capacity and expertise of the land-grant university system to enhance our biosecurity network.