Tomato Organic Management and Improvement (TOMI) Project

Variety Development

Funding for this project is generously provided by NIFA-OREI (#2024-51300-43372) and NSF-URoL (#2319569)

The Challenge: Demand for organically grown tomatoes sold through local, direct-to-consumer markets continues to rise. Yet growers struggle to meet this demand because of foliar diseases that routinely reduce both yield and fruit quality. These challenges are intensifying as shifting weather patterns introduce new pathogens and existing pathogens evolve to overcome genetic resistance in commercial tomato varieties. The development of new varieties with durable resistance to these pathogens is important for organic systems.

The Opportunity: Plant breeders have identified alleles for resistance to early blight, septoria and late blight from wild relatives of tomato. These have potential to increase genetic resistance to these diseases in varieties that are adapted to organic environments, with excellent fresh-market quality and flavor.

The **overarching goal** of these studies is to develop improved varieties for organic growers, with more durable resistance to key pathogens impacting production. In addition, we aim to better understand how to combine durable resistance to these pathogens, flavor and fresh market quality in tomato varieties.

sls-1 & *sls-2* homozygous susceptible

sls-1 & *sls-2* heterozygous

sls-1 & *sls-2* homozygous resistant

Photos: Ambar Carvallo, August 22, 2025 - Mt Horeb, WI

Our approach:

•***Field trials across 5 states*** (IN, NC, WI, OR, CA) We will make crosses using genotypes identified from our on-going program as well as others with known resistance genes and desirable end-use quality traits. Crosses for each ecoregion will be selected based on the most problematic foliar diseases in that region. Segregating populations will be evaluated in on-station trials

•***We will screen new sources of resistance*** from Oregon State University's late-blight resistance breeding program containing stacked Ph2, Ph3 and Ph5 resistance genes and PM resistance, and from Cornell University's novel sources of Septoria Leaf Spot and Early Blight resistance.

•The use of **molecular markers and genomic prediction** will be assessed for their ability to predict resistance and improve field breeding of lines with multiple disease resistances, high productivity and good quality attributes.

For more information about the TOMI project and our biocontrol trials visit our website (https://eorganic.info./tomi) or contact the TOMI project PI: ***Dr. Lori Hoagland****, lhoaglan@purdue.edu*