

Gene McAvoy—IPM Success Story 2015

Savings Realized by Using Bacterial Spot Resistant Pepper Varieties

Situation

Selection of the best available vegetable varieties for a region is one of the most important decisions a grower makes. Vegetable producers in Florida need to grow the best adapted varieties to be successful every season and year.

While Florida growers produce a wide variety of peppers, green bell peppers constitute the overwhelming majority of peppers grown in the state. Florida is second in the US in the production of bell pepper with Florida accounting for most of the U.S. grown bell peppers eaten by Americans from October through June. USDA stats show the value of Florida's bell pepper was \$205 million in 2013.

In 2012, California produced 51 percent of U.S. field-grown bell pepper volume (9.9 million cwt), followed by Florida (4.5 million cwt) with 26 percent, Georgia and New Jersey with 6 percent each, North Carolina with 5 percent, Ohio with 4 percent, and Michigan with 2 percent. (NASS 2013)

Bacterial spot, caused by the bacterium, *Xanthomonas euvesicatoria*, remains one of the most serious diseases of pepper because it can spread rapidly during warm periods with wind driven rains, and because fruit symptoms reduce marketability. Symptoms of bacterial spot appear as small, water-soaked, greasy spots on infected leaflets which may coalesce to give a blighted appearance. Severe plant defoliation can result in high yield loss with documented losses ranging from 25-40%.

Copper sprays have been the traditional means of controlling bacterial leaf spot. Copper is a protectant and must be applied preventatively beginning at transplanting and is then applied weekly or even more frequently under conditions favorable to disease development. Most growers apply copper approximately 26 times throughout the season. Repeated application of copper has led to the development of resistance and a decrease in the effectiveness of copper sprays for the control of bacterial spot.

Resistance of bacterial strains to copper is well-documented in Florida, especially for bacterial spot strains from both tomato and pepper. For example,

in a 1989-90 survey in Florida, 114 of 118 strains of *Xanthomonas euvesicatoria* from pepper were resistant to copper.

Researchers have identified multiple strains of bacterial spot in pepper. In 1972, races 1 and 2 were identified. Surveys conducted in 1982 indicated that race 1 was widely distributed and race 2 only in Florida and Guadeloupe.

In 1989/90, pepper breeders released cultivars with Bs1 gene resulting in a shift in bacterial spot race 1 defeating the Bs1 gene and resulting in major losses.

In 1990, seed companies released cultivars with the Bs2 gene which conferred resistance to bacterial spot races 1, 2, and 3. In 1995, bacterial spot races 4 and 5 appeared and were destructive on peppers in North Carolina. In 1995, an outbreak of race 6 which can defeat Bs1, Bs2, and Bs3 occurred in Ohio and by 1997-98, growers saw a shift to race 6 in South Florida, resulting in serious losses in Florida.

Commercial bell pepper varieties are now available with combined resistance to many or all of the 10 known races of *X. euvesicatoria* from a number of seed companies including Syngent, Seminis, Harris Moran, Sakata, Enza Zaden and others.

By using resistant varieties pepper growers can reduce the use of copper sprays considerably for controlling bacteria and other pathogens. In practice, growers using resistant pepper varieties have the number of copper sprays by 50%

Action (outcomes based on objectives)

Pepper variety trials were conducted in 2006-2014 investigating the use of new commercially available bacterial spot resistant pepper varieties incorporating resistance to multiple-races of bacterial spot. Trials were conducted on grower's farms using standard production practices, eg fumigated plastic mulched beds with two rows of plants spaced 9 inches apart for a plant population equivalent to 19,360 plants/acre. Experimental design was a randomized complete block design with 4 replications. Plot size was 26 plants (13 plants/row) per rep.

Trials were conducted fall and spring until 2013 and subsequently fall only as bacterial spot is most prevalent in the fall planting due to frequent rains and high humidity associated with end of the rainy season

Data collection consisted of yield (two harvests by grade, eg. super jumbo, jumbo, X-large, large, medium and culls) and postharvest fruit characteristics including number of lobes, length, width, thickness, cracking, and bruising).

A number of commercially available bacterial spot resistant cultivars were evaluated in these trials and included (but not limited too as varieties were added or dropped as they became available or were phased out by the various seed companies):

Abbott and Cobb

ACR 2993	BLS 1-5
ACR 75311	BLS 1-6

Enza Zaden

Myakka	BLS 1-4
Abay	BLS 1-5
Dashen	BLS 1-5

Harris Moran

Allegiance	BLS 1-5
Vanguard	BLS 1-5

Sakata

Touchdown	BLS 1-5, 7-9
Blitz	BLS 1-5, 7-9
Gridiron	BLS 1-5, 7-9

Seminis

8302	BLS 1-5
7141	BLS 1-5
4288	BLS 1-6
2815	BLS 1-6
9325	BLS 1-6
PS0 09979325	BLS 1-10
SV3255PB	BLS 1-10
Antebellum	BLS 1-10
SV0972PB	BLS 1-10

Syngenta Rogers

Tomcat	BLS 1-5
--------	---------

Hunter	BLS 1-5
Bayonet	BLS 1-5, 7-9
Bastille	BLS 1-5, 7-9
Rampart	BLS 1-5, 7-9

Control was the grower standard Aristotle – bacterial spot race 1, 2, and 3 resistant.

Trials were located in commercial field and all pest and disease management was conducted by the cooperating grower according to grower standards.

The trials demonstrated that advanced commercially available bacterial spot resistant pepper varieties (BLS 1-5, 7-9 and BLS 1-10) had statistically significant lower disease levels and higher yields.

Accomplishments (short and long-term impacts)

Use of the bacterial spot resistant pepper varieties resulted in a savings of \$450 per acre per crop. If applied to all 18,000 acres of Florida peppers, this would yield a savings of over \$8,000,000 per year. Grower surveys indicated that bacterial spot resistant varieties now represent over 85% of the planted acreage in South Florida. South Florida has 18,000 acres of peppers, so the anticipated annual savings of 6.8 million dollars. Moreover, by cutting the copper applied by half has resulted in less potential environmental contamination with copper, freeing labor for other activities besides spraying and better quality peppers with equal or greater yields.