

Win BIG with Sakata's New Eastern Pepper Players!

Not only does our line-up offer traits like great adaptability, earlier maturity, high yield potential, labor friendliness, improved disease resistance, flavor and shelf life, these peppers are backed by a team of research and market experts that is constantly analyzing trends, features and priorities to help you get the sustainable returns you need.

New Bells for the East - **BECOME A FAN!**

After many years of intensive and rigorous development, the Sakata team is proud to introduce three exciting new bell peppers—Blitz, Gridiron and Touchdown—specifically developed and adapted for regions and slots in the East.



BLITZ bell pepper is an early-maturing, extra-large blocky green-to-red type with great yield potential at first harvest. Fruit are high quality with thick walls and a uniformly blocky shape. It is a consistent performer providing size and quality. Blitz has

excellent open field performance and is adapted for production in high tunnel and mid tech protected culture. **Blitz has high resistance to TMV: 0, and Xcv: 0-5, 7-9 and intermediate resistance to TEV.**



GRIDIRON is an early maturing, extra-large blocky dark green-to-red bell with impressive yield potential. The fruit are smooth, glossy and high quality,

with thick walls and a uniform blocky shape. **Gridiron has high resistance to TMV: 0, and Xcv: 0-5, 7-9 and intermediate resistance to TEV.**



TOUCHDOWN offers a strong prolific plant with continuous setting ability and excellent cover. This variety has high yield potential of large to extra-large blocky fruit that mature from green to red. The fruit are smooth with thick walls and have a uniformly blocky shape. **Touchdown has high resistance to TMV: 0 and Xcv: 0-5, 7-9.**

Pathology Report

by Randy Johnson & Hacene Bouzar

Bacterial spot of pepper is economically the most detrimental disease of pepper and tomato in the Southeastern United States (SE U.S.).

Infection results in the production of small, irregular water soaked lesions on leaves (Fig. 1), stems and fruits (Fig. 2). Foliar lesions may lead to defoliation of older leaves and sunscald of the fruit, but the major yield reduction results from flower drop and non-marketable symptomatic fruits (Fig. 2). Once the pathogen is established and the disease conditions are favorable (i.e., warm and humid weather, wind-blown rain), there is little that can be done to slow the progression of the disease in susceptible pepper varieties. In the southeast, epidemics can result in 60% infection resulting in >40% economic loss (McAvoy, University of Florida). There are a variety of pesticides used for bacterial spot control, but the most efficient means of control is introgression of resistance genes and the use of healthy seed. Sakata Seed America has been using both strategies in its approach to develop high quality pepper products.

The life cycle of the bacterial spot pathogen requires a host, plant debris, or contaminated seed as the source of primary inoculum to infect a new pepper crop. Survival of the bacterial spot pathogen is almost always associated with infected plant debris and volunteer pepper or tomato plants. However, the disease may be introduced on contaminated seed or infected transplants. The risk of seed transmission can be reduced by using seed that was tested and found negative for Xcv and seed that has been surface disinfected with sodium or

calcium hypochlorite. Transplants pose a risk because in the presence of Xcv, the frequent irrigation, the crowding of seedlings and the warm temperatures in transplant houses favors the rapid spread of the bacterial spot pathogen. Infected transplants are the most efficient way to initiate an epidemic under warm and moist environments prevailing in the Eastern U.S. in the summer. For these reasons, Sakata ensures that pepper seed lots are healthy by performing seed health assays on every pepper seed lot.

Bacterial spot is caused by four *Xanthomonas* species (*Xanthomonas euvesicatoria*, *X. vesicatoria*, *X. perforans* and *X. gardneri*) formerly named *Xanthomonas campestris* pv. *vesicatoria* (Xcv); however, species affiliation has little relevance to genetic disease resistance of pepper. What is relevant is the Xcv race (table 1) and the resistance genes bred in the pepper variety. The first genes for resistance used in pepper breeding were single dominant genes that result in a hypersensitive reaction (Fig 3). Resistance to Xcv races 1, 2 and 3, conferred by the pepper *Bs1*, *Bs2*, and *Bs3* genes, was identified in the '70s and '80s; and, *Bs2* was used in pepper breeding programs to confer resistance to all known races at the time (i.e., races 0-3). However, resistance broke down in 1991 with the emergence of races 4, 5, and 6 in the SE U.S.. In the past two decades there has been a steady increase in the prevalence of races 4 and 6. This race shift was suspected to be the result of the widespread introduction of the *Bs2* gene in hybrid pepper varieties and the resulting selection pressure which allowed for the emergence of bacterial races that overcame *Bs2*. To control races 4 and 5, additional *Bs* genes (*Bs3* and *Bs1*, respectively) need to be stacked on top of *Bs2*. Whereas resistance to race 6 requires the use of *Bs4*, a resistance gene found in a different species of pepper not commonly used in



Figure 1

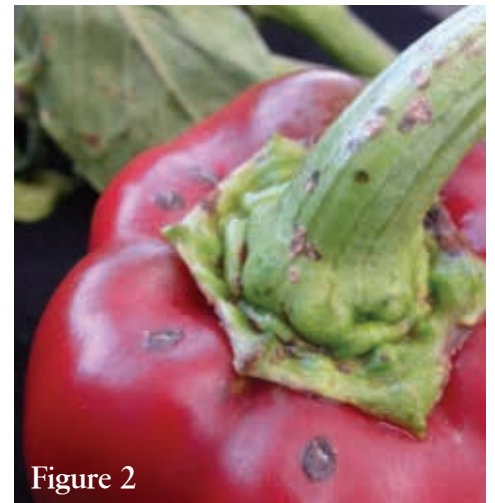


Figure 2



Figure 3

breeding. *Bs4* differentiates races 1, 3, 4, and 6 from races 7, 8, 9, and 10, respectively.

Bacterial spot races are found in nature as mixtures of races and species. Depending upon what pepper resistance package is being used in the area, one or two may predominate in the field. To create a more durable resistance, Sakata is using the *Bs1-Bs3*

genes along with two other resistance genes (*bs5* and *bs6*) that have differing inheritance and modes of action against the pathogen. The *bs5* and *bs6* genes together can provide a higher level of resistance to most of the known races and isolates of bacterial spot including race 6, thus providing more durable protection.

Sakata currently has many pepper products layered with many of the resistance genes that have been shown to provide resistance to a wide spectrum of bacterial spot races across the SE U.S..

Table 1. Differentiation of bacterial spot races using known resistance genes in pepper

Pepper Race	Xcv avirulence gene(s)	Pepper resistance gene(s):					
		No resistance gene	<i>Bs1</i>	<i>Bs2</i>	<i>Bs3</i>	<i>Bs4</i>	<i>Bs1, Bs2, Bs3, bs5, bs6</i>
0	<i>avrBs1, avrBs2, avrBs3, avrBs4</i>	S [†]	HR	HR	HR	HR	HR
1	<i>avrBs2, avrBs3, avrBs4</i>	S	S	HR	HR	HR	HR
2	<i>avrBs1, avrBs2</i>	S	HR	HR	S	S	HR
3	<i>avrBs2, avrBs4</i>	S	S	HR	S	HR	HR
4	<i>avrBs3, avrBs4</i>	S	S	S	HR	HR	HR
5	<i>avrBs1</i>	S	HR	S	S	S	HR
6	<i>avrBs4</i>	S	S	S	S	HR	R
7	<i>avrBs2, avrBs3,</i>	S	S	HR	HR	S	HR
8	<i>avrBs2</i>	S	S	HR	S	S	HR
9	<i>avrBs3</i>	S	S	S	HR	S	HR
10	not identified	S	S	S	S	S	R

[†] S = susceptible (disease); HR or R = resistant (no disease).

Trial Report: Winning Performance at UF/IFAS

The University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS) is a federal-state-county partnership dedicated to developing knowledge in agriculture, human and natural resources, and the life sciences. IFAS provides research and development for Florida's agricultural, natural resources and related food industries. Over the past four years in IFAS trials, the following results were reported:

IFAS Scorecard: Touchdown & Blitz

Variety	Year	Season	Location	Ranking	Comments
Blitz	2010	Winter	West Palm Beach	#1 First Harvest	Dark green fruit, mostly 4-lobed, extra-large and jumbo
Blitz	2011	Spring	Immokalee	#1 Total Harvest	Dark green fruit, 3-4-lobed, extra-large and jumbo
Blitz	2011	Fall	West Palm Beach	Top 6 Total Harvest	Dark green fruit, mostly 4-lobed, large and extra-large
Blitz	2012	Spring	Immokalee	#3 Total Harvest	Dark green fruit, 3-4-lobed, extra-large and jumbo
Blitz	2013	Fall	West Palm Beach	Top 3 Total Harvest	Dark green fruit, mostly 4-lobed, large and extra-large
Touchdown	2009	Winter	West Palm Beach	#1 Total Harvest	Fruit mostly 4-lobed, large and extra-large size
Touchdown	2010	Winter	West Palm Beach	#2 Total Harvest	
Touchdown	2013	Fall	West Palm Beach	#1 Total Harvest	

For complete trial results, visit <http://www.imok.ufl.edu/programs/veg-hort/research/peppers/peppers.php>

Our Dedicated Pepper Team is Here to Help!

Introducing Kevin Ratchford



If you're involved in the Eastern U.S. ag industry, chances are you've heard his name and may even know longtime industry member Kevin Ratchford, president of Agri-Logic Consulting, Inc. Kevin has been involved in the ag business for many years and has gained a wealth of knowledge. We're happy to report that Kevin joined our sweet pepper team in 2013 as a consultant - helping growers throughout the Southeast have greater success with Sakata genetics.

"I have been involved in commercial vegetable production in Florida and Georgia for the past 25 years," says Kevin. "I spent my early years scouting vegetable crops in central and south Florida and subsequently entered the seed business as a Product Development Specialist.

During his time as a Product Development Specialist, Kevin was also directly involved with evaluating the performance, adaptability and introduction of pepper varieties with BLS resistance. He followed commercial and breeder trials as the vegetable production season shifted to Georgia and up the eastern seaboard.

Bryan Zingel, Senior Product Manager for peppers and tomatoes perhaps sums it up best by saying "Kevin's wealth of experience, personable character, skills in networking and teamwork make him a valuable industry resource. We're really excited to have Kevin on our team!"

Contact Us Anytime!

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The Pepper Report

by Kevin Ratchford

Central and South Florida's fall planting season has gotten off to a rocky start this year in many locations, September's wet, hot and humid weather created nothing but headaches in land prep and planting schedules. Plus, the extended periods of rain, in addition to the heat and humidity, produced an ideal environment for disease development.

Pythium was common in younger pepper plantings that had excessive soil moisture from rainfall. In mid-October, on the west coast of Florida (Palmetto-Ruskin), increases in bacteria leaf spot were being reported in both pepper and tomato. However, on the east coast bacteria pressure remains very low. Let's hope it stays that way.

We could be in for a challenging season. The winter weather outlook for Florida is calling for a wetter and colder-than-average growing season. We are all well aware that bacteria leaf spot increases under wetter conditions. The good news is Sakata has bacteria leaf spot resistance with Blitz, Touchdown and Gridiron. This will certainly give pepper growers some peace of mind when conditions are favorable for bacterial infection.

The early maturity of Blitz and Gridiron will help growers put points on the scoreboard faster. The extended pick of Touchdown will further help growers reach the end zone. With solid yields and quality fruit, in addition to BLS resistance, Blitz, Touchdown and Gridiron will surely help pepper growers deal with challenges that must be overcome to complete a winning season.

In the meantime, let's all huddle up, keep our focus, make the right calls to address the challenges, and go all-out!

DISCLAIMER: Claims and other disclosed information are based on our observations and/or information from other sources. Crop performance depends on the interaction between the genetic potential of the seed, its physiological characteristics, the environment, including management, and other uncontrollable factors that may alter expected performance. Statements on the reaction of varieties to a specific pathogen, pest or stress are based on evaluation under defined conditions. These reactions can be affected by changes in environmental and biological factors, especially new pathogen races, pest biotypes or vectors of disease agents. Therefore, we give no warranty, express or implied, for crop performance relative to the information given; nor do we accept any liability for any loss, direct or consequential, that may arise from any cause. Read all seed package labeling carefully as it contains terms and conditions of sale.