

# Evaluation of the usefulness of a late blight decision support system

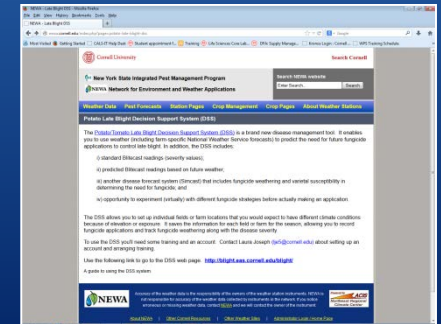
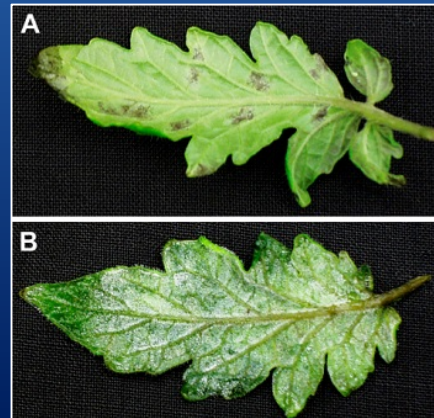
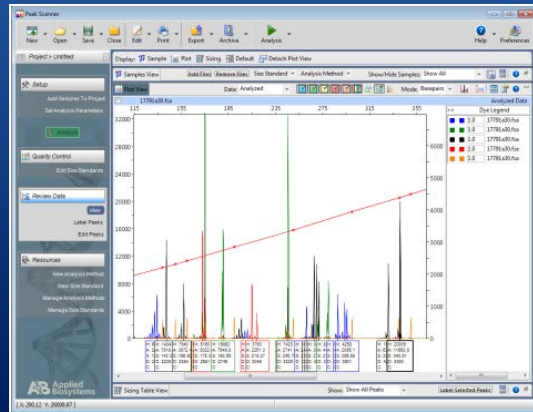
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# Late Blight caused by *Phytophthora infestans* on tomato





# Genotype



# Phenotype



# Control Strategies

'genotype' is defined as the genetic makeup of an organism

Host preference

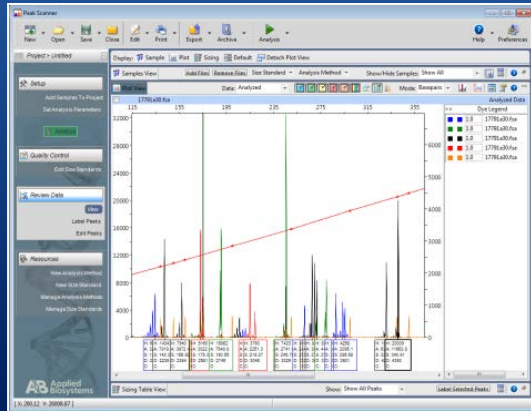
Fungicide sensitivity

Mating type

Late blight decision support system (DSS)

Fungicide selection

# Importance of genotyping *P. infestans*



**Genotype**



'Genotype' is defined as the genetic makeup of an organism

- \*Currently DNA 'Fingerprinting'
- \*SSR =Microsatellite markers on more than 10 loci (Lee et al, 2006)
- \* Send samples to Dr Bill Fry at Cornell for quick SSR typing
- \* Samples processed very quickly



**US-23 dominated in northeast  
U.S. in 2014 and so far in 2015**

**In Florida, only US-23 detected in  
2014 and 2015 on tomato**

**US-23 genotype is characterized  
as mefenoxam sensitive**

<http://swfrec.ifas.ufl.edu/programs/plant-path/faculty/roberts/roberts-publications/>

The screenshot shows a web browser window with the URL <http://swfrec.ifas.ufl.edu/programs/plant-path/publications.php>. The page has a light blue header with navigation links: "Program", "Dr. Pamela Roberts", "HLB Diagnostic Lab", "Personnel", "Publications", "Extension Publications", and "Other Publications". The main content area is titled "Publications" and features a list of 13 publications, each preceded by a right-pointing triangle icon. The publications are categorized by crop: Citrus, Cucurbits, Peppers, and Tomato. The Tomato category is currently selected, showing 13 entries. On the right side, there is a contact information box for the Plant Pathology Program.

## Publications

- ▶ Citrus
- ▶ Cucurbits
- ▶ Peppers
- ▼ Tomato

- ▶ Evaluation of compounds for the management of late blight on tomato, spring 2014
- ▶ Evaluation of compounds for management of bacterial spot in tomato, spring 2013
- ▶ The continuing challenge of late blight caused by *Phytophthora infestans* on Tomato and Potato
- ▶ Evaluation of compounds for management of late blight in tomato, spring 2012
- ▶ Evaluation of compounds for management of late blight in tomato, spring 2011
- ▶ Evaluation of compounds for management of bacterial spot in tomato, fall 2011
- ▶ Evaluation of compounds for management of bacterial spot in tomato, fall 2010
- ▶ Evaluation of compounds for management of late blight in tomato, spring 2010
- ▶ Evaluation of compounds for management of late blight in tomato, spring 2009
- ▶ Evaluation of compounds for management of late blight in tomato, fall 2008
- ▶ Evaluation of compounds for control of foliar diseases in tomato, fall 2007
- ▶ Evaluation of fungicides and bactericides for control of late blight and bacterial spot in tomatoes, 2000

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## USABLIGHT

A NATIONAL PROJECT ON TOMATO & POTATO LATE BLIGHT IN THE UNITED STATES

[About Late Blight](#) ▼

[Occurrence Map](#) ▼

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[Managing Late Blight](#) ▼

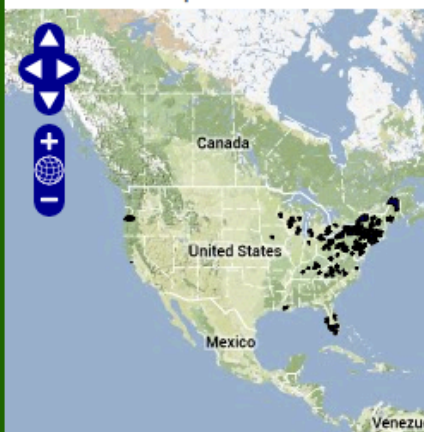
[Cornell DSS](#)

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### Current Disease Map

Click the map for more details



[Recent Reports](#) [Older Reports](#)

### Quick Links

**Check your alerts!** Click [here](#) or find it under the "Reporting Outbreaks" menu.

**Submit a report!** Click [here](#) or find it under the "Reporting Late Blight" menu.

### USABlight Webinar on Jan 14th, 2014

Organic farmers: join the USABlight extension team in a free Webinar and Live Chat Session on **Tuesday, January 14th at 2pm EST** through *eOrganic* to learn about the current status of the pathogen and efficacy of management practices from research and farmer experiences.

For more details, and to register for this free webinar, [click here](#).

[Read more](#)

### Welcome to USABlight





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Cornell DSS

## Cornell Decision Support Home

The **Potato/Tomato Late Blight Decision Support System (DSS)** is a brand new disease management tool. It enables you to use weather (including farm-specific National Weather Service forecasts) to predict the need for future fungicide applications to control late blight. In addition, the DSS includes:

- i) standard Blitecast readings (severity values);
- ii) predicted Blitecast readings based on future weather;
- iii) another disease forecast system (Simcast) that includes fungicide weathering and varietal susceptibility in determining the need for fungicide; and
- iv) opportunity to experiment (virtually) with different fungicide strategies before actually making an application.

The DSS allows you to set up individual fields or farm locations that you would expect to have different climate conditions because of elevation or exposure. It saves the information for each field or farm for the season, allowing you to record fungicide applications and track fungicide weathering along with the disease severity.

To use the DSS you'll need some training and an account. Contact Laura Joseph ([lje5@cornell.edu](mailto:lje5@cornell.edu)) about setting up an account and arranging training.

Use the following link to go to the DSS web page. <http://blight.eas.cornell.edu/blight/>

For a "How-To" on the DSS, please consult the webinar below (conducted on May 30th, 2012)

Maximizing the efficiency of late blight manage...

### How to access the DSS

USABlight



<http://usablight.org/ds>



# Late Blight Decision Support System (DSS) (Small et al. 2015)

Decision Support System (DSS) is the term used for programs (mostly computer based) developed to assist growers in making disease management decisions.

1. Location-specific weather data (NWS, local FAWN)
2. Disease forecasting tools based on relative humidity; rainfall, and temperature:
  - Blitecast (estimates favorability of weather)
  - Simcast (blight units, fungicide units and accounts for host resistance)
3. Can input varieties and US genotype
4. Alerts (email or text)

# Late Blight Decision Support System

[Login](#)[Input/Reports](#)[Simulation Experiments](#)[Alert Settings](#)[Messages](#)[Infection Risk](#)[Sprinkler Irrigation](#)[New Location](#)

Current Location

Geneva

Location Selection

Geneva ▼

## Input



Cultivar: Yukon Gold ▼

Resistance: susceptible

## Variety

[Click here for additional cultivar information.](#)

Maturity: mid season

Emergence date 05/15/2013

First potato foliage (culls, volunteers, current crop) or first tomato foliage (e.g. transplants) in the region - approx. 30 mile radius

Pathogen Lineage: US-24 ▼

## Pathogen

Potato: susceptible Tomato: not susceptible Mefenoxam: generally effective (only moderately effective in some cases)

Please fill in the requested information and then click on the 'Submit Fungicide' button.

Date  Select Hour ▼ Select Fungicide Ingredient[Submit Fungicide](#)[Cancel Fungicide](#)

## Fungicide

[Get Reports](#)

# Blitecast used prior to late blight to predict when LB

Potato Late Blight

blight.eas.cornell.edu/blight/

Rule That Cu...day's Paper Fastmail NOAA's Natio...her Service Oracle BI In... Dashboards Workday Remedy Incident Ticket My Settings ... Application UnitTrak login Cornell Uni...ncials Home

Potato Late Blight

Date  Select Hour  Select Fungicide Ingredient

**Simcast Summary**

Date	6/19	6/21	6/22	6/23	6/24	6/25	6/26
Blight Units	14	18	18	22	27	31	31
Fungicide Units	-13	-14	-17	-20	-21	-22	-23

**Key**

	Below Threshold
$\geq 37$	Blight Unit Threshold Exceeded and 5 Days Since Last Fungicide
$\leq -23$	Fungicide Unit Threshold Exceeded and 5 Days Since Last Fungicide

Threshold will change based on varietal susceptibility

Threshold will change based on fungicide applied

Reports (click link below)	Color Legends and Report Explanation
<a href="#">Weather Report</a>	
<a href="#">Blitecast Report</a>	<a href="#">Blitecast Explanation</a>
<a href="#">Simcast Report</a>	<a href="#">Simcast Explanation</a>

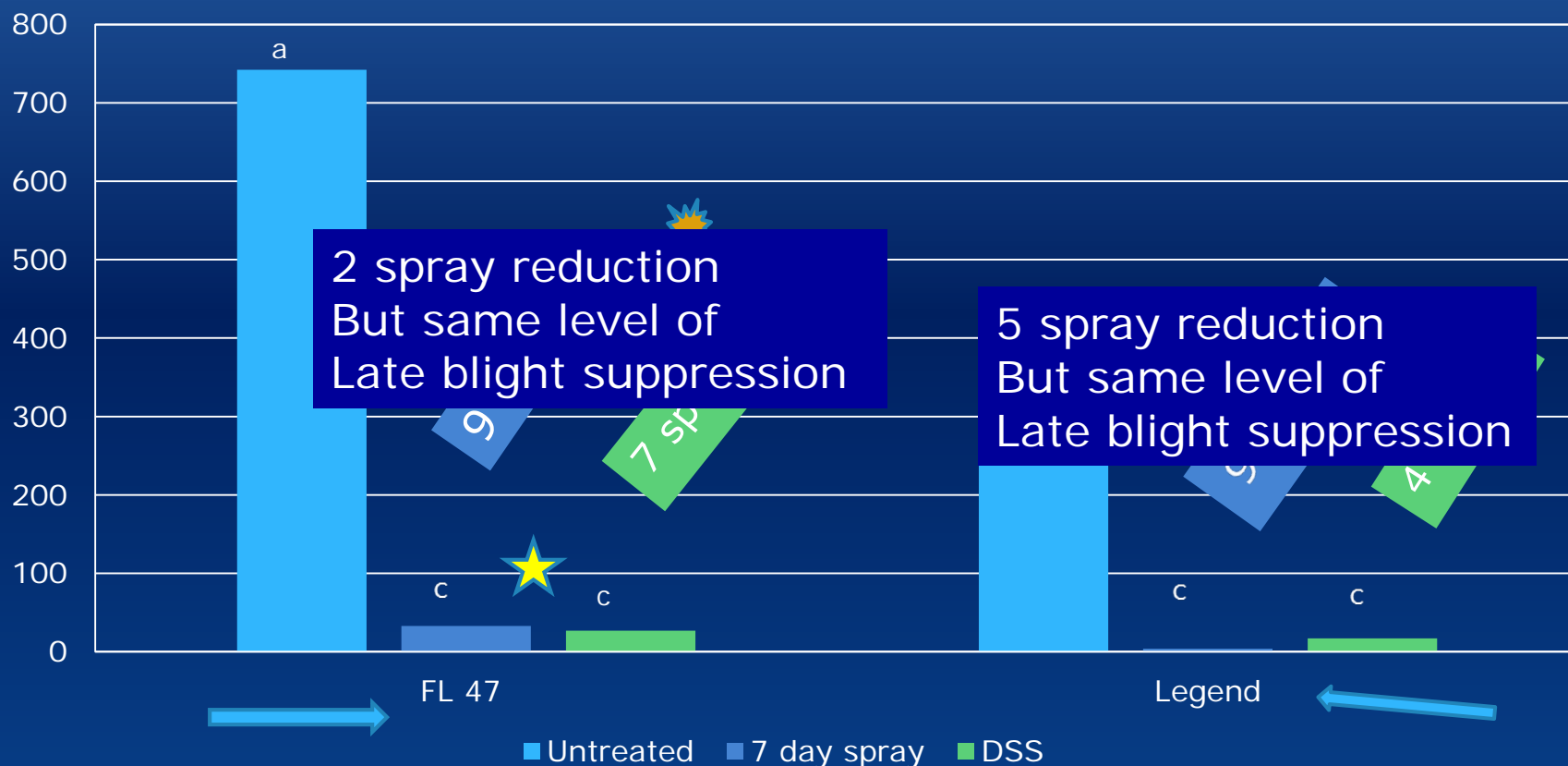
Purpose: Examine the usefulness of using the Cornell DSS for determining fungicide applications for late blight on tomato

- Two cultivars:
  - very susceptible ('FL 47' or 'Charger')
  - less susceptible 'Legend'
- Small, replicated plots
- Three treatments
  - Untreated control
  - Weekly fungicide spray program initiated soon after transplanting (LB in area)
  - Fungicide spray program triggered using the DSS
- Disease severity (% affected tissues) over time used to calculate Area Under the Disease Progress Curve (AUDPC)



# Evaluation of a DSS for fungicide applications on very susceptible 'FL47' and moderately susceptible 'Legend' tomato, 2014

## AUDPC

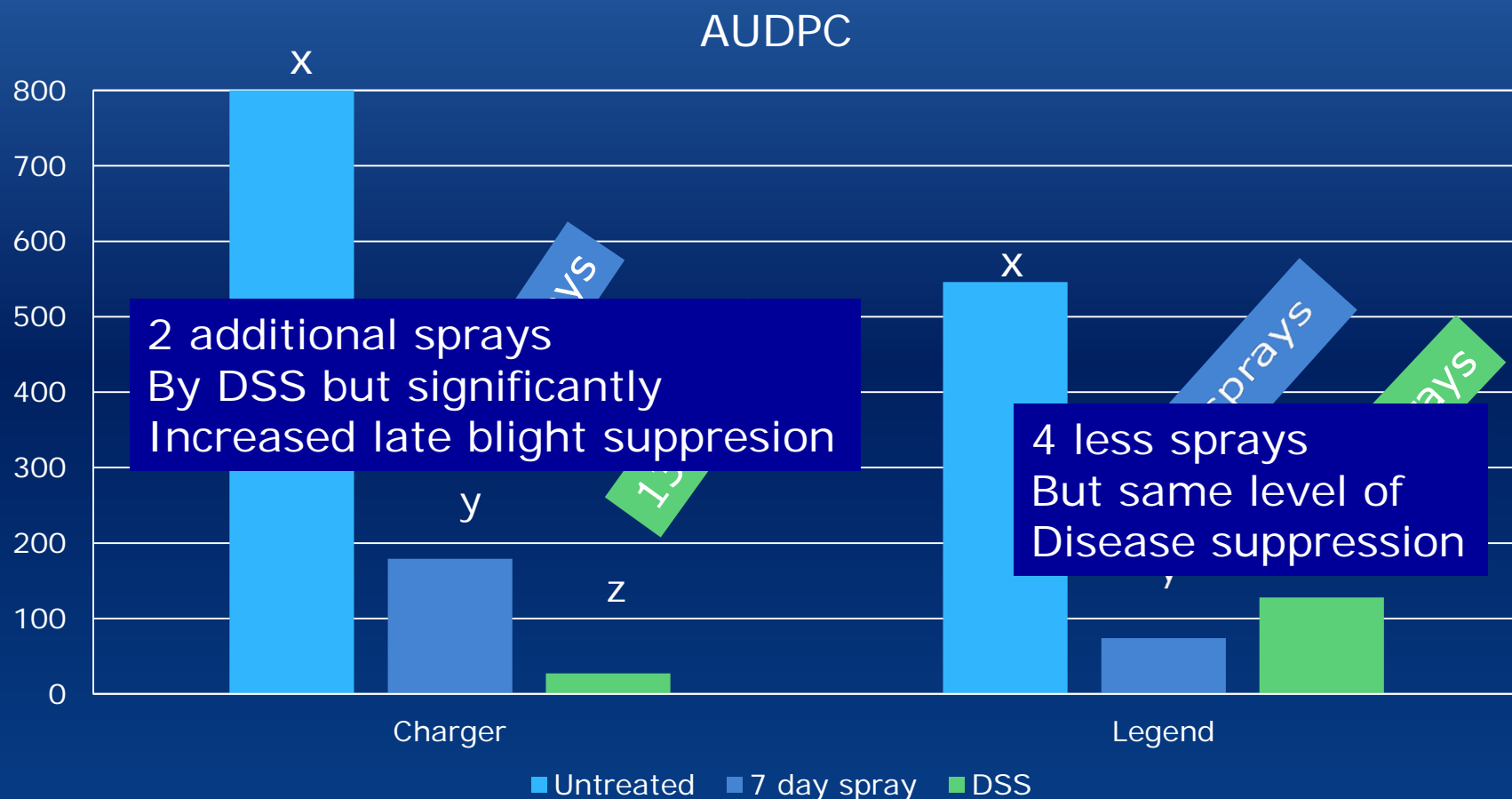


Untreated= no sprays

7 day full season= 9 sprays all chlorothalonil

DSS= Cornell Decision support system= 7 sprays for 'FL 47' and 4 for 'Legend'

# Evaluation of a DSS for fungicide applications on very susceptible 'Charger' and moderately susceptible 'Legend' tomato, 2015



Untreated= no sprays

7 day full season= 11 sprays: all late blight fungicides

DSS= Cornell Decision support system= 13 sprays for 'Charger' and 7 for 'Legend'



Plots of  
tomato  
plants  
within  
same trial:  
fungicide  
not  
effective  
vs highly  
effective  
fungicide  
control of  
late blight

# Results of 2014 and 2015 DSS trials using DSS

Highly **susceptible** tomato cultivar

- In 2014, 20% reduction in number of sprays; same level of disease suppression
- In 2015, increased number of spray applications but significantly reduced AUDPC



# Results of 2014 and 2015 DSS trials using DSS

Moderately **resistant** tomato cultivar

- In 2014, 55% reduction in number of sprays; same level of disease suppression
- In 2015, 35% reduction in number of spray applications but significantly reduced AUDPC

In conclusion, DSS appears promising to aid in timing of fungicide applications and trials using

This year we are planning to expand to some commercial sites

Please refer to: [Usablighlight.org](http://Usablighlight.org)

# Acknowledgements

- \* Dr. Mellinger , Galen Frantz, Leon Lucas and personnel at Glades Crop Care
- \* Sonia Tighe, FFVA
- \* SWFREC: Jessie Watson
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