

EVALUATION OF FUNGICIDES FOR THE DEVELOPMENT OF AN EFFECTIVE SPINACH WHITE RUST CONTROL SYSTEM

*Larry A. Stein
Professor & Extension Horticulturist*

*2011 International Spinach Conference
Amsterdam, Netherlands
October 3-4, 2011*



CURRENT RECOMMENDED CONTROL SYSTEM

- **Resistant varieties**
- **In-seed furrow application at planting of metalaxyl @ 10 lbs/A**
- **Initiate foliar fungicide applications of Quadris or Cabrio 30 – 45 DAP (when initial 12 hr leaf wetness period occurs after the 4-leaf stage)**

EVALUATION OBJECTIVE

- To find an effective fungicide or fungicides to alternate with **the strobilurins**

SUMMARY TO DATE

15-YEARS OF EVALUATION

40+ COMPOUNDS,

- VARIOUS RATES

AND

- APPLICATION SCHEDULES

SOME LOOK VERY GOOD

COOPERATIVE EVALUATION:

Texas AgriLife Extension Service

DEL MONTE FOODS RESEARCH



“White rust infestation”
DEL MONTE FOODS RESEARCH FARM
CRYSTAL CITY, TX





RANDOMIZED COMPLETE BLOCK DESIGN

4- REPLICATES / TREATMENT

40 ' ROW LENGTH / REP

10 ' ALLEYWAYS BETWEEN PLOTS

2 TREATMENT BUFFER BEDS

2 PLANT ROWS / 40 " WIDERAISED BED

2 TREATED BEDS

**4-BED
TREATMENT
PLOT**



**DELIVERY RATE
40 GAL / A**

CONDITIONS OF STUDY

- **White rust susceptible variety**
- **Direct seeded typically in mid-October**
- **Trial has been cut due to lack of white rust pressure and re-grown the last few years.**
- **Treatments usually made in late January and early February.**

TREATMENT EFFICACY DETERMINATION PROCEDURES

- **1 – Visual rating**
- **2 – % infected leaves calculated by sampling**

VISUAL WHITE RUST SEVERITY INDEXING PROCEDURE

- **Visually rating severity**
 - **Scale 1 – 10**
 - 1 = clean
 - 10 = near death



30 From each treated bed
- 6 random leaves from
- 5 locations in each bed



TREATMENT SAMPLING PROCEDURE

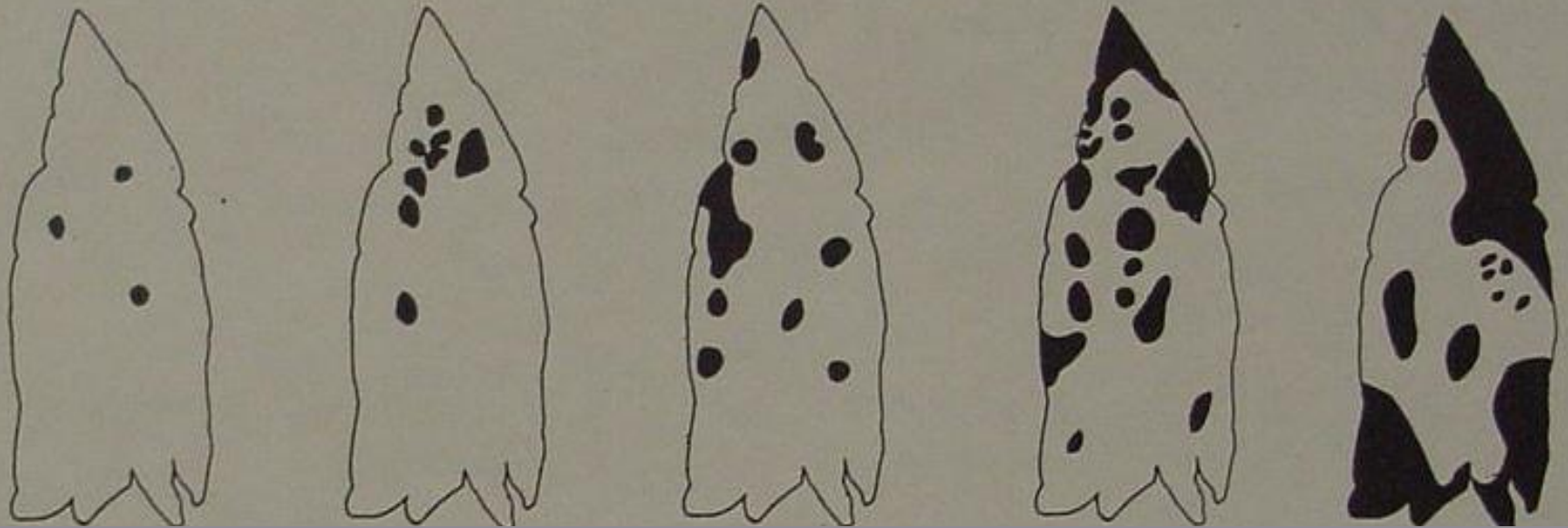
WHITE RUST SEVERITY

% LEAVES INFECTED

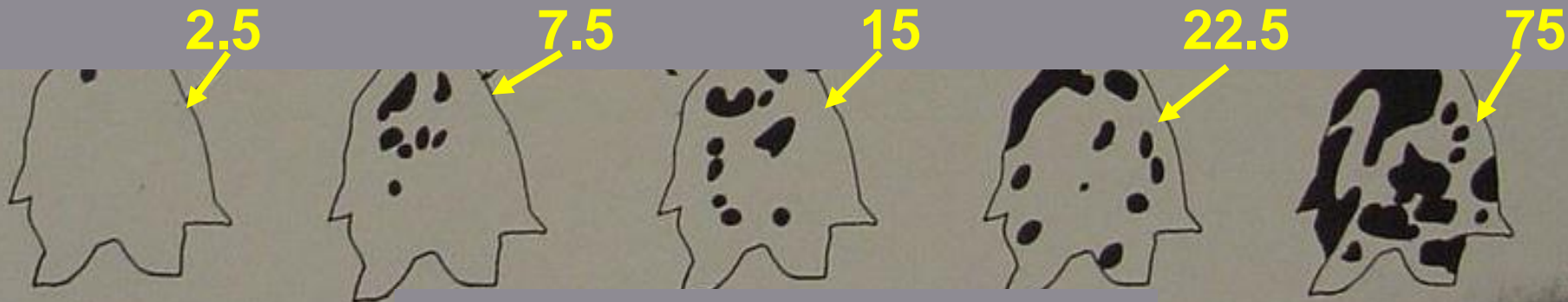
- **% infected leaves:**
 - **Leaves sorted into infected and non-infected lots (1 lesion = infected leaf)**
 - **Percentage infected determined**

PERCENT SPINACH LEAF AREA WITH WHITE RUST

(Dr. Mark Black)



CORRECTION FACTORS



% Leaf area infected

1%

5%

10%

20%

50%

4:2

An aerial photograph of a lush green field, likely a crop field, with a dirt path winding through it. The text is overlaid on the image.

- **A comparison of visual white rust indexing**

VS.

leaf sampling showed no difference over a two year period.

- **As a result, only visual ratings are taken today.**

2004-2005 Spinach Fungicide Results

	1/20/2005 Rating
Cabrio 12 oz/A alt. with Bio Phos (2%)	1.3
Cabrio 12 oz/A alt. with Phostrol 2.15 lbs/A	2.0
Cabrio 12 oz/A alt. with Kocide 2000 2 lbs/A	2.0
Cabrio 12 oz/A alt. with Ranman 2.75 fl oz/A	2.5
Reason 8 fl oz alt. with Kocide 2000 2 lbs/A	2.8
Check	10.0

1 = clean, 10 = blown out

2005-2006 Spinach Fungicide Results

	3/14/2006 Rating
Cabrio 12 oz/A alt. with Forum 6 fl oz/A + Kocide 2 lbs/A	2.8
Amistar (Quadris) 12 oz/A alt. with Kocide 2000 2 lbs/A	2.5
Cabrio 12 oz/A alt. with Ranman 2.75 fl oz/A	3.0
V-10161 2.8 oz/A + Previcur 1.2 pts/A	3.0
Cabrio 12 oz/A alt. with Kocide 2 lbs/A	3.3
Check	10.0

1 = clean, 10 = blown out

2006-2007 Spinach Fungicide Results

	3/21/2007 Rating
Cabrio 12 oz/A alt. with Kocide 3000 1 lb/A	3.5
Quadris 12 oz/A alt. with Kocide 3000 1 lb/A	4.3
Cabrio 12 oz/A alt. with Ranman 2.75 fl oz	2.8
Sonata 2 qts/A + Biotune 0.2% v/v	5.3
Serenade 2 qts/A + Biotune 0.2% v/v + Quadris 6 oz/A	3.3
Quadris 12 oz alt. w/Ridomil Gold Copper 2.5 lbs/A	3.3
Check	10.0

1 = clean, 10 = blown out

2007-2008 Spinach Fungicide Results

	2/29/2008 Rating
Cabrio 12 oz/A alt. with Kocide 3000 1 lb/A	4.0
Reason 8 fl oz + Induce 8 fl oz	4.3
Quadris 12 oz/A alt. with Presidio 3 oz/A	4.8
Presidio 3 oz alt. w/Kocide 3000 1 lb/A	5.0
Check	10.0

1 = clean, 10 = blown out

2008-2009 Spinach Fungicide Results

	3/4/2009 Rating
Omega 0.5 a.i./A	2.0
Presidio 3 oz alt. with Quadris 12 oz/A	3.0
Presidio 4 oz alt. with Kocide 3000 1b/A	2.3
Cabrio 12 oz/A alt. with Kocide 3000 1 lb/A	2.3
Picoxystrobin 0.20 a.i./A	2.0
Ranman 5.5 fl oz/A + Silwett 77 5 oz	3.0
Check	8.8

1 = clean, 10 = blown out

2009-2010 Spinach Fungicide Results

	3/15/2010 Rating
Picoxystrobin 0.20 a.i./A alt. with Kocide 3000 1 lb/A	1.3
Cabrio 12 oz/A alt. with Kocide 3000 1 lb/A	1.5
Reason 8 fl oz + Induce 8 fl oz	1.5
Quadris 12 oz/A + 0.5 oz/A Actigard	1.5
Ranman 2.75 oz + Stillwet 2 oz/A	2.0
Check	8.5

1 = clean, 10 = blown out

2010-2011 Spinach Fungicide Results

	3/15/2011 Rating
Cabrio 12 oz/A + Induce 4 oz/A alt. with Ranman 2.75/A + Kinetic 4 oz/A	2.0
Cabrio 12 oz/A + Induce 4 oz/A alt. with Prophyt 1½ qts/A + Kinetic 4 oz/A	2.0
Cabrio 12 oz/A + Induce 4 oz/A alt. with Presidio 3 oz/A + Kinetic 4 oz/A	2.8
Quadris 12 oz/A + Induce 4 oz/A alt. with Presidio 3 oz/A + Kinetic 4 oz/A	3.0
Quadris 12 oz/A + Induce 4 oz/A alt. with Prophyt 1½ qts/A + Kinetic 4 oz/A	3.5
Check	9.5

1 = clean, 10 = blown out

SUMMARY

- **Cabrio (group 11) better than Quadris (group 11)**

Reason: Same as above

Good alternative products:

- **Ranman 2.75 fl oz/A (group 21)**
- **Presidio 3 oz/A (group 43)**

2012 International Spinach Conference

November 29 & 30, 2012

San Antonio, TX



















4450 JOHN DEERE



