Oxathiapiprolin: a new fungicide active ingredient for control of diseases caused by Oomycetes

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Technical Features of Orondis

- ✓ Common name of active ingredient: Oxathiapiprolin
- ✓ Unique mode of action (FRAC U15): Targets oxysterol-binding protein (OSBP) with essential function in fungal cells
- ✓ Systemic: Translaminar and xylem movement
- ✓ Highly effective fungicide for control of Oomycete diseases
  - o Late blight in potatoes and tomatoes
  - o Downy mildew in cucurbits and leafy vegetables
  - o Black shank in tobacco
  - o *Phytophthora capsici* blights in cucurbits and fruiting vegetables

POTATOES | TOBACCO | CUCURBITS | LEAFY VEGETABLES | FRUITING VEGETABLES

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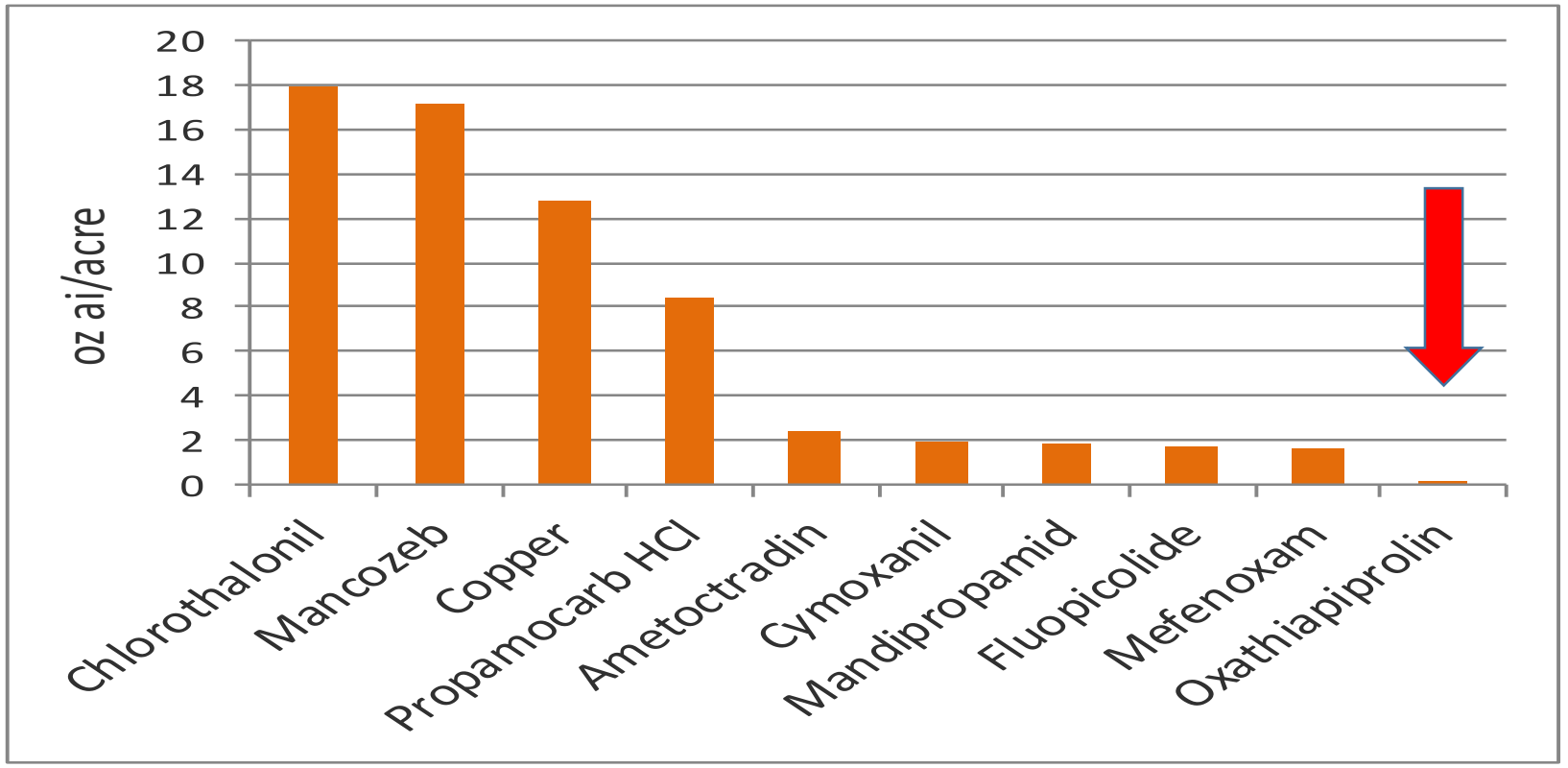
Technical Features of Orondis

Comparative Active Ingredient Use Rate



- 10-100 times lower a.i. rate than other fungicides
- Low use rate reduces environmental load, exposure, and risk to non-target organisms

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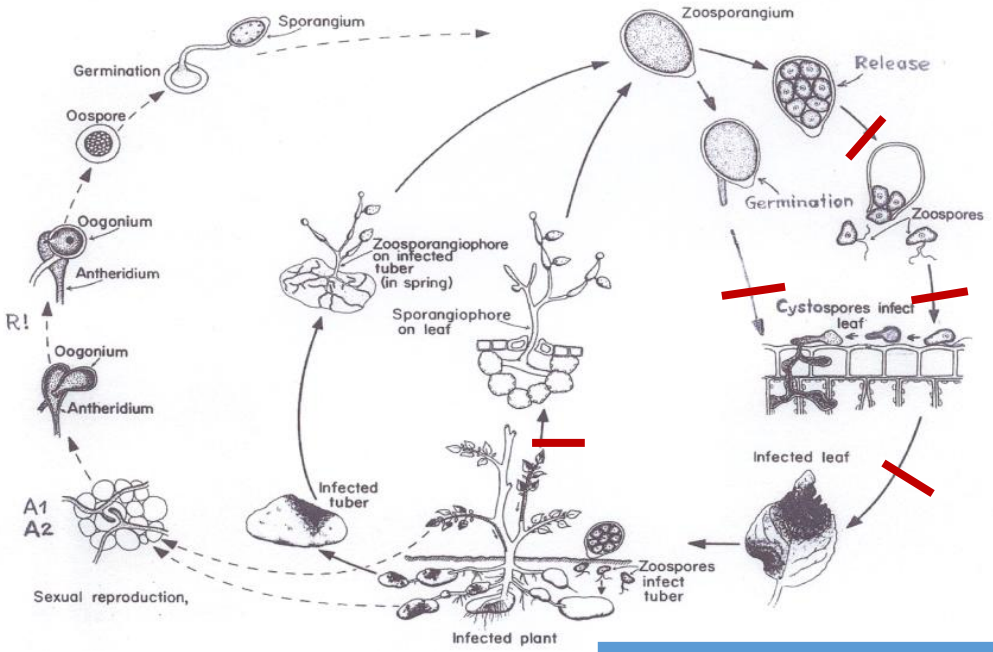
Technical Features of Orondis

New Mode of Action



- ●Targets an oxysterol binding protein essential to fungal development
- ●The only active ingredient (a.i.) in FRAC Group U15
- ●Single site action, thus Resistance Management is important
- ●No cross-resistance to any other fungicide a.i.
- ●Inhibits all stages in the fungal life cycle and with high intrinsic activity
- ●Preventive, residual, and anti-sporulant activities

P. Infestans studies *in vitro*	Oxathiapiprolin EC_{50} (ppb)
Zoospore release	<10
Zoospore germination	<0.01
Direct germination of sporangia	<0.01
Mycelial growth	0.02

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Technical Features of Orondis

Sites where normal fungal growth is inhibited

Untreated

Oxathiapiprolin

Complete inhibition of zoospore germination at 6.4 ppb

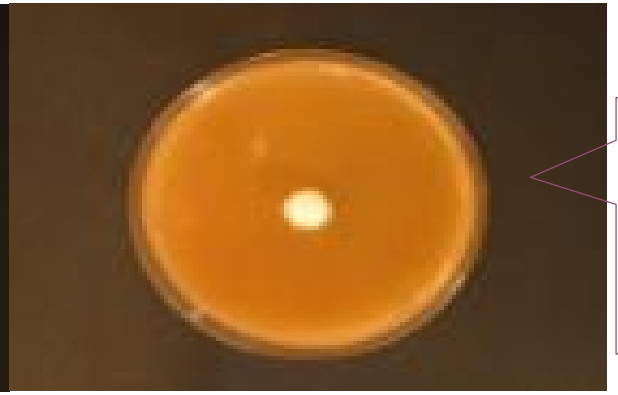
Inhibition of Sporangia Formation at Less than 0.01 ppb

Untreated

Oxathiapiprolin

Untreated

Oxathiapiprolin



Complete inhibition of mycelial growth at 0.02 ppb

Source: Richard Bittner - NCSU

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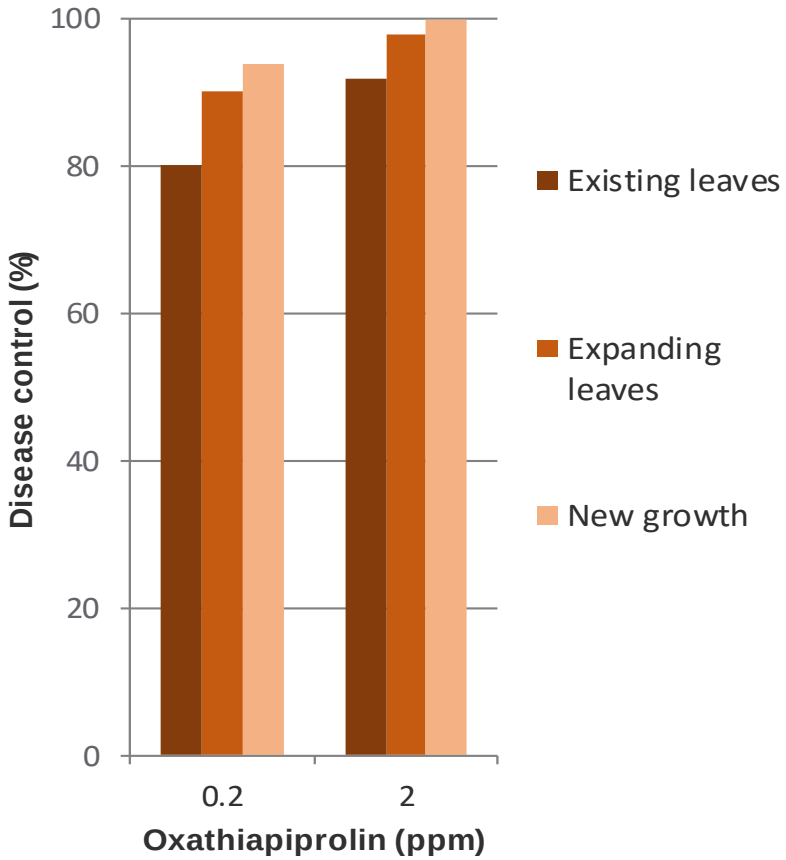
Technical Features of Orondis

Systemicity and Rainfastness



Control of late blight in potato plants treated with oxathiapiprolin (greenhouse test) foliar appl.

Systemic

Translaminar movement - across leaves to protect lower surfaces

Acropetal movement in xylem - into growing tips and distal parts of leaves

Redistribution to protect expanding leaf canopy

Rainfast

Within 30 minutes

Quickly binds to cuticle for uptake into leaves

Prevents wash off of a.i. in the event of rainfall

Mitigates the need for retreatment

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Technical Features of Orondis

Systemicity and Residual Control

- Single drench application of oxathiapiprolin at 15ga/ha on tomato plants kept in greenhouse.
- Repeated inoculation with *Phytophthora infestans* every 5-7 days following treatment.
- Marker on plant shows new growth

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Orondis Gold 200 SC

- ✓Syngenta obtained marketing rights to Oxathiapiprolin from DuPont in 2013
- ✓Agreement required product be used in mixtures in most markets
- ✓Development program in tobacco focused on:
  - ✓Confirming rates and optimizing formulations (100 OD vs. 200 SC)
  - ✓Evaluating application timings
  - ✓Evaluating tank mixture vs. single ai alternation programs
  - ✓Development of a premix
  - ✓Crop safety
- ✓Regulatory program focused on:
  - ✓Obtaining registration on tobacco as Tier 1 crop
  - ✓Securing special label to allow tank mixtures in 2016

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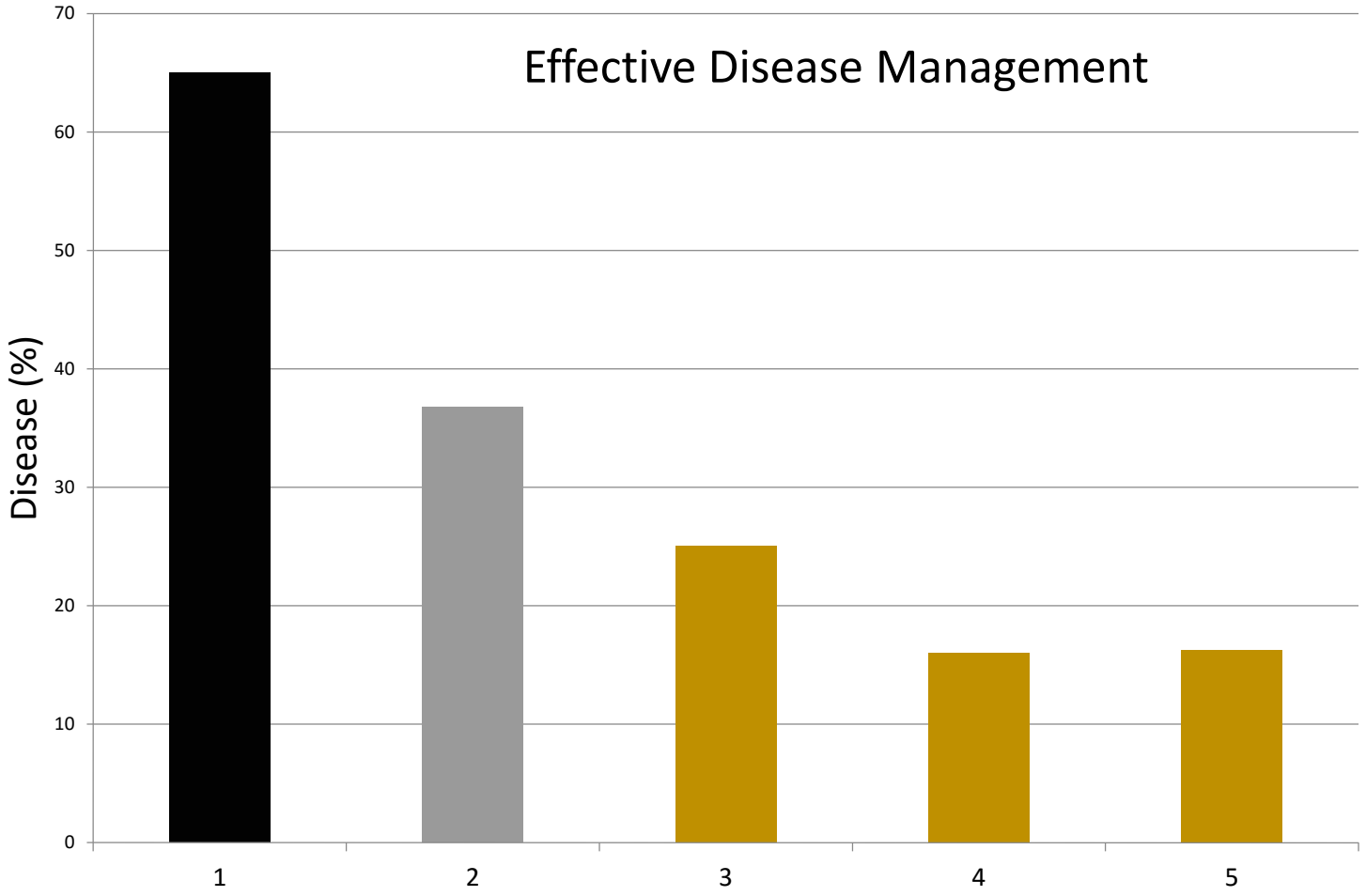
2015 Orondis on Farm Trial – P. Peterson SC



Orondis 100 OD formulation used in this trial evaluating single ai alternation programs
The 9.6 oz rate of the OD is equivalent to the recommended 4.8 oz of the SC formulation

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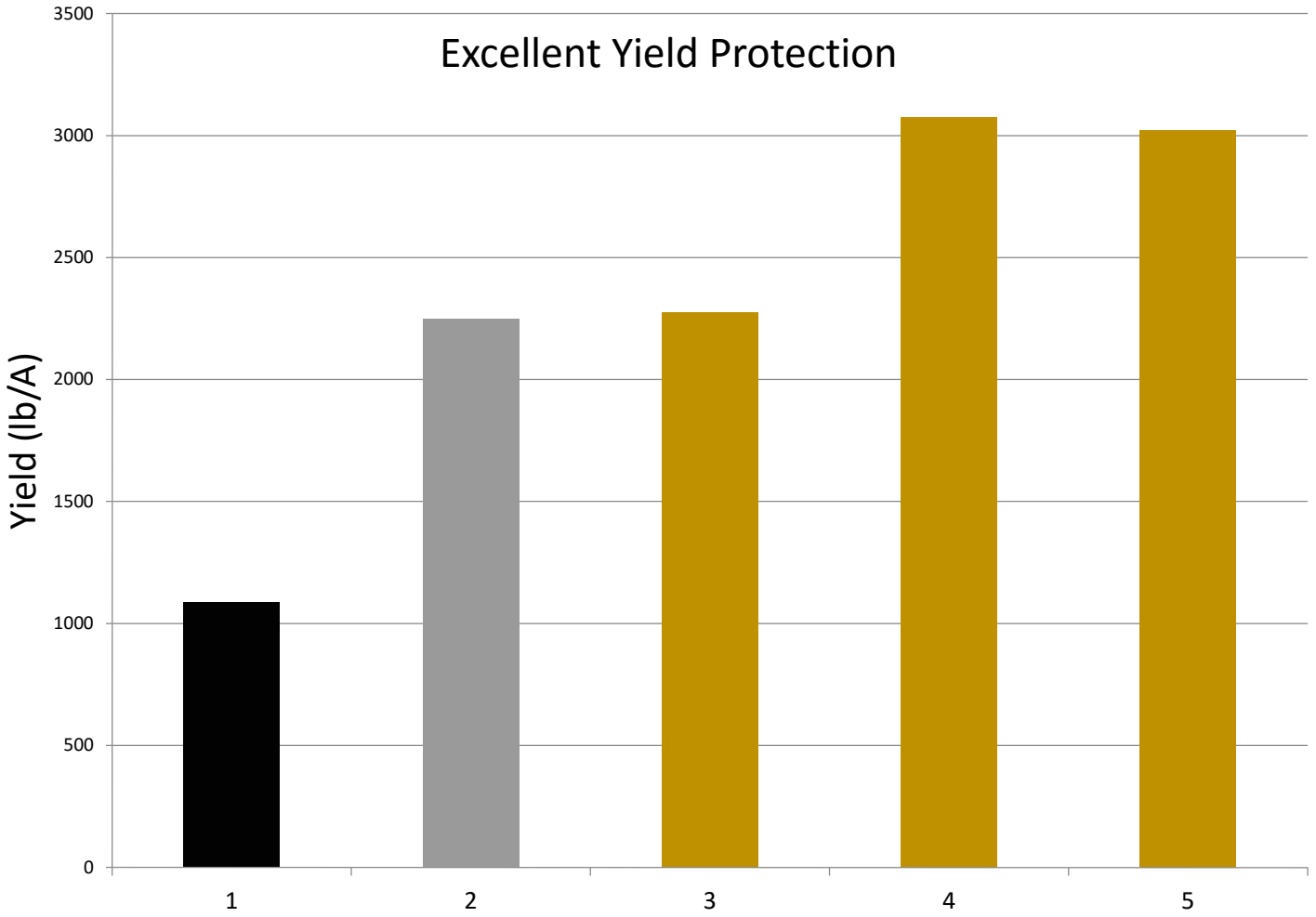
2015 Orondis on Farm Trial – P. Peterson SC



Orondis 100 OD formulation used in this trial evaluating single ai alternation programs
The 9.6 oz rate of the OD is equivalent to the recommended 4.8 oz of the SC formulation

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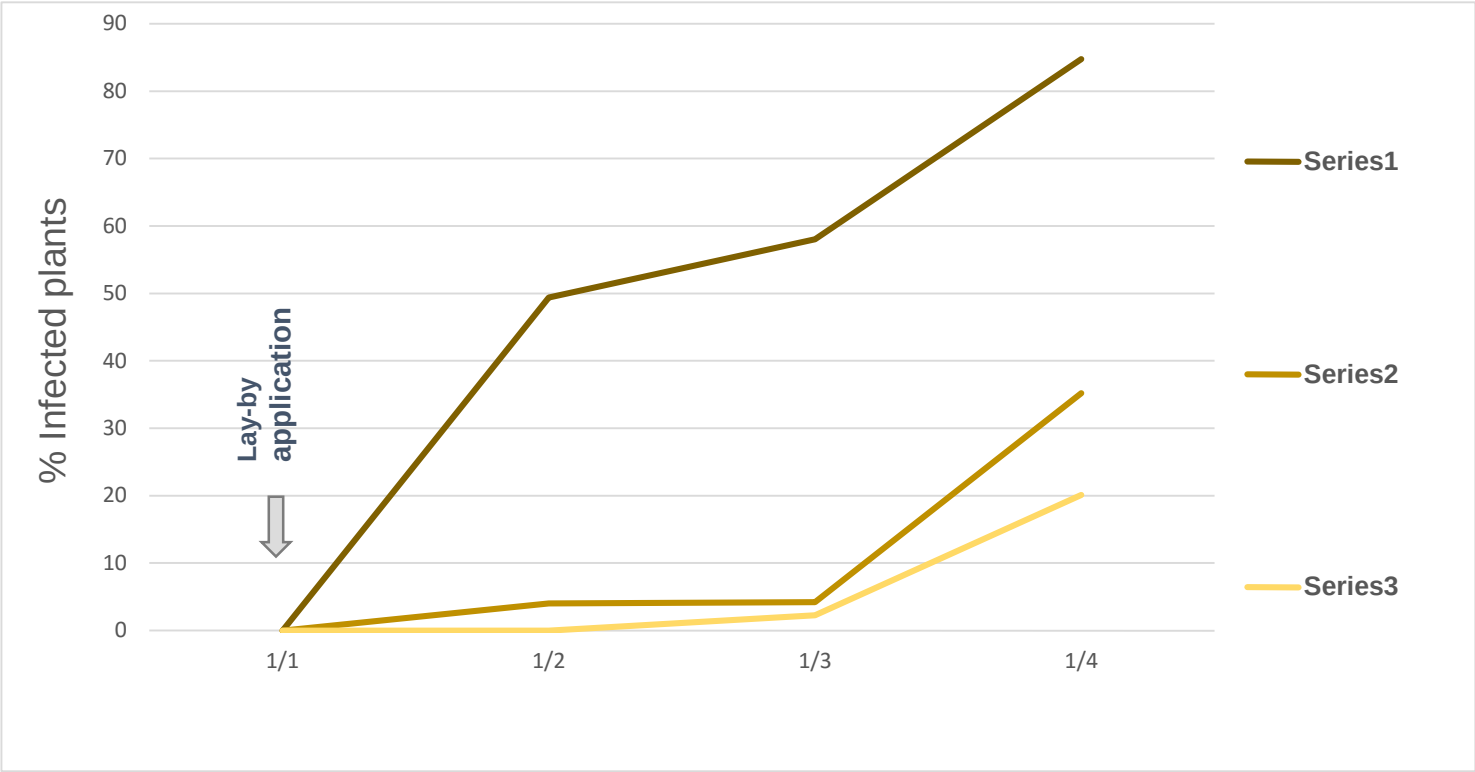
2015 Orondis BS Nursery Trial – A. Mila NC

Excellent performance from TPW flby Layby by both programs thru 28 days after layby



Orondis 100 OD formulation used in this trial evaluating single ai alternation programs
The 9.6 oz rate of the OD is equivalent to the recommended 4.8 oz of the SC formulation

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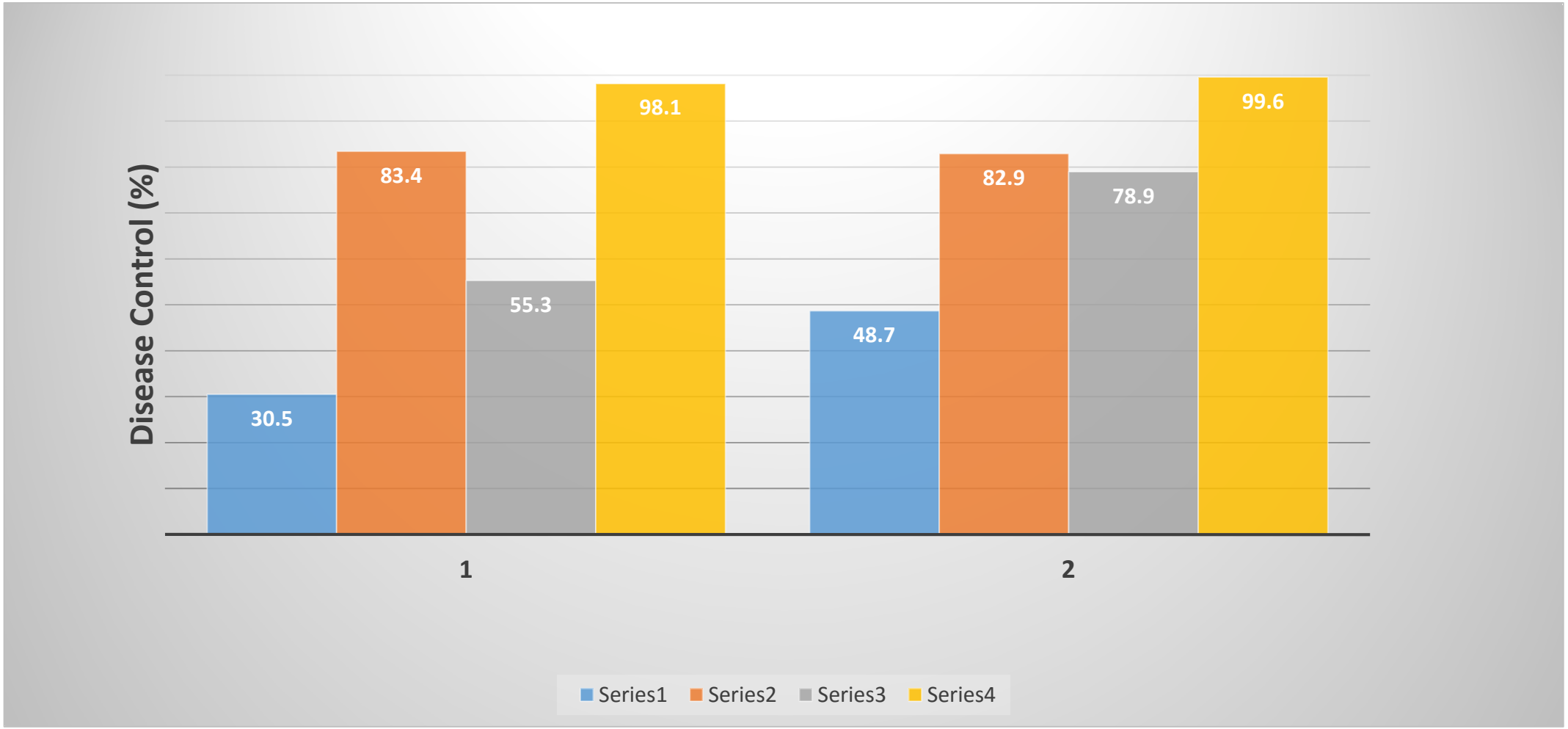
2014 Orondis BS Nursery Regional Trial

Effective disease management from tank mix of Orondis + RD Gold at TPW fb Layby



- A. Csinos
- A. Mila
- B. Fortnum
- C. Johnson

UTC Disease Incidence

GA – 91.8%

NC – 19.3%

SC – 76%

VA – 48.7%

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2016 Orondis Commercial Launch

Packaging and Application

- ✓ Multipack of two Black Shank effective active ingredients: oxathiapiprolin and mefenoxam
- ✓ Target pathogen: Black Shank **and** *Pythium*
- ✓ Labeled use rates dependent on appl. timing:
  - ✓ TPW: 3.4 - 4.8 fl.oz/A Orondis + 5.7 - 8 fl.oz/A Ridomil Gold
  - ✓ Post transplant: 4.8 fl.oz/A Orondis + 8 fl.oz/A Ridomil Gold
- ✓ Application volume:
  - ✓ TPW – Ensure saturation of transplant root zone at 100 – 200 gal/A
  - ✓ Post Transplant - apply 4- to 12-inch band at 20 – 40 gal/A and follow it with cultivation or irrigation (0.5 to 1”)
  - ✓ Recommend Orondis component be used once in a growing season
  - ✓ TPW **or** 1st Cultivation **or** Lay-by
- ✓ Ridomil Gold application flexibility is unchanged
  - ✓ Do not exceed 1.5 lb ai/A mefenoxam per season

One case treats 20 - 24 acres

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2016 Orondis Commercial Launch

- ✓ Regulatory Guidelines for 2016 will require the following:
  - ✓ Orondis Gold 200 SC Sec 3 label
  - ✓ RD Gold SL 24c label for transplant water
  - ✓ 2ee label allowing the tank mixtures of both products
- ✓ Recommended use rate and application timing:
  - ✓ TPW: 4.8 fl.oz/A Orondis Gold + 8 fl.oz/A Ridomil Gold
- ✓ Product Stewardship:
  - ✓ Two MoA – inhibition of OSBP binding and nucleic acid synthesis
  - ✓ Use in combination with resistant varieties and proper field rotation
  - ✓ "One and Done" use pattern for Orondis component
  - ✓ Preventative rather than curative
- ✓ Anticipate Sec 3 label for premix in 2017:

One case treats 20 - 24 acres

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Summary of Orondis Benefits & BMP

- ✓ Unique mode of action (FRAC U15)
- ✓ Target Disease is Black Shank (*P. nicotianae)*
- ✓ No cross-resistance to other fungicides
- ✓ Highly effective at low use rates with good residual control
- ✓ Systemic: Translaminar and xylem movement
- ✓ Rainfast
- ✓ Should be used in combination with another effective MoA – Ridomil Gold SL
- ✓ Should be used only <u>once</u> in a tobacco program including resistant varieties and proper field rotation
- ✓ Flexible application timing: TPW or 1st Cultivation or Lay-by
- ✓ Recommended rate is 4.8 oz Orondis + 8 oz Ridomil Gold SL at TPW

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