Building A Better Mouse Trap

Rango™ Biopesticide

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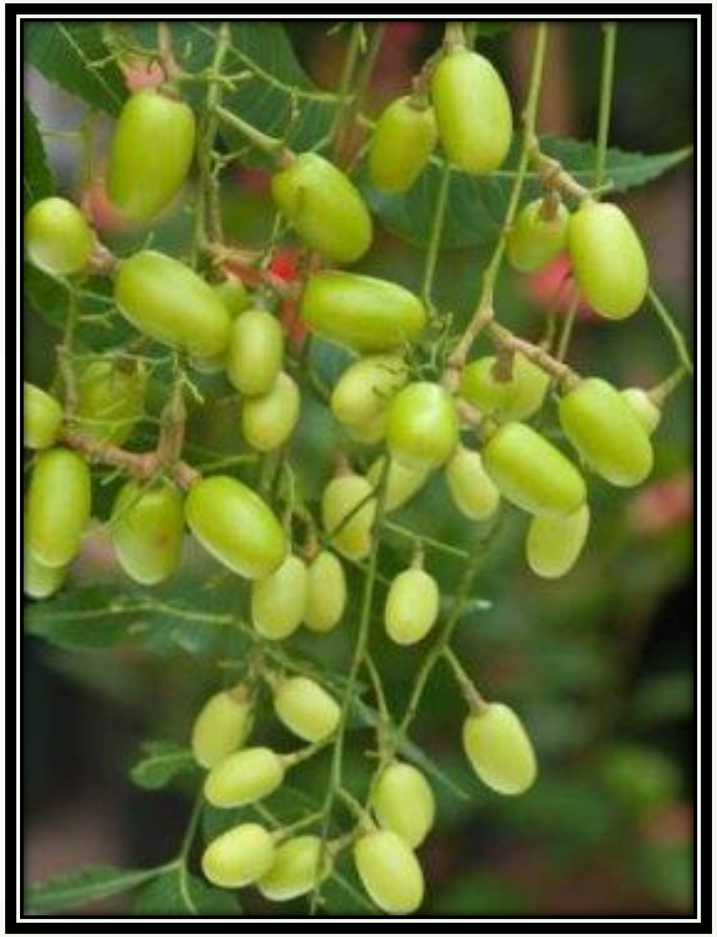
The Neem Tree

- Native to India, Bangladesh, Pakistan and surrounding geographies of the Middle East
- Mahogany Family
  - Similar to Chinaberry
- Evergreen
- Very Fast Growing
- Drought resistant
- All parts of the tree are utilized including the kernel, bark, leaves and roots

Biopesticide Discovery

- Neem’s ability to repel insects was first reported between 1928 & 1929 by two scientists in India
- Real significance was not demonstrated until 1962 in a field trial where it was noted that locust that landed on neem plants refused to consume any of the foliage.
- Bioactive compounds are found throughout the tree however the seed kernels contain the highest concentration of actives



Bioactive Properties

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- Over 150 biological active compounds
  - Major constituents are known as limonoids
- At least 9 limonoids are highly active, they include
  - Azadirachtin, salannin, meliantriol, nimbin, nimbidin, nimbinin, nimbolides and fatty acids (oleic, stearic, palmitic)
- Azadirachtin, Salannin & Meliantriol play a key role in insect management
  - Repel and disrupt insect growth & reproduction
  - Potent feeding deterrents & growth regulators
    - Repel & reduce the feeding of many insect species including nematodes
  - Azadirachtin can break the metamorphosis life cycle of an insect. The insect will not molt.
- Systemic Activity – varies by plant & insect species and formulation
  - Only xylem available to deeper feeding insects such as hoppers
- Nimbin, Nimbidin and other limonoid activities have fungicidal and antiviral activity
- Neem Oil offers the complete package – Fungicide, Insecticide, Nematicide

The Neem Oil Extraction Process

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- Methods
  - Cold Press Method
  - Water extraction,
  - Solvent/heat extraction such as: Hexane, Pentane, Alcohol
- Cold Press is Best
  - Some actives in neem are sensitive to heat/solvent based extraction methods therefore Cold press is the Best at preserving the actives
- Solvent/Heat processing impacts oil/active composition
  - Important to know how your oil was extracted
  - Solvent extraction using Hexane results in high oil variability. This oil finds its way to the soap making industry
  - The azadirachtin content can vary depending on the extraction method and quality of the neem seed

How To Build A Better Mouse Trap

- Willing to think outside the box
  - Innovation is key
- Willing to take a risk
- Willing to invest
  - People
  - Time
  - Money
- Terramera is committed to innovation that benefits agriculture

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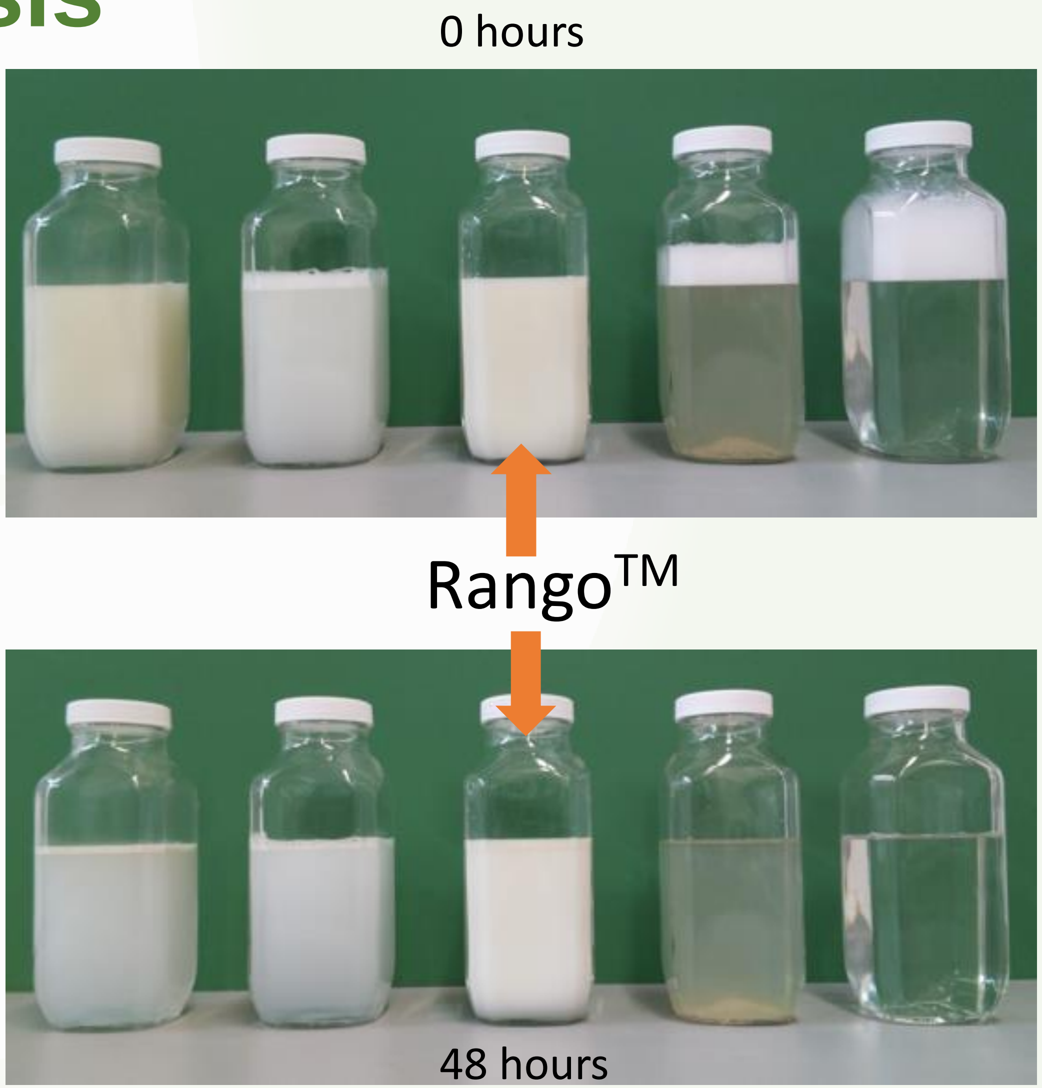
Challenges with Neem

- Consistency in field performance
  - High end spray solution that provides targeted coverage
- Consistency in the tank
  - Ease of mixing
    - Reasonable agitation
  - Stays in solution (Mixing Stability)
    - In the tank and on the leaf

Rango™ – 70% Cold Press Neem Oil built on a new inert chassis

- Superior Formulation
  - “Farmer Friendly”
  - Easy to mix
  - Stays in solution
  - Consistent coverage
  - Consistent efficacy



Rango™ – Field Trial Results

- First Year of Field Evaluations
- Superior Formulation
- Outstanding Efficacy – Exceeded the Expectations!
- EPA Registered – Will have all states by March 1 except California which is scheduled for 2ndQ
- OMRI Listed

Rango^{TM} General Information

- **What is the Signal Word and Personal Protective Requirements for Rango ^{TM}?**
  - Rango ^{TM} is a Catorgy 4 “Caution” material which is the safest classification a material can receive from the EPA.
  - The PPE requirements are minimal:
  - Long sleeved shirt and long pants
  - Shoes plus socks

Rate Information

Pest Type	Crop Type	Rate Range	Maximum Rate/Acre
Insects	All Crops	0.625 to 1.8% v/v	3 quarts
Mites	All Crops	0.625 to 1.8% v/v	3 quarts
Diseases	All Crops	1.25 to 1.8% v/v	6 quarts

INSECTS

Aphids	Grasshoppers	Psylids
Beetles	Leafhoppers	Scales
Borers	Maggots & Grubs	Thrips
Caterpillars/Moths/Worms	Mealy Bugs	True Plant Bugs
Flies & Gnats	Mites	Wireworms
		Whiteflies

FOLIAR & SOIL FUNGAL DISEASES

Alternaria	Botrytis	Powdery Mildew	Stem Mildew
Anthracnose	Downey Mildew	Rust	Southern Blight
Blight (early, late, leaf)	Molds	Scab	Sour Rot Grapes

Fusarium Oxyporum	Pythium	Rhizoctonia Solani

Apple Powdery Mildew – Washington

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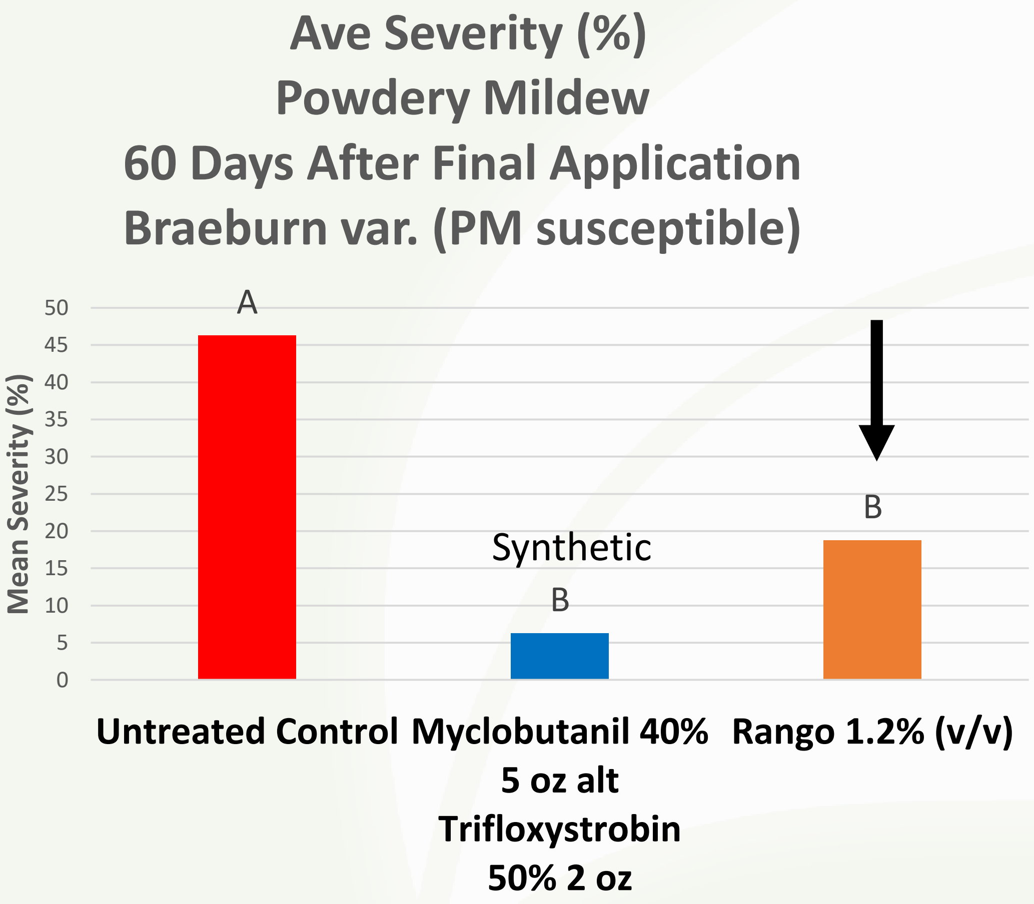
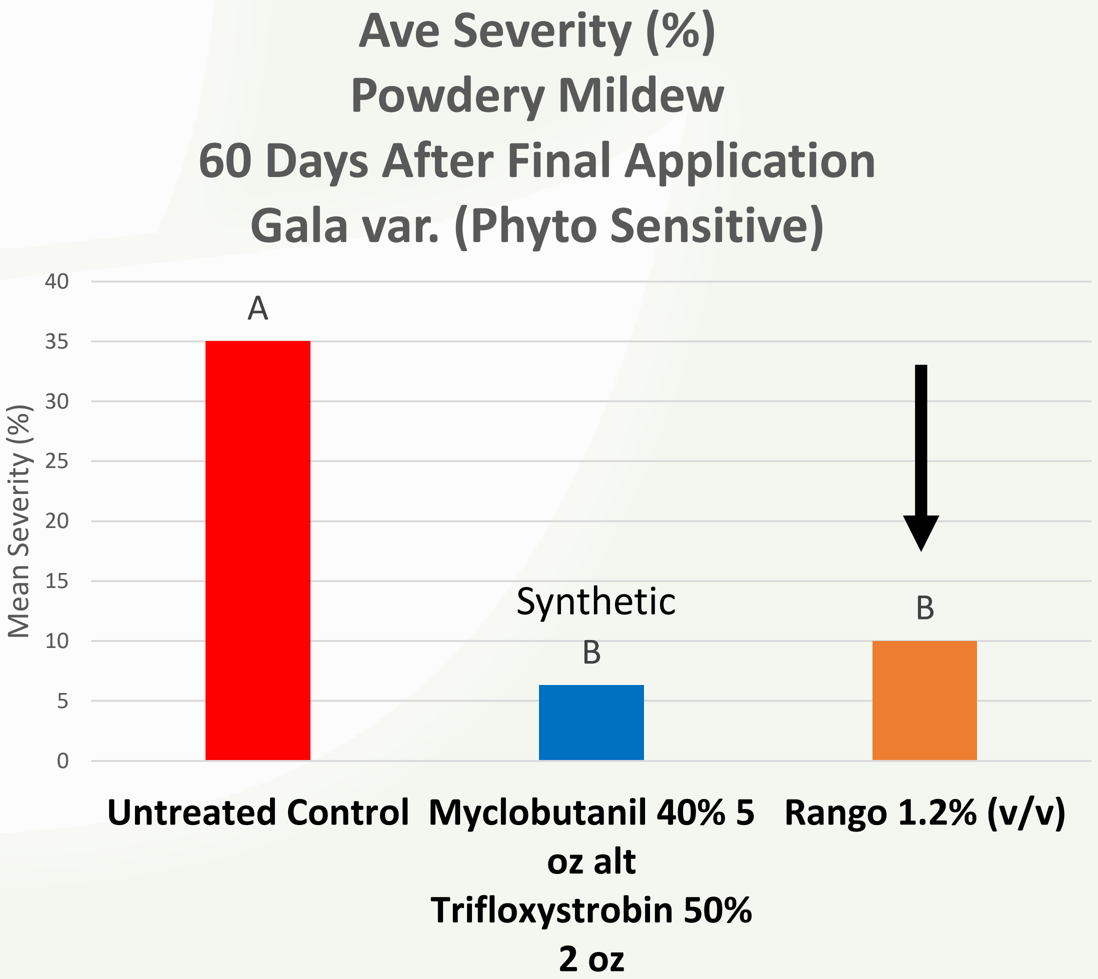
- Trial Setup:
  - 6 apps: April 4, 13, 24, May 3, 14 & 24
  - Air blast conventional sprayer 100 GPA





Tomato Powdery Mildew – Escalon, CA

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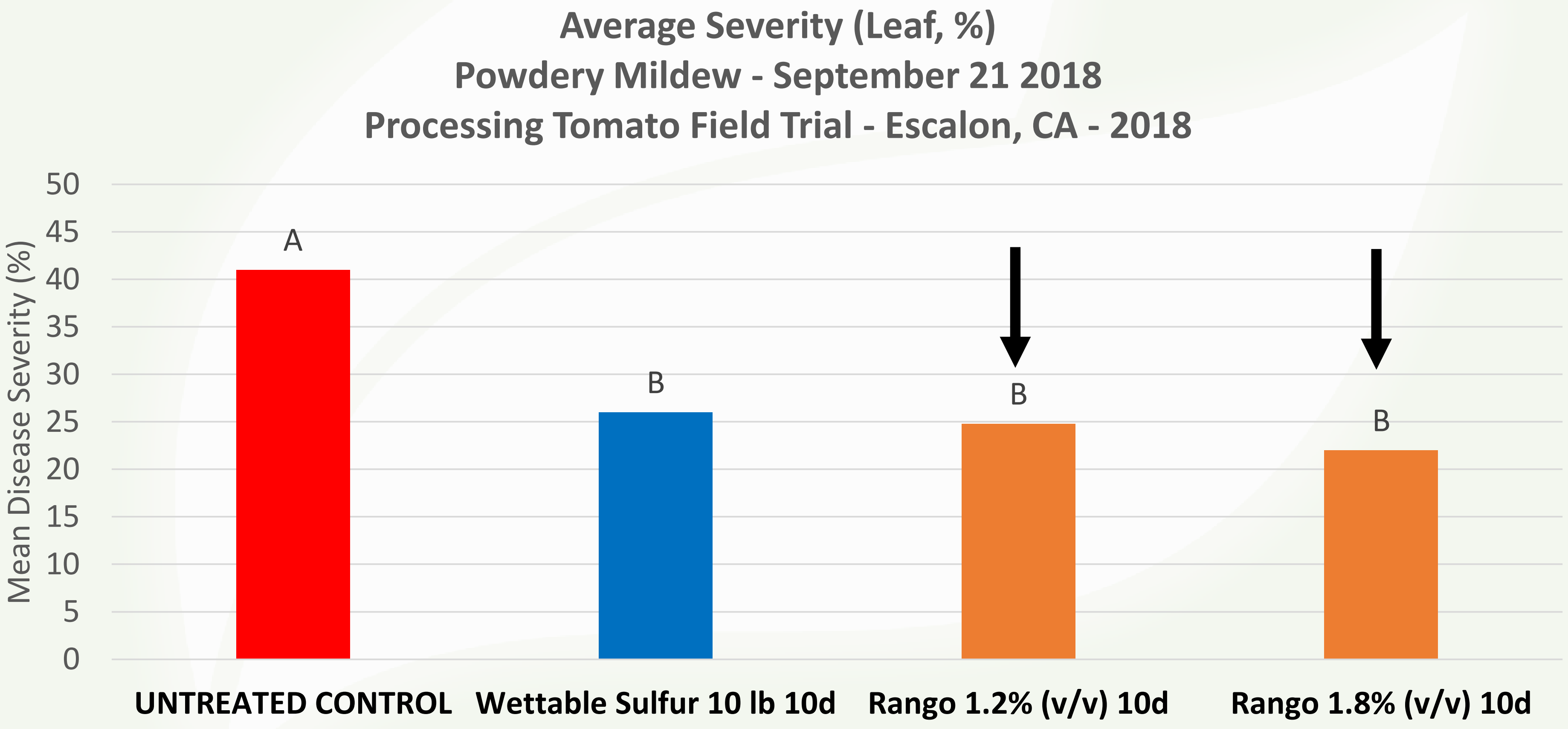
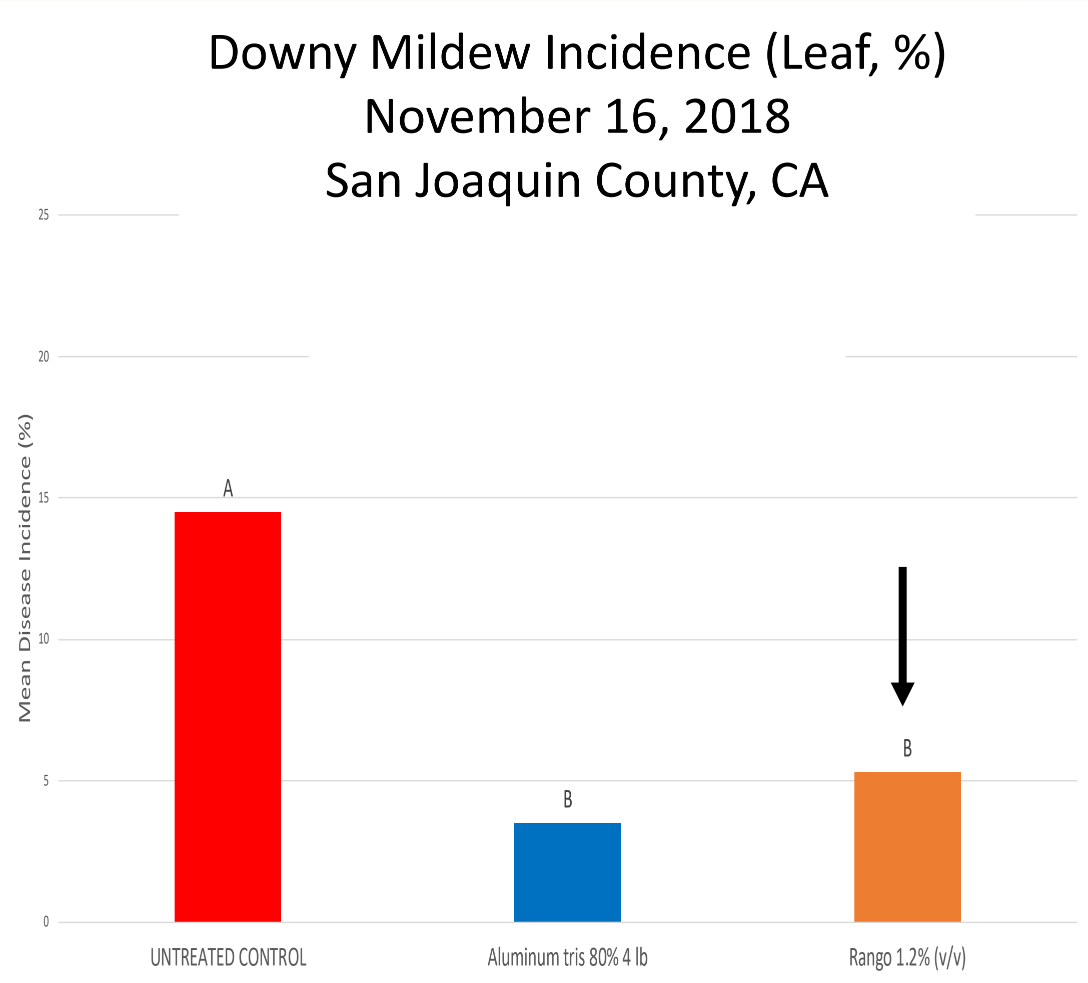
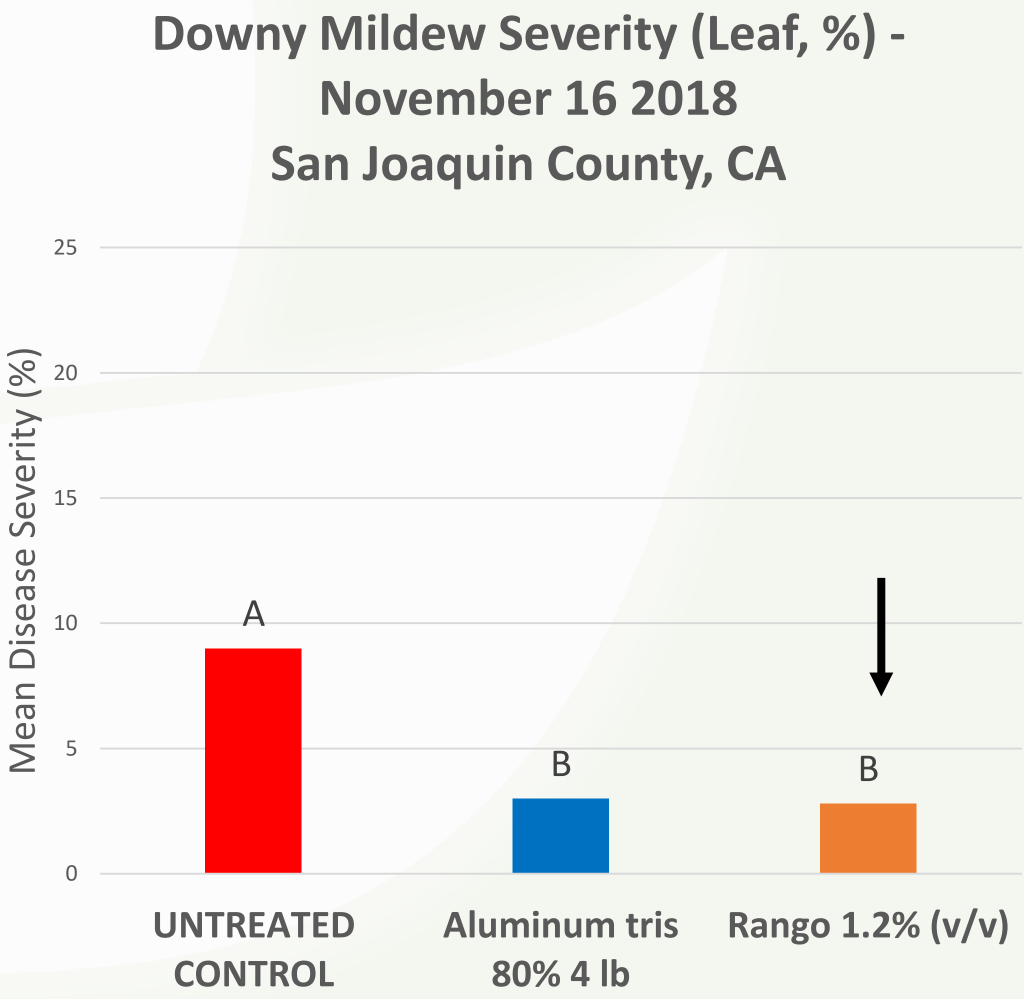
- Trial Setup
  - 5 apps: July 16, 26, August 6, 16 and 27
  - CO_2 Sprayer 3-nozzle, 35 GPA



Spinach Downy Mildew – Escalon, CA





Broccoli Insecticide Field Trial – Escalon, CA

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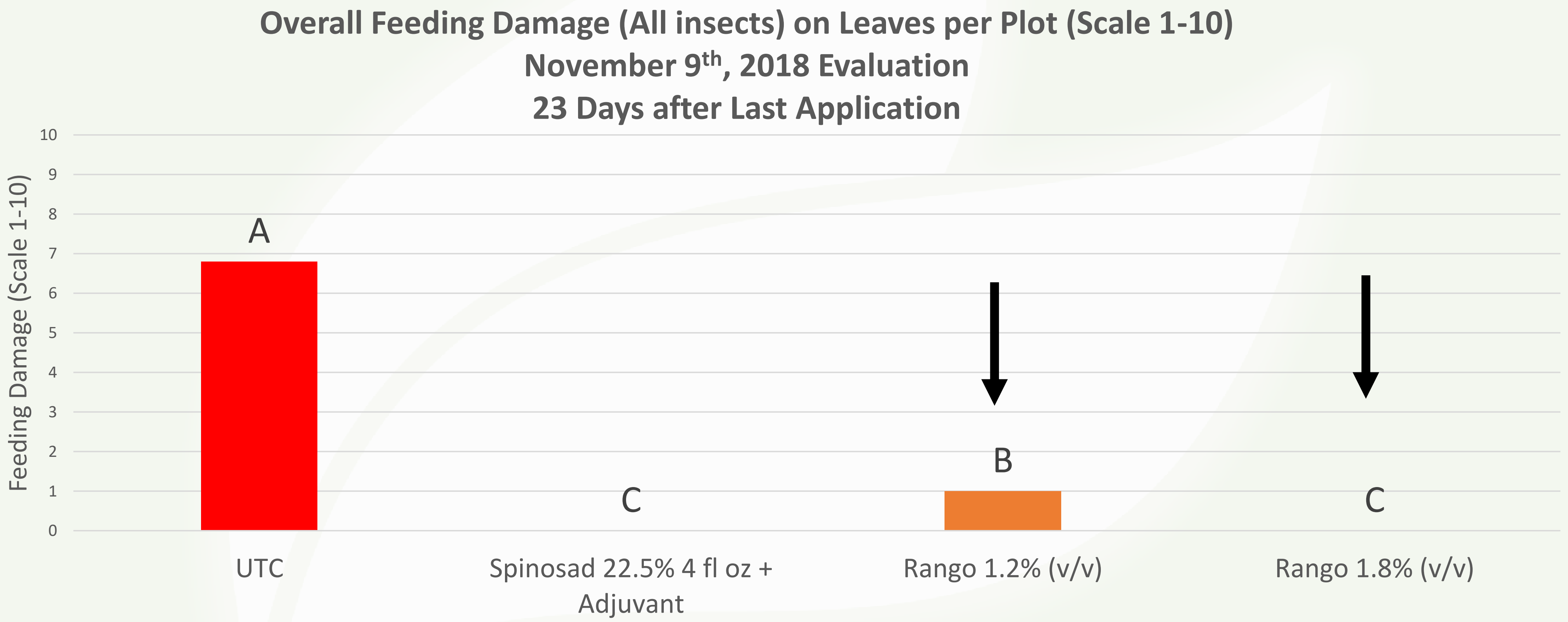
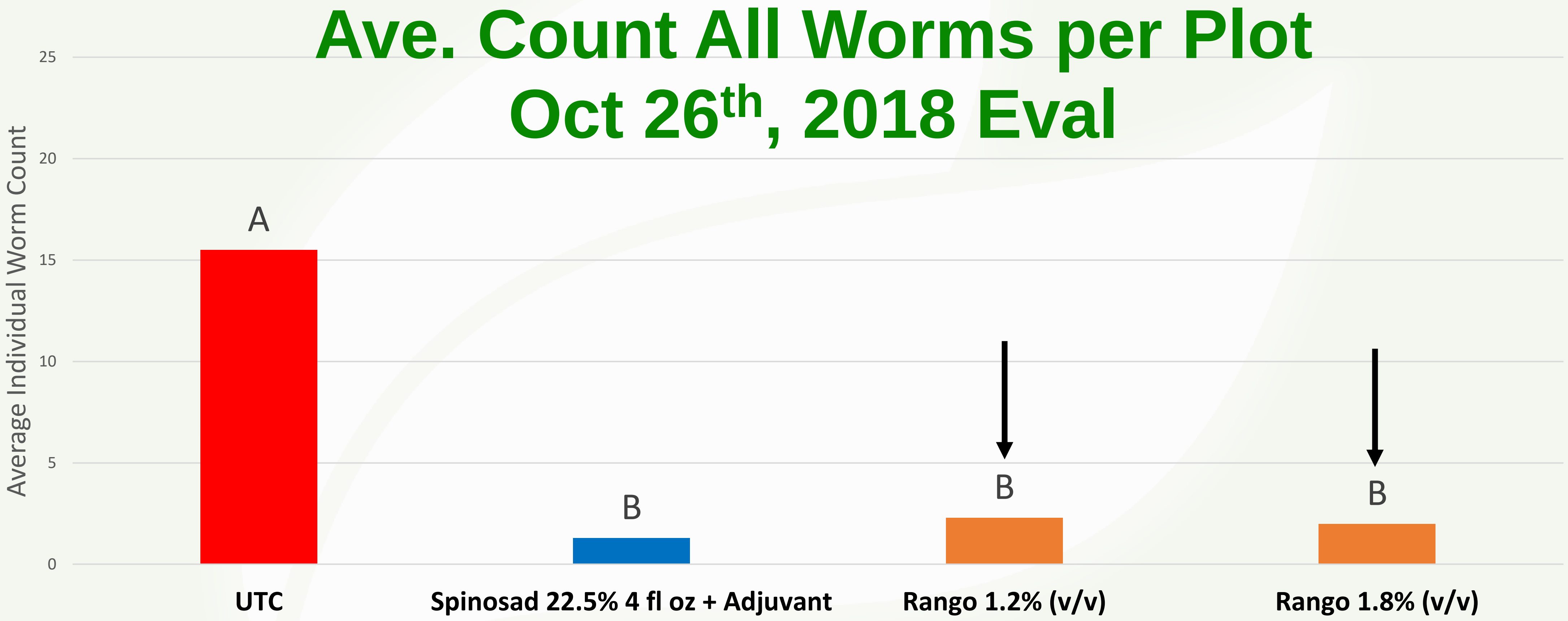
- 7 weekly applications September to October 2018
- CO2 Sprayer 3-nozzle, 40 GPA
- Pest: Cabbage Looper, Beet Armyworm, Diamondback Moth, Imported Cabbage Worm, Turnip Aphids, Silverleaf Whitefly



Broccoli Insecticide Field Trial – Escalon, CA



Rango™ - Conclusions

- Superior Formulation
  - “Farmer Friendly”
  - Easy to mix
  - Stays in solution
  - Consistent coverage
  - Consistent efficacy
  - California Registration 2ndQ

Thank You!

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