

# Product Updates

IR-4 Industry Technology Session  
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# Tril-21

## Thyme oil-based Fungicide & Bactericide



# Tril-21 Contact Fungicide-Bactericide

## Experimental Product Profile

<b>Active Ingredient</b>	Thyme oil
<b>Mode of Action</b>	FRAC F7: Cell membrane disruption
<b>Crops</b>	All crops, indoor and outdoor
<b>Target Pests</b>	Broad spectrum fungal and bacterial foliar plant pathogens
<b>Application Rate</b>	32-128 fl oz/100 gal (0.25%-1%)
<b>Number of Applications</b>	3-5 applications
<b>Spray Interval</b>	3-7 days, pressure dependent
<b>FIFRA 25(b)</b>	0-hour REI, 0-day PHI



# Registration Progress

- OMRI certification pending – anticipating Q4 2022
- All state registration submissions pending



# Tril-21 Current IR-4 Trials

- Environmental Horticulture
    - Complete
      - 20-025 Botrytis
      - 21-006 Pythium
      - 21-008 Rhizoctonia
      - 21-010 Cylindrocladium
      - 21-021 Bacterial Leaf Spot & Blight
    - Pending
      - 21-007 Thielaviopsis
      - 21-009 Fusarium
      - 21-015 Powdery Mildew
      - 21-016 Bionematicide RKN
      - 21-025 Botrytis
  - 22-009 Pythium sp.
  - 22-010 Phytophthora
  - 22-011 Fusarium wilt
  - 22-012 Myrothecium roridum
  - 22-013 Rhizoctonia
  - 22-022 Botryosphaeria sp.
  - 22-026 Pseudomonas syringae blight
- Food
    - 2021 IS0344 - Powdery & Downy Mildew - Organic Cucurbits





# Tri1-21 IR-4 Trial Results Update

Environmental Horticulture – All rates were at 64 fl oz/100 gal water

Protocol	Researcher	Pathogen	Crop	Method	Application	Result
20-025	Santamaria	Botrytis cinerea	Peony	Foliar Spray	-3, 7, and 14 days	<b>Good</b> ; low foliar severity and statistically similar to negative uninoculated control
21-006	Meadows	Pythium	Snapdragon	Drench	-3, 4, and 14 days	<b>Good</b> ; low disease severity and statistically similar to negative uninoculated control
21-006	Meadows	Pythium	Snapdragon	Sprench	7 and 14 days	<b>Poor</b> ; disease onset
21-006	Beckerman	Pythium	Lavender	Sprench	-3, 3, and 14 days 7 and 14 days	Phytotoxicity observed
21-008	Hand	Rhizoctonia	Impatiens	Drench	-3, 3, and 14 days 7 and 14 days	<b>Poor</b> ; disease onset
21-010	Norman	Cylindrocladium	Spathe flower	Drench	0, 7, 17 days 0, 10, 17 days	<b>Poor</b> ; disease onset
21-015	Bodine	Powdery Mildew	Zinnia	Foliar Spray	Every 7 days Every 11 days	<b>Mediocre</b> ; 7-day delay in first treatment application
21-021	Baysal-Gurel	Pseudomonas	Lilac	Foliar Spray	0, 3, 17 days 10 and 14 days (+)	<b>Excellent</b> ; better than the standard PC (Camelot O)



# Tril-21 IR-4 Trial Results Update

Food – All rates were at **128** fl oz/100 gal water

Protocol	Researcher	Pathogen	Crop	Method	Application	Result
21-IS0344	McGrath	Downy mildew	Cucumber	Foliar Spray	Every 7 days (6x)	<b>Inconclusive</b> ; DM established prior to treatment start and weather events, none of the trial treatments reduced incidence or severity
21-IS0344	McGrath	Powdery mildew	Pumpkin	Foliar Spray	Every 7 days (6x)	<b>Good</b> ; low disease severity and statistically similar to positive control (Kocide 3000-O)
21-IS0344	Smart	Powdery mildew	Squash	Foliar Spray	Every 7-10 days (6x)	<b>Poor</b> ; disease severity statistically similar to the untreated control



# Efficacy on Apple Powdery Mildew (APM)

**GOAL:** Evaluation against powdery mildew (*Podosphaera leucontricha*) on apple (*Malus domestica* var *Jonagold*) for efficacy of Tril-21 at two rates compared to the organic industry standard

**DESIGN:** 4 replicate blocks in random complete block design. Environmental conditions were favorable for mildew infection during the experiment

## APPLICATION RATES

- **Tril-21** at two rates: 64 fl oz/100 gal (0.5%) and 128 fl oz/100 gal (1%)
- **Organic Standards (OS) Rotation:**
  - Treatment #1 sprayed on April 12, 2021 : A.I: Potassium bicarbonate 81.9% at 2.5 lbs
  - Treatment #2 sprayed on April 27, 2021 : A.I: *Bacillus amyloliquefaciens* strain D747 25.0% at 96 fl. oz.
  - Treatment #3 sprayed on May 11, 2021 : A.I: *Extract of Reynoutria sachalinensis* 5% at 48 fl. oz.
  - Treatment #4 sprayed on May 21, 2021 : A.I: *Polyoxin D zinc salt* 5% at 6.5 fl oz. + spreader-sticker at 12 fl. oz.
- **Negative control:** Untreated (UTC)

**A lime sulfur application at 3 gal/acre was made at 'green tip' prior to the first treatment on all the treated trees (not the untreated control)**

## APPLICATION METHOD:

- Treatment application was initiate at/or before anticipated apple mildew disease pressure
- Treatments were applied with a backpack sprayer delivering ~2L/tree at 200 psi at four specific times related to the developmental stages of the developing apple flower

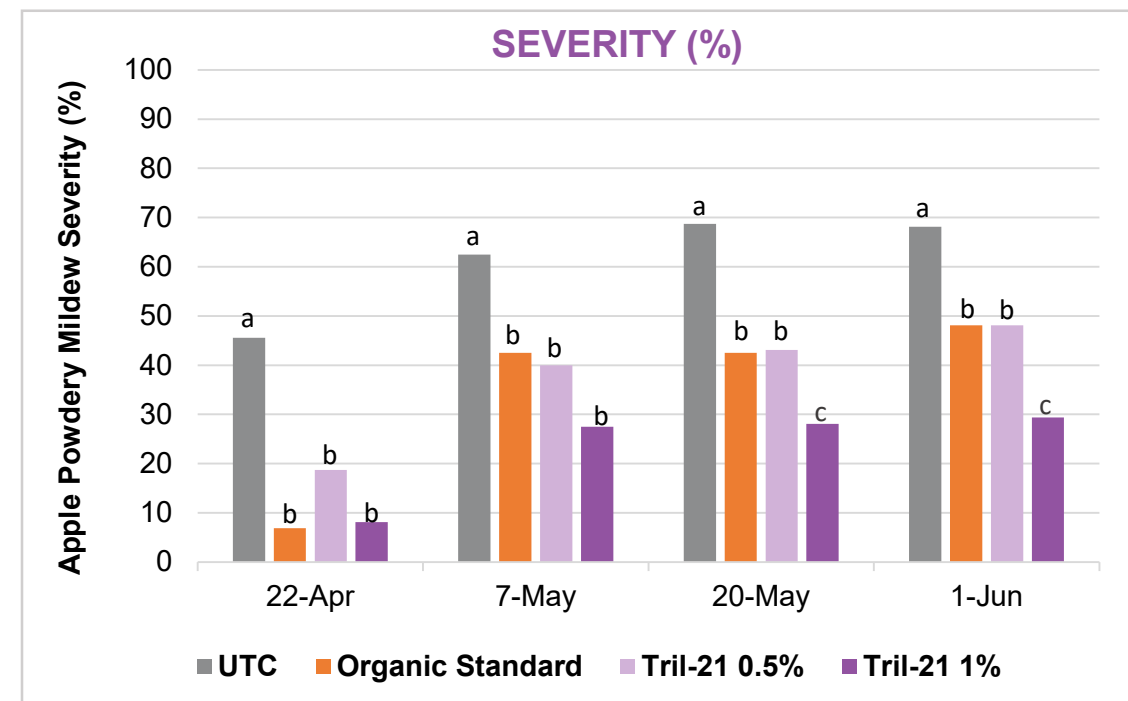
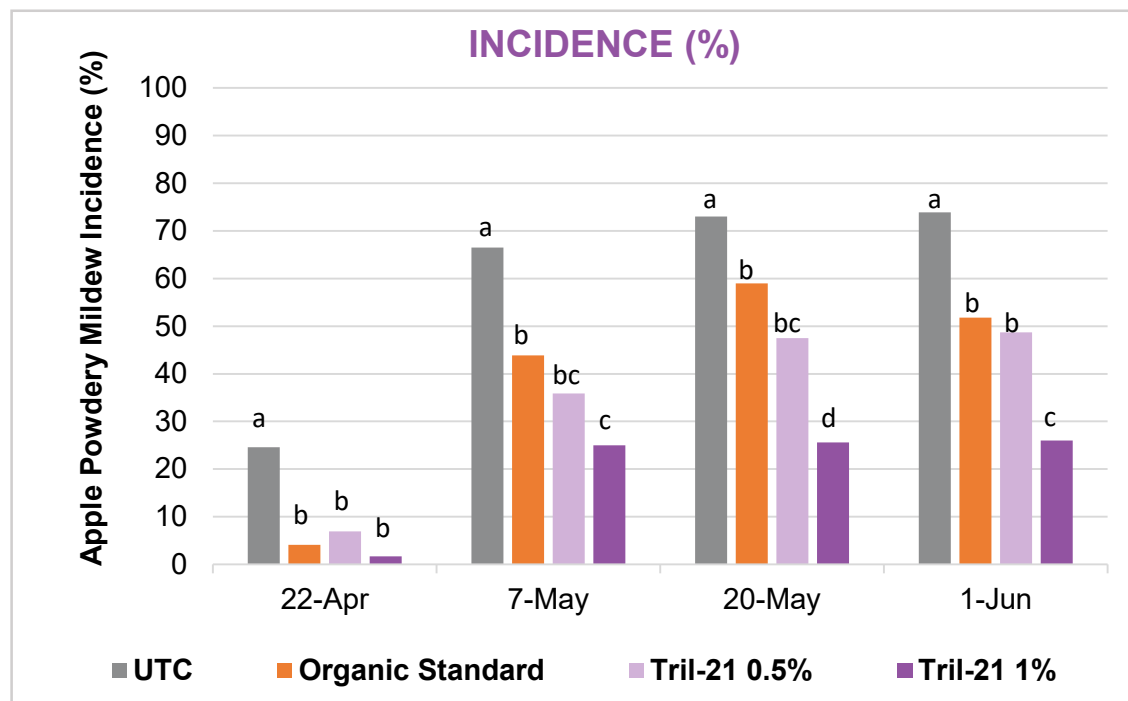
## EVALUATION INCIDENCE AND SEVERITY SCORES:

- Incidence and severity of APM was >60% at the end of the season indicating high inoculum pressure
- APM incidence and severity were evaluated on 10 vegetative shoots per tree, 7-10 days after each treatment application





# Results



- Mean APM incidence and severity observed in the standard organic treatment were significantly lower compared to the untreated control at the four dates evaluated
- Tril-21 showed 48% fewer shoots with powdery mildew spores present
- Tril-21 64 fl oz/100 gal rate was comparable and/or better control for incidence and severity over the organic standard
- Tril-21 128 fl oz/100 gal rate showed the highest significant control for powdery mildew incidence and severity over the entire trial
- Especially due to the high environmental pressures for powdery mildew disease, these results showed that Tril-21, which has a different mode of action than what is currently used, could be an excellent candidate for use in an organic standard rotation program
- No phytotoxicity was observed in treated trees



# TriL-21 Contact Fungicide-Bactericide

## IR-4 Request

### Application Information:

- Apply before or when environmental conditions for pest development are high
- Foliar spray providing complete coverage of the leaf and plant surfaces, apply to run off
- Make 3-5 consecutive applications 3-7 days apart depending on pressure
- Rates:
  - 64 fl oz/100 gal (greenhouse/indoor high pressure)
  - 128 fl oz/100 gal (outdoor high pressure)
- Apply early in the morning or late afternoon when temperature is under 90 °F

### Testing Needs:

- Greenhouse and field **efficacy trials** on all foliar/fruit plant pathogens
- Plant **safety trials** at 128 fl oz/100 gal on most crops





# TetraCURB™

MAX

**Botanical Contact  
Miticide-Insecticide**

**KEMIN®**  
CROP TECHNOLOGIES

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# New FIFRA 25(b) Exempt Miticide-Insecticide

**TetraCURB™**  
MAX



## Active Ingredients

- Castor oil, 20%
- Rosemary oil, 10%
- Clove oil, 3%
- Peppermint oil, 2%



## Target Pests

- Mites, spider mites
- Small, soft-bodied insects such as: aphids, whiteflies, thrips, mealybugs, lygus



## Application

- Contact
- Foliar
- Standard spray equipment, high volume sprayers, booms, hydraulic-air assist



## Application Sites

- All crops
- Indoors and outdoors



# Multiple Modes of Action

TetraCURB<sup>TM</sup>  
MAX



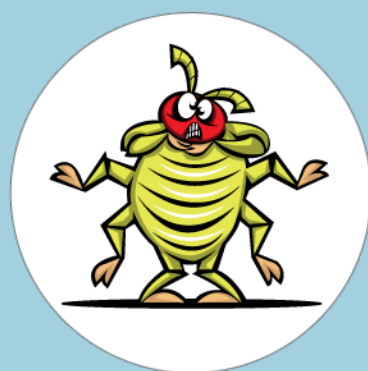
## NEUROTOXIC EFFECT



### PARALYSIS

The botanical oil active compounds affect the octopamine receptors specific to insects, disrupting its nervous system, causing paralysis followed by its death

## CONTACT EFFECT



### SUFFOCATION

The castor oil provides true pest suffocation by blocking air from entering the spiracle, leading to the pest death



### DESICCATION

The formula degrades/disrupts the waxy cuticle allowing the active ingredients to quickly penetrate and induce water loss in mites, resulting in desiccation and death

## REPELLENT EFFECT



### REPELLENCY

The vapor exposure to the botanical oils interferes with the pest's sensing faculties, inducing hyperactivity and avoidance behavior thus keeping them away and limiting chances of their establishment on crops.



✓ Quick knockdown



✓ Slow the chance of pest resistance development



# Registration Progress

## APPROVED

- AL
- AZ
- CA
- CO
- DE
- FL
- GA
- HI
- IA
- ID
- MA
- MI
- MN
- MO
- NJ
- NY
- NC
- OH
- OR
- SC
- TN
- TX
- WA

## PENDING

- AK
- AR
- CT
- IL
- IN
- KS
- KY
- LA
- ME
- MD
- MS
- MT
- NE
- NV
- NH
- NM
- ND
- OK
- PN
- RI
- SD
- UT
- VT
- VA
- WV
- WI
- WY





# Current IR-4 Trials

- Environmental Horticulture – All Pending
  - 22-005 Citrus and Madeira Mealybugs
  - 22-006 Lobate Lac and Brown Shield Scales
  - 22-025 Western Flower Thrips
- Food
  - 2021 IS00382 - Mites - Hemp
    - Excellent, Samuel-Foo – Two-spotted spider mite
    - Excellent, Szczepanec – Russet mite
    - Poor, Villanueva – Russet mite



# IR-4 Trial Results Update

- Food – All at 128 fl oz/100 gal water

Protocol	Researcher	Pest	Crop	Method	Application	Result
21-IS0382	Reeves	Two-spotted spider mite	Hemp (high tunnel)	Foliar Spray	Every 7 days (3x)	<b>Good</b> ; 63-84% control and statistically similar to the standard control (Neem oil)
21-IS0382	Szczepaniec	Hemp Russet mite	Hemp (greenhouse)	Foliar Spray	Every 7 days (3x)	<b>Excellent</b> ; 99% control with average of 50 mites/leaf at start of trial
21-IS0382	Villanueva	Hemp Russet mite	Hemp (field)	Foliar Spray	Every 7 days (3x)	<b>Poor</b> ; maintained population control first half of trial, then no control on last half



# TetraCURB MAX IR-4 Request



## Application Information:

- Apply when pest population first appears and before economic threshold is reached
- Complete coverage of the leaf and plant surfaces, apply to run off
- Make 2-3 consecutive applications 5-7 days apart
- Rates:
  - 64 fl oz/100 gal (moderate infestation)
  - 128 fl oz/100 gal (high infestation)
- Apply early in the morning or late afternoon when temperature is under 90 °F

## Testing Needs:

- Greenhouse and field **efficacy trials** (specialty crops) on all small, soft-bodied insects and mites



# Thank you!



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