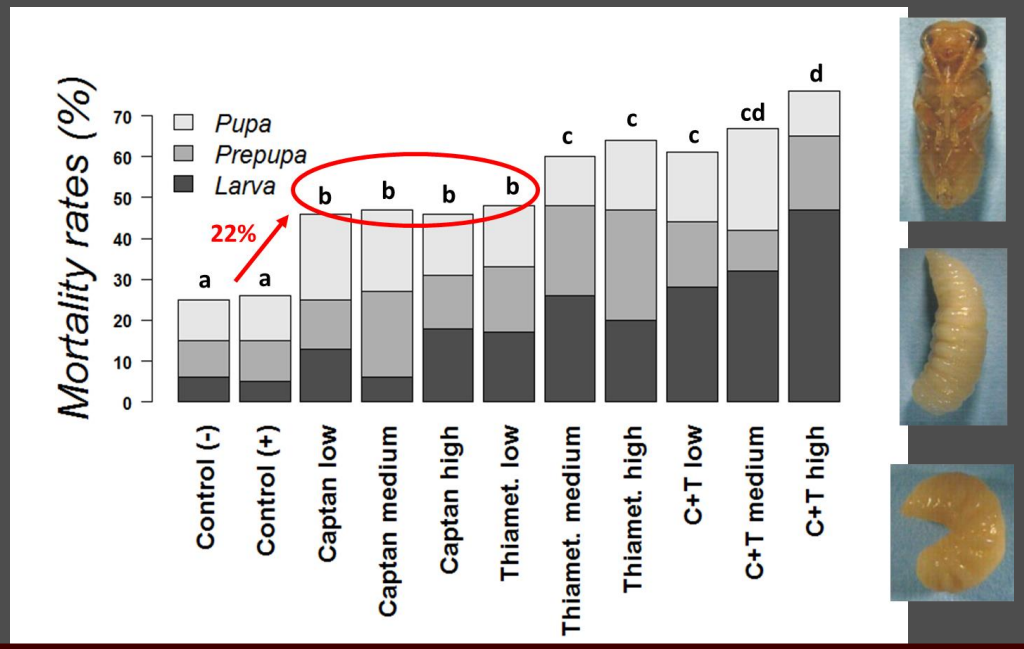
Native Bee and & Pesticide **Past** Research

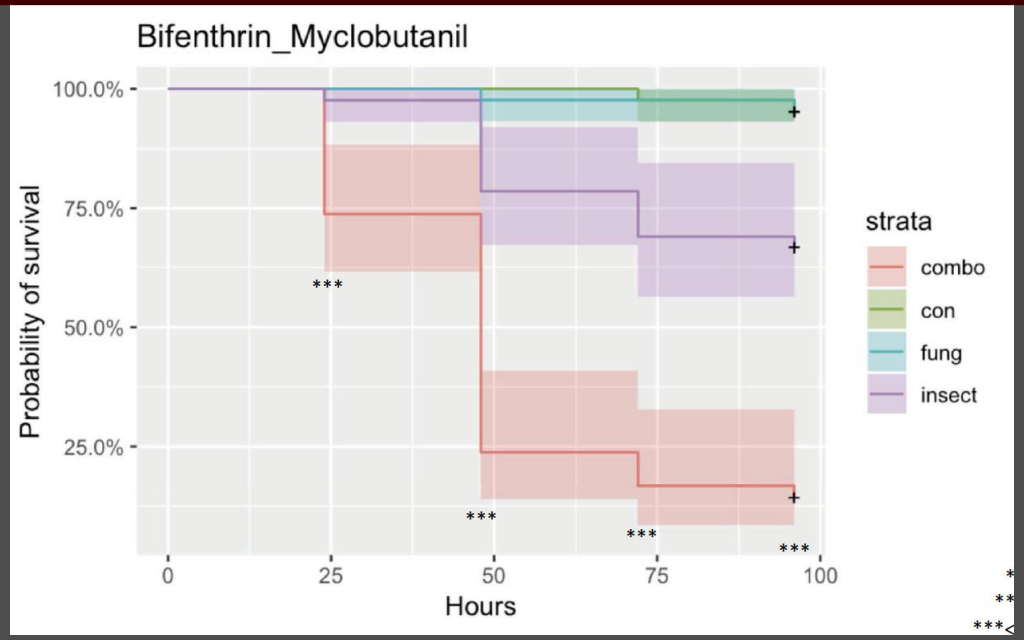
Captan is toxic to young developing honey bees at concentrations that bees are commonly exposed to during apple bloom.

Captan: Captec, Captevate

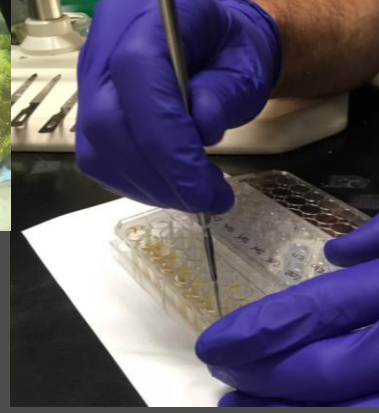


Mycobutanil synergizes with **bifenthrin** AND increases over time

Myclobutanil: Quali-Pro myclobutanil, Rally 40WSP, Sonoma 4WSP
Bifenthrin: AcetoEPA/NY, BifentureEPA, Brigade WSBEPA†, Brigade ECEPA†, FanfareEPA, Tundra ECEPA



Native Bee & Pesticide **Current** Research (4 projects)

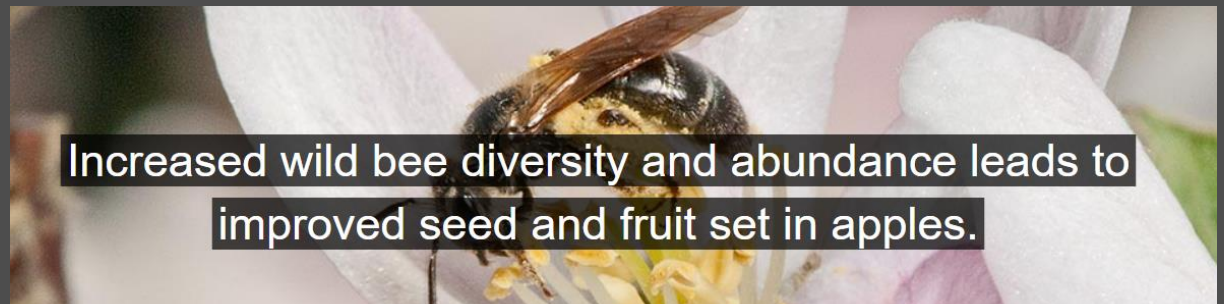


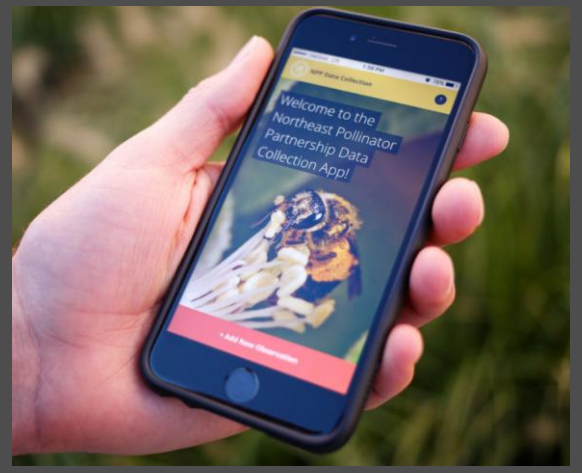
1. Toxic effects of **cyprodinil** on the development of mason bees

2. Comparing toxicity of **mancozeb** and some other common pre-bloom and during-bloom fungicide sprays

3. Assessing pesticide exposure of honey bees, bumble bees, mason bees, mining bees during bloom. (20-30 orchards for the past 4 yrs | we screen for ~260 pesticides)

4. NEPP App for assessing bee abundance in your apple orchard http://www.northeastpollinatorpartnership.org/





NY farm viability INSTITUTE

USDA United States Department of Agriculture | National Institute of Food and Agriculture

The Pesticide Decision-Making guides report on

- toxicity to **non-honey bee** species
- toxicity to **life stages other than adults**
- **sublethal** toxicity to bees
- **fungicide** toxicity to bee species
- **synergisitic**  effects on toxicity

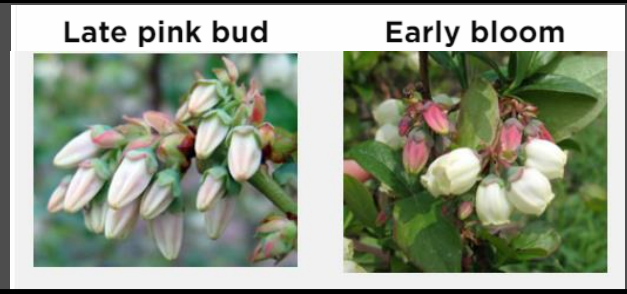
Synergy

A combined toxicity of two or more active ingredients that's **greater than the sum** of the toxicity of each pesticide alone.

Potential For Synergies

- Wildflowers along field edges & in between crop rows
  (wild bees & honey bees)

- Pre-Bloom or Pink
  (wild bees & honey bees)



- Post-Bloom or Petal Fall
  (wild bees & honey bees)

- Inside Honey bee hives
  (miticide & fungicide treatments)
  (honey bees only)

A Pesticide Decision-Making Guide to Protect Pollinators in *Tree Fruit Orchards*

2018 Edition

By Maria van Dyke, Emma Mullen, Dan Wixted, and Scott McArt

Table 2. Pesticide synergies and acute, chronic, and sublethal toxicities for honey bees and other pollinators in tree fruit orchards

Key to table abbreviation, symbols, and colors

- * - Restricted-use pesticide
- † - Not for use in Nassau and Suffolk counties of New York
- § - Meets USDA organic standards
-  - Identifies a chemical that at least one study has shown synergy with other active ingredients or products.
-  - Identifies a formulation containing more than one active ingredient, at least one of which has been shown to synergize with other chemicals

EPA standard toxicity ratings: acute oral and/or contact toxicity to the honey bee *(Apis mellifera)*

- ***Highly toxic*** (acute LD_{50} < 2µg/bee)
- ***Moderately toxic*** (acute LD_{50} 2 - 10.99µg/bee)
- ***Practically non-toxic*** (acute LD_{50} >11 µg/bee)

Active Ingredient *Chemical group* *[Resistance code]*	New York Trade Name Examples	High toxicity	Moderate toxicity	Practically non-toxic	Synergies, sublethal effects, and toxicity to bee species other than the honey bee
copper octanoate *inorganic fungicide/bacteriacide [M1]*	Camelot O§, Cueva§, Liquid copper Products§, Ortho Elements Garden§				
copper oxychloride/ copper hydroxide *inorganic fungicide/bacteriacide [M1]*	Badge SC & X2§				Copper oxychloride synergizes with imidacloprid[22].
copper oxychloride/copper sulfate *inorganic fungicide/bacteriacide [M1]*	C.O.C.S.				Copper oxychloride synergizes with imidacloprid[22].
copper sulfate *inorganic fungicide/bacteriacide [M1]*	Bordeaux§, Cuprofix Ultra§, Cuproxat§, Mastercop§				**Highly** toxic to a stingless bee species via oral exposure[23].
cyprodinil *anilino-pyrimidine fungicide, [9]*	Vanguard WG				**Moderate** toxicity when it synergizes with thiacloprid[2].
difenoconazole *DMI-triazole fungicide [3]*	Quadris-Top, Amistar, etc.				Synergizes with deltamethrin[24] and the *tau*-fluvalinate[25] product Mavrik® inducing hypothermia in honey bees.
difenoconazole + fludioxonil *DMI-triazole + phenylpyrroles fungicides [3+12]*	Academy				See difenoconazole and fludioxonil separately for synergy information.
difenoconazole + cyprodinil *DMI-triazole + anilino-pyrimidine fungicides [3+9]*	Inspire Super				See difenoconazole and cyprodinil separately for synergy information.
dodine *guanidine fungicide [U12]*	Syllit FL				
fenbuconazole *DMI-triazole fungicide [3]*	Indar 2F				Synergizes with *tau*-fluvalinate[18] making it **highly** toxic to honey bees. At a field relevant dose Indar 2F® (fenbuconazole) synergizes with acetamiprid[26] in a solitary bee, doubling the toxicity of acetamiprid, making it borderline **highly** toxic (LD_{50} 2.1).

A Pesticide to Pro Tre

By Maria van Dyk

Bloom Pesticides – Relative Toxicity to Pollinators, by Trade Name

Janet van Zoeren and Anna Wallis, Cornell University

Trade Name	Active Ingredient	Toxicity Rating	Mix Synergies (do not mix with)
Aliette	fosetyl-al	Low	
Assail	acetamiprid	Moder./High	Synergizes with some **fungicides** and **adjuvants**
Badge	copper octanoate + copper hydroxide	Low	Synergizes with **imidacloprid** (Admire Pro, Leverage)
Cabrio	pyraclostrobin	Moderate	Synergizes with **tau-fluvalinate***, and with **Portal**
Captan/Captec	captan	Moderate	**Inert ingredients** may cause high toxicity. Toxic to wild bees.
Cueva	copper octanoate	Low	
Ferbam Granuflo	ferbam	Low	
Fireline	oxytetracycline	Low	
Firewall	streptomycin	Low	
Flint	trifloxystrobin	Low	

Intrepid	methxyfenozide	Moderate	Causes long term sub-lethal damage
Luna Sensation	fluopyram + trifloxystrobin	Low	
Luna Tranquility	fluopyram +pyrimethanil	Low	
Manzate	mancozeb	Low	Synergizes with **pyrethroid** insecticides including **Raid** and **Warrior II**
Merivon	fluxapyroxad + pyraclostrobin	Moderate	Synergizes with **tau-fluvalinate***
MycoShield	oxytetracycline		
Penncozeb	mancozeb	Low	Synergizes with **pyrethroid** insecticides including **Raid** and

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