Pyrethroids in processing tomato: patterns of use and alternatives

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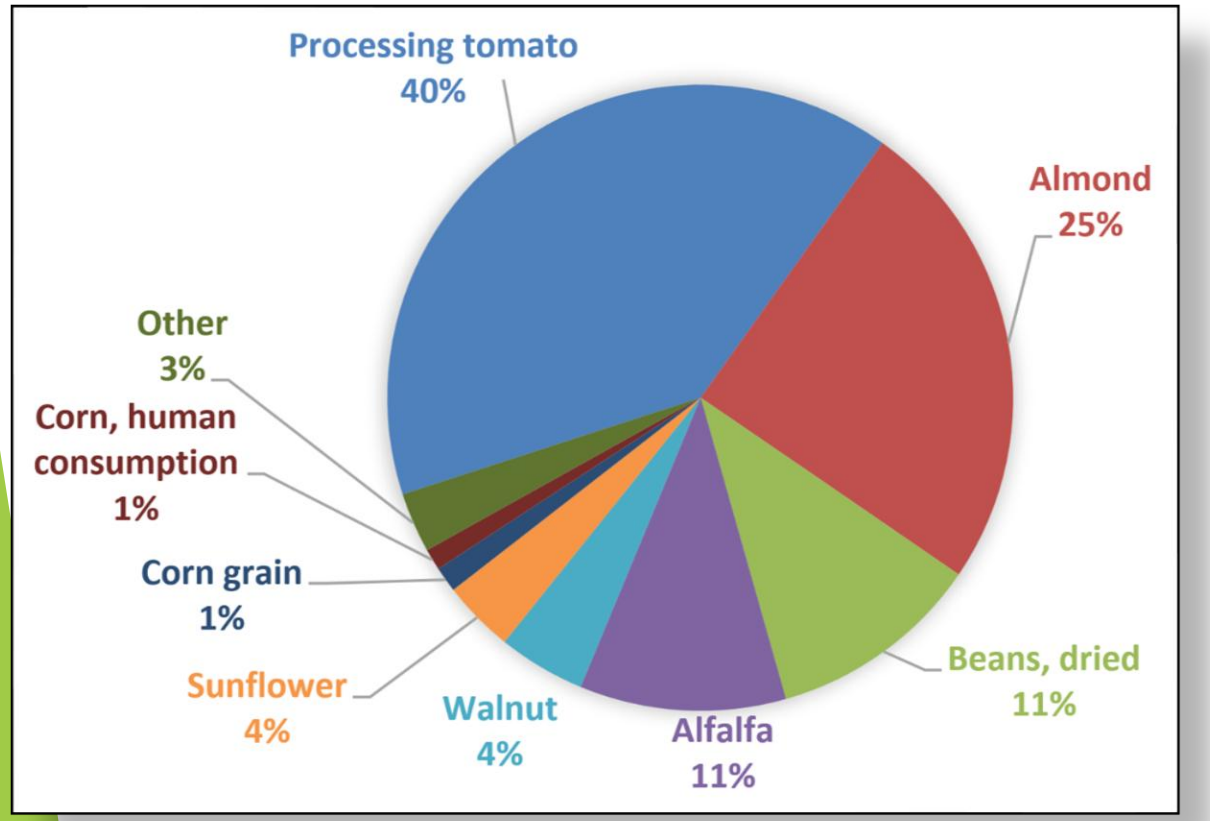
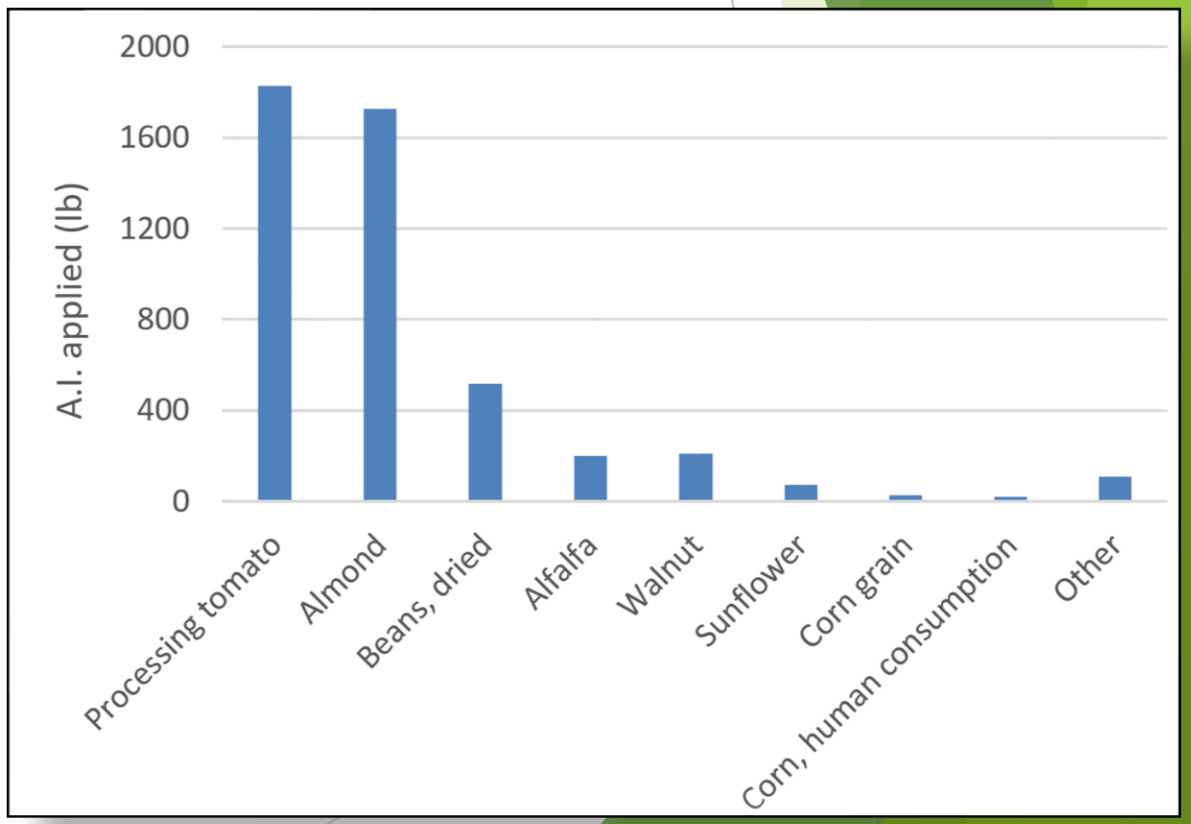
Pyrethroid use in Solano County: crop type

Crops receiving pyrethroid applications (% total acreage receiving pyrethroids in 2024)



Crops receiving pyrethroid applications (total lb of A.I. applied in 2024)



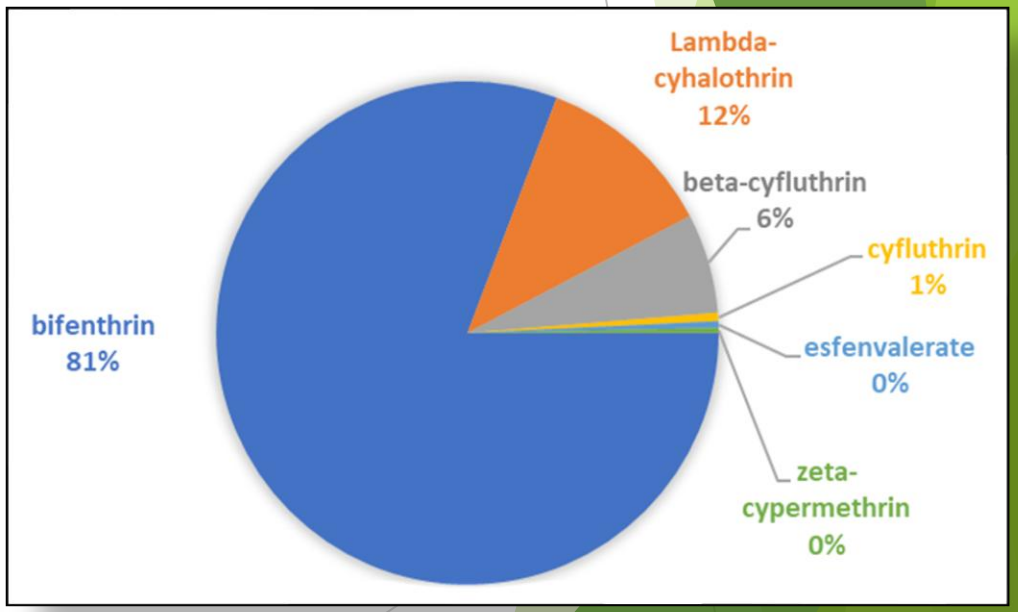
Data from Solano Co. 2024 permits

Pyrethroids used on processing tomato for the last five years in Solano County

Major pyrethroid-containing insecticides applied 2020-2024

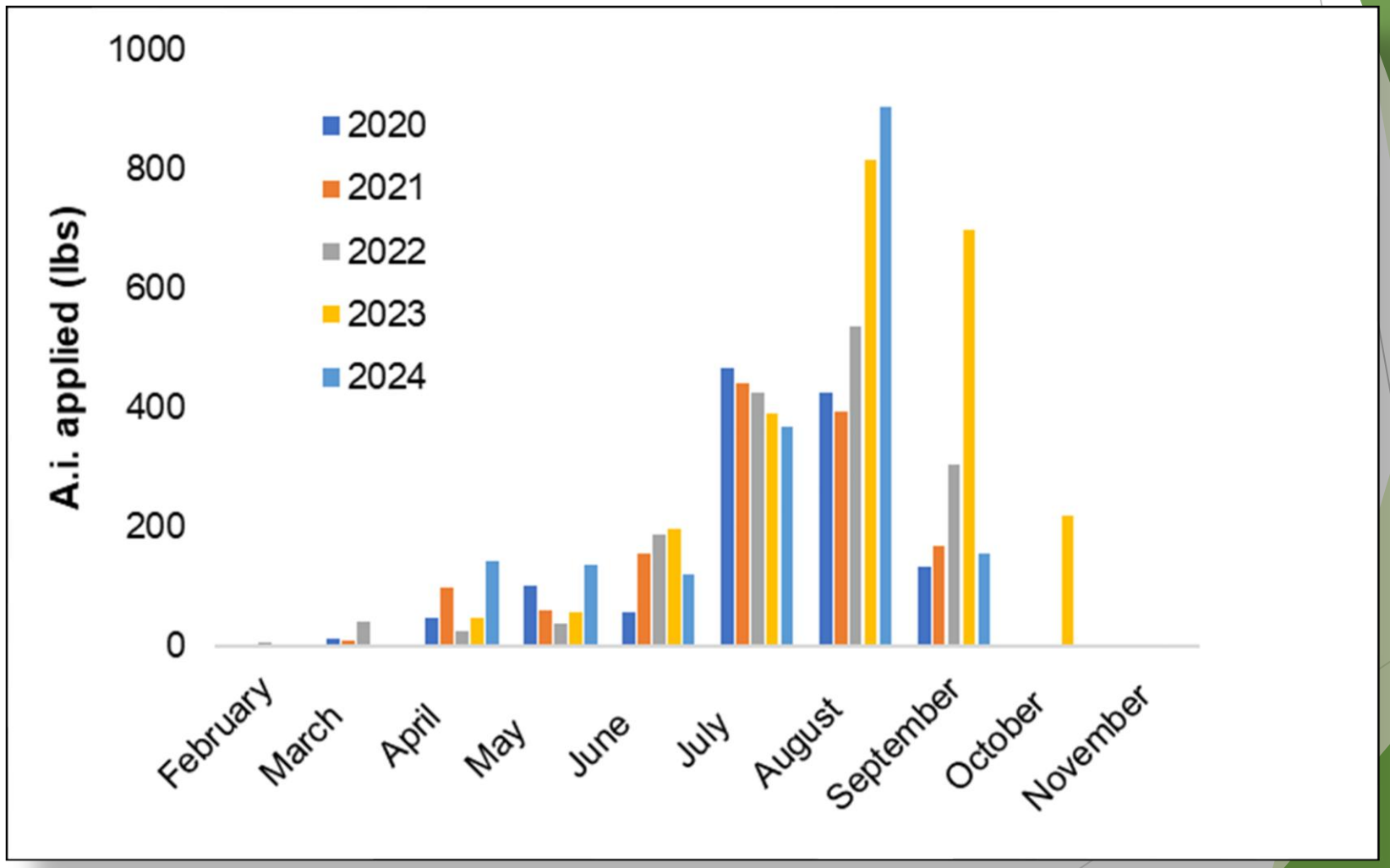
Insecticide	Pyrethroid A.I.	A.I. applied 2020-2024 (lb)	%
Bifen 2 AG Gold	bifenthrin	4436	53
Bifenture EC Agricultural Insecticide	bifenthrin	1531	18
Besiege Insecticide	lambda-cyhalothrin	641	8
Leverage 360 Insecticide	beta-cyfluthrin	537	6
Lambda-Cy AG	lambda-cyhalothrin	211	3
Bifenture LFC	bifenthrin	206	2
Athena Insecticide/Miticide	bifenthrin	163	2
Fanfare EC	bifenthrin	154	2
Fanfare 2EC Insecticide-Miticide	bifenthrin	122	1
Other	Bifenthrin, lambda-cyhalothrin, cyfluthrin, zeta-cypermethrin, esfenvalerate	395	5

Active ingredients (lbs applied, 2020-2024)



Data from Solano Co. 2020-2024 permits

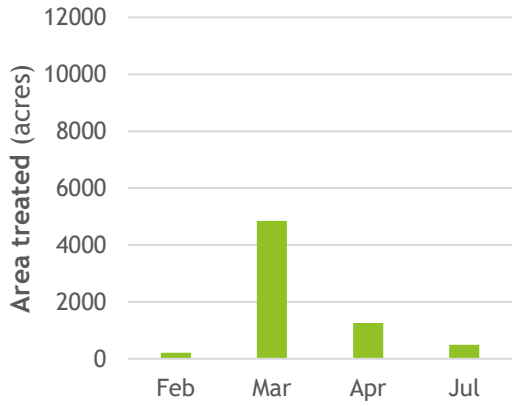
Processing tomato pyrethroid use: timing



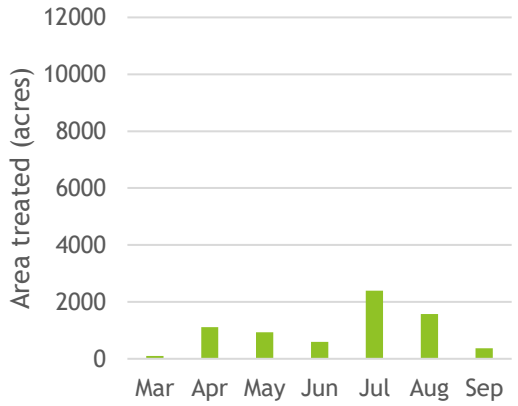
Data from Solano Co. 2020-2024 permits

Other rotational crop use: timing (2024)

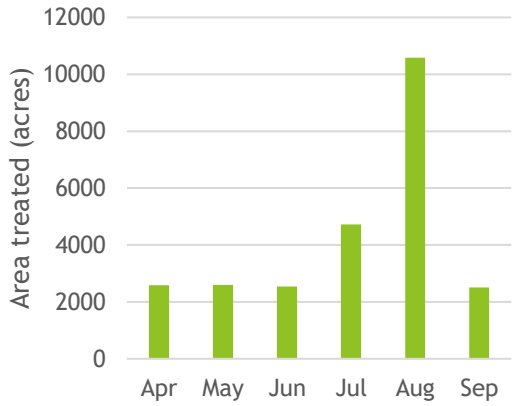
Alfalfa



Dry beans



Tomato



Data from Solano Co. 2024 permits

Benefits of pyrethroids

- Broad-spectrum (can control multiple pests if present)
- Contact kill, quick mortality—useful for “rescue” treatments
- Relatively short re-entry and pre-harvest intervals

Considerations when thinking about alternatives

- Is ability to kill multiple pests needed?
- Is a rescue treatment needed?
- How soon is the application before harvest?

Pests that reduce stand

- Cutworms
- Flea beetles
- Garden symphylans

Pests that transmit viruses

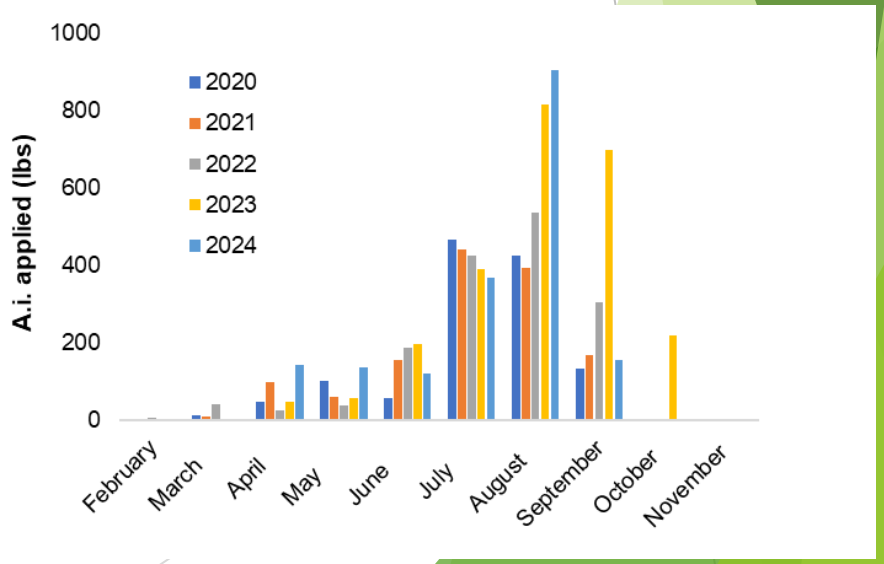
- Some aphids (AMV—green peach aphid)
- Thrips (TSWV)
- Beet leafhoppers (BCTV)
- Whiteflies (TYLCV—not yet a major issue)

Pests that damage fruit directly

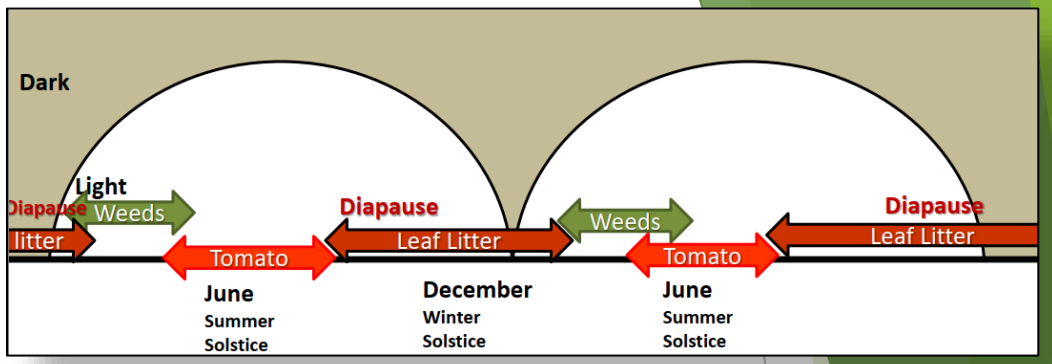
- Stink bugs
- Lepidoptera larvae (most of them)
- Lygus bugs, false chinch bugs (lesser extent)

Stink bug

- Major target of pyrethroid sprays: ~40% of sprays June or later in the Central Valley target stinkbugs
- Cause damage from late fruit set through ripening
- Move into new fields when infested field is harvested
- Very difficult to control: often tank-mixed with with insecticides from other classes including acetamiprid (Assail), methomyl (Lannate), an organophosphate such as malathion or diazinon, novaluron (Rimon), or cyantraniliprole (Exeril)
- Late season sprays are not really effective
- Strategies
  - Cultural controls
  - Scouting
  - Improve canopy penetration



Stink bug: IPM strategies



- Manage field-edge habitat
  - Weeds that are especially important to remove include little mallow (*Malva parviflora*), Russian thistle (Salsola spp.), and mustards such as wild radish (*Raphanus raphinastrum*).
- Early detection, allowing for earlier management
  - Cone traps (e.g. Stink Bug Dead-Inn)
  - AlphaScents lures
- Maximize canopy penetration—e.g. air-assisted sprayers
- Avoid successive planting adjacent blocks of tomatoes (e.g. March, April, May)
- Earlier harvest (where possible)

Photos courtesy of Tom Turini

Lepidoptera larva

- Low tolerance for damage
- Tomato fruitworm, western yellow-striped armyworm, cutworms
- ~25% of pyrethroid sprays applied to tomatoes prior to June; ~20% of sprays applied June or later
- Alternate products: Intrepid 2F (methoxyphenozide); Coragen (chlorantraniliprole), the spinosyns spinetoram (Radiant) and spinosad (Entrust, Success), novaluron (Rimon), emamectin benzoate (Proclaim), and indoxacarb (Avaunt)
- Some require targeting earlier stages; less useful as rescue sprays than pyrethroids

- Can also be used to target cutworms; armyworm damage at planting, but not often used for this

Aphids

Photos courtesy of UC IPM

- Early season (Green peach)
  - Feeding can injure stressed plants
  - Can vector alfalfa mosaic virus, if near a virus source
  - Can be controlled with pre-bloom neonics (e.g. Admire Pro, Platinum)

- Late season (Potato)
  - Not normally before late June (cannot use neonics for control)
  - Distort leaves, stems, can stunt plants
  - High populations 6-8 weeks before harvest reduce yields (risk declines as harvest approaches)

- Effective alternative insecticides to pyrethroids for aphid control include spirotetramat (Movento), pymetrozine (Fulfill), flonicamid (Beleaf), flupyradflurone, aphidapen (Sefina), dimethoate, malathion, and acetamiprid (Assail).
  - Early broad-spectrum applications can reduce natural enemy populations

Flea beetles

- Slow growth by causing damage to young leaves & stalks, heavy infestations on young fields can reduce stands
  - Risk increased by dry soil, windy weather, tomato-following-tomato
- Can occasionally become a late season pest if after leaf senescence beetles begin to feed on the fruit.
- Perhaps 5% of pyrethroids applied July or later target flea beetles (neonics no longer available)
- Alternatives: Imidacloprid (Admire Pro) and thiamethoxam (Platinum) as a preplant application is effective for flea beetle control early season in direct seeded and transplanted fields. Carbaryl bait is an effective alternative for early season control.

Flea beetle damage on a field in Solano County

Thrips

- Main damage is vectoring tomato spotted wilt virus (TSWV)
- Very high populations can cause flowers to abort
- Sprays most effective at 3rd or 4th thrips generations (generally around mid-July); later infections don't affect yields. GDD model available; can subscribe to blog detailing location-specific predictions to aid spray timing
- Not a major use of pyrethroids, other insecticides more effective.
  - Spinetoram and spinosad especially effective ; but insecticide resistance in thrips populations are known to occur with these chemicals, important to rotate
  - Other products that provide better control of thrips than pyrethroids on tomatoes include methomyl (Lannate SP), dimethoate, and flonicamid (Beleaf). Unfortunately, methomyl and dimethoate are especially disruptive of natural biological control of other insects such as leafminers.
  - Abamectin (Agrimek), Cyntraniliprole (Verimark), moderately effective, similar to pyrethroids

Images courtesy UC IPM

Garden symphylans

- Can be an issue in the Delta- likes high organic matter soils
- Causes stunting, stand loss—not very common, but very serious when it occurs
- The pyrethroid lambda cyhalothrin is the most commonly used insecticides for their control (applied as a soil drench) but diazinon similarly applied is also effective.

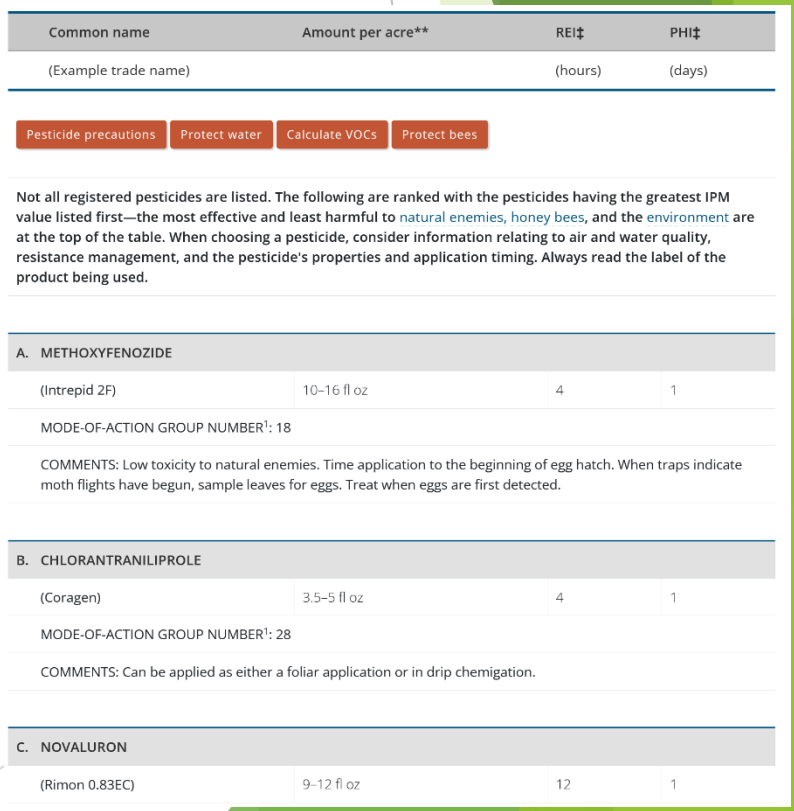
Symphylan damage in San Joaquin County

Conclusions

- No good substitutes, in many cases
- Think about alternatives
  - Before a rain event
  - When an effective substitute is available
  - Earlier in the season, if a narrower-spectrum option is available

Resources

- UC IPM Pest Management Guidelines for Processing Tomato
- Pest Management Strategic Plan for Processing Tomato Production



Common name	Amount per acre**	REI‡	PHI‡
(Example trade name)		(hours)	(days)

Pesticide precautions | Protect water | Calculate VOCs | Protect bees

Not all registered pesticides are listed. The following are ranked with the pesticides having the greatest IPM value listed first—the most effective and least harmful to natural enemies, honey bees, and the environment are at the top of the table. When choosing a pesticide, consider information relating to air and water quality, resistance management, and the pesticide's properties and application timing. Always read the label of the product being used.

A. METHOXYFENOZIDE			
(Intrepid 2F)	10–16 fl oz	4	1
MODE-OF-ACTION GROUP NUMBER[1]: 18			
COMMENTS: Low toxicity to natural enemies. Time application to the beginning of egg hatch. When traps indicate moth flights have begun, sample leaves for eggs. Treat when eggs are first detected.			
B. CHLORANTRANILIPROLE			
(Coragen)	3.5–5 fl oz	4	1
MODE-OF-ACTION GROUP NUMBER[1]: 28			
COMMENTS: Can be applied as either a foliar application or in drip chemigation.			
C. NOVALURON			
(Rimon 0.83EC)	9–12 fl oz	12	1