

# Benefits of Pyrethroids to Tomatoes

## PYRETHROIDS BENEFITS PROJECT

The Pyrethroid Working Group contracted an extensive analysis of the benefits of pyrethroids to agriculture. A multitude of data was analyzed with different methodologies to determine the value of pyrethroids, and the costs to growers if they were no longer available. These analyses determined: (1) costs to the grower of key insect pest management practices with and without pyrethroids, (2) yield benefits of pyrethroids, (3) monetary and non-monetary value of pyrethroids based on a farmer survey, and (4) a multi-market analysis to project the aggregate economic benefits of pyrethroids to the U.S. economy. Below are the primary benefits of pyrethroids for tomatoes from these analyses.

## BENEFITS TO TOMATOES

### 1. Costs with and without pyrethroids

- The total market value of U.S. production in 2015 was \$1.2 billion for fresh-market tomato and \$1.4 billion for processing tomato.
- Pyrethroids are used on 23% of product acres of tomato, a significant number considering 13 insecticide chemistries are available for tomato.
- Pyrethroid applications average more than 1 application per year in rotation with other chemistries for resistance control.
- The cost increase to the tomato industry, without pyrethroids, would be an overall \$6.1 million, representing a 13% increase in total insecticide costs.
- Farmer costs would rise almost \$13 per product acre and over \$15 per planted acre without use of pyrethroids.
- The average cost advantage to farmers of use of pyrethroids is over \$12, or a 70% cost advantage over other insecticides.

### 2. Yield Benefits

- Pyrethroids give tomato a 5% yield benefit over other insecticides
- Pyrethroids alone result in a 63% reduction in crop damage compared to untreated controls.
- Pyrethroids alone result in a 60% decrease in pest abundance compared to untreated controls.
- There are 13 insecticide classes available and used for tomatoes. Yet pyrethroids still constituted 23% of all insecticide product acres, indicating their importance in insect management for tomato



### 3. Monetary and Non-Monetary Value to Growers (Case Study)

#### Insights from Florida fresh market tomato production

- Pyrethroids are cost effective insecticidal options for Florida tomato growers and are needed for resistance management programs.
- Multiple insecticidal tools are needed to manage whitefly populations to limit transmission of the devastating geminivirus. This is achieved using rotations of selective active ingredients with differing modes of action (MoA), but repeated use of these options has resulted in resistance and reduced effectiveness and often requires the addition of pyrethroids to extend effectiveness.
- As insecticide resistance has increased, and the effectiveness of pyrethroid alternatives has decreased, new pest threats (thrips, leafminers) have emerged that require pyrethroids.
- Systemic neonicotinoids are essential in protecting transplants and early season field plants from whiteflies and virus transmission. If resistance to these active ingredients develops (which is probable) or regulatory restrictions are imposed, pyrethroids will be essential alternatives for use in foliar programs that rotate mode of action classes.

### 4. Direct and Indirect impacts

- Of the estimated net economic benefit is \$784 million of pyrethroids to specialty crops, \$115 million is due to tomato
- On a per cropped acre basis, the economic benefits for society from using pyrethroids on tomato are more than \$293/A
- Benefits are often enhanced when insecticide treatments combine pyrethroids and non-pyrethroids, indicating the benefits from mixing or sequencing pyrethroids with other modes of action, not only by increasing yield and efficacy in the short-term, but also in the long-term by improving resistance management.
- Several selective insecticides are available for use in tomato to manage key insect pests; these insecticides are effective but also expensive. The significant benefit of pyrethroids is as a lower cost, broad spectrum class to rotate with the more expensive, selective insecticides for managing insect resistance. As an effective broad spectrum insecticide, pyrethroids are useful in tank mixes to control a variety of pests. Based on the little available data and these considerations, the subjective assessment for economic analysis is that yield loss of 5% would occur if pyrethroids were not available for tomato, largely as a result of the development of insecticide resistance among key pests.



*Insect Pests of Florida Fresh Market Tomatoes*

Pests	When controls are applied	Importance of pyrethroids	Resistance concerns	Alternative management strategies	Potential impacts of pyrethroid loss
<b>Key Pests</b>					
Whiteflies as vectors of geminiviruses	Neonicotinoids used in transplants and early field, supplemented with selective AIs for nymph control and pyrethroids for adult control	Needed for adult control in rotations of MoA groups	Resistance management critical to preserve efficacy of all MoAs, documented for essentially all classes, pyrethroid use increased as other classes are less effective	Plant resistance (partial)	Greater reliance on alternative MoAs, faster resistance, lack of control, decline of industry
Tomato pinworm and new lepidopteran threat, <i>Tuta absoluta</i>	Fruiting to harvest	Mating disruption replaced pyrethroids for tomato pinworm <i>T. absoluta</i> introduction imminent, pyrethroids will be essential	None current, AIs with different MoAs are available if <i>T. absoluta</i> established	Mating disruption (not developed)	Potentially serious fruit damage
Thrips as vectors of Tomato Spotted Wilt Virus	Fruiting to harvest	Bifenthrin and beta-cyfluthrin effective	Resistance is common, MoA class 5, AIs are recommended but should be rotated with effective pyrethroids	Plant resistance (partial)	Severe fruit quality loss
Colorado potato beetle	Planting to harvest	Used in conjunction with soil applications of neonicotinoids in early season	Managing resistance essential to preserve efficacy of all MoAs	Crop rotation (partial) Range of alternative AIs	More use of alternatives, faster resistance, more sprays
<b>Sporadic Pests</b>					
Hemipteran complex: leaf footed bugs, stink bugs	Fruiting	Pyrethroids only effective options	None	None	Increased fruit damage
Occasional 'worm' pests	All season when larvae or damage over threshold	Important for rapid cleanup of infestations, most effective and economical	Other alternative MoA available if resistance occurs	None	Reduced yield and quality

