

# Pyrethroid Insecticide Benefits Analysis

Pyrethroids provide benefits to society as a low cost and effective insecticide class that provides control of a broad spectrum of pests in a variety of settings while being a critical element in resistance management. This summary provides the key highlights from an in-depth benefits analysis conducted by AgInformatics for the PWG. The full report can be made available.

## Overall Benefits:

- Pyrethroid benefits to the US economy total \$1.6 billion, split equally between commodity crops and specialty crops. Most of this \$1.6 billion benefit goes to US consumers as lower prices on fruits, vegetables, nuts, meat, poultry and many other foods that use crops as inputs. Without pyrethroids, there would also be reduced availability of certain fruits, nuts and vegetables.
- Farmers care greatly about human and environmental impacts when selecting insect control options - and for most crops they choose pyrethroids more than any other class.
- Growers benefit from low input costs that provide broad spectrum control.
- Pyrethroids are a key resistance management tool in many applications where limited alternatives exist, including for control of disease vectors (mosquitoes, ticks), fire ant quarantine uses for nursery plants, and many crop uses.
- Growers benefit from the ability to sell globally with well-established Maximum Residue Limits.
- Pyrethroids are the most important insecticide class to manage public health pests such as cockroaches, ants, mosquitoes, bed bugs and flies in and around places where people live, work and play.
- Public health specialists emphasize that pyrethroids are essential for managing pests (mosquitoes, ticks, flies, etc.) that can transmit serious pathogens to humans, pets and livestock such as West Nile Virus and Zika.

## Economic Benefits:

- Economic benefits were determined using triangulation methods to establish robust estimates of the value of pyrethroids, including: (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 farmer surveys; and (4) a multi-market analysis to project the aggregate economic benefits of Pyrethroids to the U.S. economy.
- The economic benefit of pyrethroids is especially high for specialty crops on a per acre basis. The following table outlines these values.

<b>Crop</b>	<b>Economic Benefit (\$/Cropped Acre)</b>	<b>Economic Benefit (\$/Pyrethroid Treated Acre)</b>
Alfalfa Hay	\$2.46	\$17.00
Corn	\$3.75	\$24.89
Cotton	\$4.11	\$8.36
Rice	\$11.16	\$27.35
Sorghum	\$0.01	\$0.10
Soybean	\$3.80	\$20.24
Wheat	\$0.38	\$4.81
Citrus	\$137.93	\$106.21
Potato	\$247.90	\$377.43
Sugar Beet	\$13.38	\$44.11
Sunflower	\$38.03	\$44.88
Sweet Corn	\$364.50	\$108.16
Tomato	\$293.47	\$238.61

The economic benefits of Pyrethroids go well beyond the values in this table. Each commodity and specialty crop reaps additional benefits from the use of Pyrethroids, with some of the key benefits detailed below.

### Commodities:

- The most actively managed insects for corn farmers are the corn rootworm and the European corn borer. Soil-applied Pyrethroids + organophosphate insecticides are the most effective conventional treatment for corn rootworm.
- U.S. cotton farmers actively manage a wide range of pests. Before first bloom, these primarily include thrips and plant bugs, and after first bloom they primarily include bollworms, stinkbugs, and plant bugs; both timings require a broad-spectrum material. Pyrethroid insecticides are used on a large portion of cotton acres, and their value is beyond cost, as costs are slightly greater than the alternatives.
- The most actively managed insect pest for alfalfa farmers is the weevil followed by potato leafhopper. By controlling the potato leafhopper with pyrethroids, yield increases occur both in the current year and for the first cutting the next year.
- Pyrethroids are the most effective treatment for soybean aphid.
- With only two modes of action available, pyrethroids are critical for resistance management in wheat and rice.

### Specialty Crops:

- Pyrethroids provide effective knockdown and long-lasting residual control of Asian citrus psyllid, the vector for the bacterium that causes citrus greening. Pyrethroids are the most effective tool for fighting the spread of this disease, which has the potential to decimate the citrus industry in Florida and other states.
- Almonds are California's top export crop and rely heavily on pyrethroids to control navel orangeworm and the Hemipteran complex. The broad-spectrum efficacy of pyrethroids is critical to meet stringent standards for damage and aflatoxin contamination for both domestic and export markets.
- Sweet corn sees the largest benefits of any of the crops studied at \$365/A per cropped acre. For fresh market blemish-free sweet corn, growers must manage ear-feeding lepidopteran pests (fall armyworm and corn earworm); pyrethroids are the most effective materials for both adult and larval control.
- Pyrethroids are the dominant insecticide class in sunflowers, with applications on 85% of insecticide treated acres. If Pyrethroids were not available, only 2 modes of action would remain for the control of insects.

### Public Health:

- Pyrethroids are essential tools to manage pests that transmit diseases, including mosquitoes and ticks.
- The only alternative chemistries to Pyrethroids for wide-area spraying for adult mosquitoes are the organophosphates naled and malathion, which are also undergoing registration review.
- There is a high probability that new mosquito-borne viral threats will be introduced into the continental U.S. from neighboring countries where they are endemic; Pyrethroids are essential to mosquito control.
- The mosquito vectors of Zika (*Aedes* sp.) require control approaches that target residences and yards, in addition to the traditional mosquito control district approaches. Pyrethroids used for mosquito control as barrier surface treatments are the only active ingredients registered for these uses.
- Permethrin is one of only two options registered to treat military clothing, which protects deployed personnel from pests.
- Pyrethroids are essential as repellents and control agents to control livestock pests.