

Benefits of Pyrethroids to Field Corn

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 farmers if they were no longer available. These analyses determined: (1) costs to the farmer 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 from these analyses.

BENEFITS TO FIELD CORN

1. Costs with and without pyrethroids

- The total market value for field corn (for grain) in 2016 was \$52 billion according to USDA-NASS.
- Pyrethroids are the most widely used class of foliar and soil-applied insecticides by U.S. corn farmers. Of all the insecticide treated acres in corn, more than 70% were treated with pyrethroids. Of the more than 14.2 million pyrethroid-treated product acres, 10.4 million acres are soil-applied (79%), and 3.8 million acres are foliar-applied (62%).
- The most actively managed insects for corn farmers are the corn rootworm and European corn borer. In a 2016 survey of US corn farmers, 61% report actively managing corn rootworm and 58% report the same for European corn borer, with corn earworm and cutworms reported by 11% and 8%.
- Costs per acre, with and without pyrethroids, demonstrate the value of pyrethroids in field corn. Corn farmers would see insecticide costs increase by more than 45% per treated acre. Based on 2014 numbers, foliar treatments averaging \$4.58/acre would rise to an average \$8.51/acre without pyrethroids (46% increase), and soil treatments averaging \$5.59/acre would rise to an average \$14.44/acre (61% increase) because of the higher cost of other insecticides.
- These increased per acre costs of the non-pyrethroid scenario translate into an overall cost increase to the corn industry. Industry costs overall would rise \$103,000,000 to replace pyrethroids, an increase of 46% over current pyrethroid costs. For foliar-applied, costs rise nearly \$12,000,000 (14% increase) and for soil-applied \$91,000,000 (65% increase).
- Loss of pyrethroids would result in cost increases that would reduce farmer profits and increase the cost of corn. This cost increase would endanger the US's competitive advantage as the world's lowest-cost corn exporter.

2. Yield Benefits

- Pyrethroids are effective at reducing root injury from rootworm larval feeding, providing protection at low cost.
- When used alone, pyrethroids provide control equivalent to organophosphates and are significantly better than the other classes examined (diamides, neonicotinoids, phenylpyrazoles). A pre-mixed combination of a pyrethroid and an organophosphate soil-applied insecticide provides a reduction in corn root injury equivalent to a single-toxin rootworm Bt hybrid.
 - Yield gains from pyrethroid control of corn rootworms are 11-12%, higher by 3.5% than



other pesticide classes, based on analysis of more than 669 observations of replicated small plot experiments from 89 locations in four states over 11 years.

- Without pyrethroids, the loss of these yield gains could be the difference between making a profit or losing money for the farmer.

3. Monetary and Non-Monetary Value to Farmers

- For farmers who reported using soil insecticides, 86% reported using a pyrethroid soil insecticide. Alternatively, for farmers who reported using foliar insecticides, 44% reported using a pyrethroid soil insecticide.
- The value of corn is estimated at \$1.5 billion dollars in the US. Of the 88 million estimated acres of corn in 2015, the implied value of soil insecticides was \$317 million with \$282 million of this value attributable to farmers who used pyrethroid soil insecticides on at least some of their corn acres. The estimated value of foliar insecticides was \$237 million with \$106 million of this value attributable to farmers who used pyrethroid foliar insecticides on at least some of their corn acres.
- More than 70 percent of the corn farmers ranked these seven features of pyrethroids as very important to them in their management programs: protecting yield, family and worker safety, protecting water quality, improving plant health, improving crop stand, public safety, and crop price.

4. Direct and Indirect Impacts

- Of all the crops examined, the aggregate economic benefits of pyrethroids were the greatest for corn, generating more than \$350 million in benefits for the US economy. The major users of corn reaped most of these benefits as lower consumer prices for meat, dairy and egg products and fuel. With organophosphates and pyrethroids outperforming other insecticides against corn root worm and other key corn pests, maintaining use of pyrethroids for resistance management is critical.
- Corn rootworm populations have developed resistance to crop rotation, Bt traits and multiple insecticide classes, so as many modes of action as possible need to be available for rotation.
- Pyrethroids are a low-cost class of insecticides to use in rotation with more costly insecticides to reduce the likelihood that insecticide resistance will develop to any of the classes.
- Corn has four major insecticide chemistries available. The loss of this key insecticide would further limit the ability to manage resistant pests.

