

Ecology & Management of Insect Pests of Corn

NC-205 (2010-2015)

Insect Pests Cause Serious Damage to Corn Crops

Each year, US farmers grow over 80 million acres of field corn and 600,000 acres of sweet corn, worth about \$66 billion. These crops are plagued by insect pests that bore into or feed on corn stalks, ears, leaves, and tassels. The European corn borer alone accounts for nearly \$1.9 billion in control costs and grain losses annually. Though advances in pest control have been made, scientists and farmers still need more information about the ecology of corn pests and the effectiveness, cost, and safety of control options.

Bt corn has become the standard for controlling insect pests in corn. This corn is genetically modified to contain toxins created by the bacterium *Bacillus thuringiensis* (Bt). These toxins, which are safe to humans and other animals, are poisonous to many caterpillar pests. However, some insect species have become resistant to single Bt toxins. New types of Bt corn contain multiple toxins to control a broader spectrum of caterpillars and slow the evolution of resistance to Bt toxins, but more work is needed to develop effective insect resistance management plans.

Multistate Research Project Works to Improve Corn Pest Management

Multistate Research Project NC-205 formed to coordinate multistate, multidisciplinary research and outreach about corn insect pests and control options. Extensive cooperation has facilitated sharing of data, lab space, tools, and financial resources. The group's research and outreach have sent a unified message to corn growers around the world about the effectiveness of different corn pest control options. Their work has led to increased adoption of sustainable management systems for insect pests in corn. In turn, profitable, environmentally friendly corn production keeps prices low for consumers.

New Knowledge, Tools Increase Adoption of Best Management Practices, Cut Corn Production Costs

Boosting Acceptance of Transgenic Corn

- Bt corn has suppressed European corn borer populations across five major corn-producing states for 13 growing seasons with a cumulative benefit of more than \$6.1 billion. Benefits to non-Bt corn account for almost \$3.9 billion of this total.
- NC-205 has demonstrated the effectiveness of new transgenic corn varieties against many insect pests. These test results have been used by companies to register corn hybrids.
- Multiple NC-205 studies have further boosted acceptance of Bt corn by showing limited impacts on non-target species.

Helping Growers Make Better Decisions

- NC-205 has expanded online access to pest management tools. Free, easy-to-use decision support tools have lowered pest management costs for corn growers by simplifying the process of choosing which corn variety to plant, where to plant it, and which strategy to use to prevent pest resistance.

Improving Pest and Pest Resistance Monitoring

- University, government, and industry scientists have used NC-205's data to predict pest spread and the impacts of climate change on pest range. Improved models have helped growers know when to scout corn fields for pests.
- A new sampling method, which includes a smartphone app option, has reduced sampling time and labor by at least 50% across the Corn Belt. Accurate screening has helped growers avoid undue economic loss by addressing pest outbreaks before they get out of hand and preventing unnecessary pesticide applications when pests are not present.
- NC-205 developed a low-cost, dependable tool that has helped scientists and farmers detect pest resistance to Bt over large geographic areas.

Informing Policy & Regulatory Decisions

- NC-205 has provided scientific assessments essential to policymaking. For example, NC-205 data is used by the EPA to regulate corn pest control options.
- In Europe, NC-205 research has been used to justify commercial use of Bt corn.
- NC-205 findings have led researchers in India to alter the way they screen for Bt resistance.
- NC-205's insights on corn pests and Bt corn are strongly influencing policies and regulations concerning other transgenic technologies. For example, a project member's address to the Danish parliament had a major impact on how Denmark intends to develop biotechnology.



Bt corn has drastically reduced the use of insecticides to control caterpillars like the European corn borer in the bottom right photo (USDA photo) and the Southern corn leaf beetle, which caused the damage shown in the top photo (Kansas State University photo). Bottom left photo by Michael Gil, Flickr, CC License 2.0.

Want to know more?

NC-205 Administrative Advisor:

Steven G. Puelppke (Puelppke@msu.edu)

NC-205 was supported through USDA's National Institute of Food and Agriculture by the Multistate Research Fund established in 1998 by the Agricultural Research, Extension, and Education Reform Act (an amendment to the Hatch Act of 1887) to encourage and enhance research on issues that have a national or regional priority. Additional funds were provided by contracts and grants to participating scientists. From 2010 to 2015, NC-205 leveraged around \$2 million. In 2014, NC-205 merged with project NCCC-46. The merger, NC-246, was approved through 2020. To learn more, visit <http://ncra.info>.

Participating Institutions:

University of Arizona
Clemson University
Cornell University
University of Delaware
University of Georgia
University of Guelph
University of Illinois
Iowa State University
Kansas State University
University of Kentucky
Louisiana State University
Michigan State University
University of Minnesota
University of Nebraska
North Carolina State University
North Dakota State University
Ohio State University
Pennsylvania State University
Texas A&M AgriLife Research
University of Wisconsin
USDA-ARS
Embrapa Cerrados (Brazilian Agricultural Research Corporation)
Ontario Ministry of Agriculture