Managing Soybean Insect Pests

This project advanced knowledge of current and emerging soybean insect pests and improved tactics for managing them, thus promoting a stable, high-quality supply of soybeans for consumers while reducing farmers' costs and making soybean production more sustainable.

Who cares and why?

Soybeans are a major crop in the U.S., where they are grown in 31 states and account for 35% of the world's production. Specialty soybean production is also a growing, profitable market. Specialty soybeans are sought for traits such as high protein or improved flavor and texture in the case of tofu and edamame. Furthermore, soybeans are the most-produced legume in the U.S. organic industry, which has grown 20% or more annually since 2002. Given the large acreage and wide distribution of soybeans, insect pests are an increasing problem. Insect pests hinder soybean growth, quality, and yield and elevate risks to human health and the environment. This damage is costly. In just Mississippi alone, insect pests caused estimated losses of $20.33 million per year from 2004 to 2010. Pest infestations also raise the cost of soybean production by dramatically increasing chemical insecticide use. The distributions and impacts of many soybean pests (such as soybean aphids, bean leaf beetle, and stink bugs) are increasing as a result of expanding soybean production, changes in cropping practices, and/or global climate change. Farmers are also encountering new insect pest problems that they have never seen or managed before. As pest problems evolve, richer, more up-to-date knowledge of these pests is needed in addition to new or modified thresholds, scouting practices, and control methods. Although insecticides are often the go-to tools for dealing with insect pest problems, sustainable long-term solutions must include pest-resistant soybean plants and biological control. Furthermore, these solutions must be effective for soybeans in many different growth stages and planting systems.

Educating growers on detecting damage is key for S-1039 members. Kudzu bug is a new invasive pest devastating soybeans in the Southeast (top photos by M. Mian). Stink bugs (middle right, photo by D. Shetlar) damage soybean seeds, causing them to wrinkle and shrink (middle, photo by A. Michel). Bean leaf beetles feed on soybean leaves and pods. Pod damage (bottom, photo by R. Hammond) enables infections in the soybean seeds, leading to moldy beans.

What has the project done so far?

Over the past five years, S-1039 members (who represent many disciplines and almost all soybean production acres in the U.S.) have shared expertise. S-1039 researchers have characterized many soybean pests and their impacts on the growth, quality, and yield of different soybean varieties. Project members have also researched when to plant soybeans, when to apply seed treatments and/or insecticides, and which agricultural practices are the most effective and cost-efficient. Building on these findings, the group has developed tactics for managing key soybean pests, including new or refined thresholds that are appropriate for specific regions, cropping systems, and growth stages; cost-effective insecticides and spray technologies; organic-compliant insecticides; modified agricultural practices; biological control; and pest-resistant soybean varieties. S-1039 members have also set up a multistate trapping network that has provided critical information for predicting pest outbreaks, keeping track of insecticide resistance, and making pest advisories and alerts. Project

Impact Statements

Educated thousands of farmers, consultants, educators, and other agriculture professionals about soybean pest management. For example, North Carolina Cooperative Extension County Agent knowledge on soybean insect identification increased 28% and confidence in the ability to train others increased 21%.

Helped farmers head off pest problems while keeping their costs and losses low by providing pest alerts that encouraged farmers to scout fields, use appropriate economic thresholds, and limit insecticide treatment to at-risk fields. For example, timely information about lower-than-expected soybean aphid numbers saved Ohio farmers an estimated $12,000,000 on insecticide applications.

Recommended soybean aphids thresholds that have prevented losses of at least $40.00 per acre. Using this threshold, U.S. soybean producers are expected to save $13.3 billion over the next 15 years.

Provided evidence for registration and labeling of several new insecticides that have longer-lasting performance but limited impacts on non-target species, thus providing farmers with safer, more sustainable control options for soybean pests.

Identified effective seed treatments that have increased soybean yields. For instance, researchers found a seed treatment that gave 45% to 100% control of Dectes stem borer and resulted in a 10% yield increase in the test location. In the mid-South, farmers who used recommended treatments increased yields by three bushels per acre.

Gave farmers alternatives to chemical pesticides, including pest resistant soybean varieties and biological control options, thus promoting environmentally and economically sustainable soybean production.

Increased acceptance and release of seed-applied insecticides and pest-resistant soybean varieties among farmers and regulators in areas where they provide the most benefit.

members have shared news and findings in many media, including over 200,000 copies of a pocket-sized, full-color field guide for identifying soybean aphids and look-alikes and the Pest Information Platform for Extension and Education (*http://www.ipmpipe.org/*).

In the northern U.S., heavy pressure from soybean aphids (SBA) results in soybean crop losses (sometimes as high as 50%). Many different insecticides are used to control SBA on millions of acres, adding $10 to $20 per acre to production costs. S-1039 researchers are evaluating new soybean varieties for resistance to SBA and other soybean insect pests. Photo by R. Bansal.

What research is needed?

Continued cooperation among states and across disciplines will improve soybean insect pest management and insecticide resistance monitoring. Additional emphasis will be placed on pest-resistant soybeans (especially finding molecular markers of pest resistance) and natural control. Scientists will continue to adjust thresholds as needed and will develop precision technologies to help farmers properly apply insecticides. Seed treatments for SBA control are becoming more popular, and seemingly more affordable, but additional research is required to make sure that this tactic is not overused to the point that it becomes ineffective. Management recommendations must also be adapted for electronic delivery.

Want to know more?

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