

Crop sustainability and pest control in farming

As all farmers will attest, pests are inevitable. Controlling them requires vigilance, creativity and a big-picture approach. No one strategy can completely resolve the problem, so farmers constantly look for new products and practices to try, and also often rotating tools to also combat the risk of pest resistance.

As the discussion of sustainability becomes a growing focal point, many of these innovative crop protection and seed products help farmers protect their harvests and the environment at the same time.

A big-picture approach

When it comes to controlling pests, Integrated Pest Management (IPM) has been an increasingly popular strategy for farmers around the globe. Farmers practicing IPM combine crop protection products, insect resistant traits, habitat modifications, changes to agricultural practices and resistant hybrid varieties to boost crop health and yield potential. By utilizing multiple tools and practices, farmers can successfully manage pests in a way that is economically and environmentally sensitive.

Naturally derived pesticides, those that come from nature like microorganisms and pheromones, are a growing part of farmers' IPM strategies. For example, while *Reynoutria sachalinensis*, or giant knotweed, is considered a nuisance to farmers, the extract of this plant can prevent the growth of some fungi and improve root growth and chlorophyll production in staple crops like corn, soybeans, peanuts and more. Today's new developments in sustainable crop protection are tackling pest problems on a larger scale, and some have surprising origins.



Scaling up pheromones

Some researchers have been working on scaling up synthetic production of female insect pheromones so they can be used in row crops to manage populations of certain pest species of Lepidoptera populations. David Llobet Calaf of BioPhero explains that "female [Lepidoptera] leave a 'bloom' of species-specific pheromone which attracts males for mating. But if we put a similar bloom throughout the air, the male won't be able to find them." With reproduction interrupted, the targeted pest's population is reduced.

Pheromones have been used for many years in Europe on crops like apples and grapes, but researchers are now working on creating products for commodity crops as well. Calaf notes that "products are being developed in South America for corn and sugarcane and in China for rice. Calaf is hopeful that, given their success and widespread adoption in Europe, farmers around the world will take up the use of pheromones quickly. Compatible with other crop protection tools, pheromones can easily be incorporated into a farmer's



IPM program. For example, insecticide applications made to control outbreaks of the targeted pests can be followed with pheromone releases to maintain populations below economically damaging levels.

Historically, cost has been the primary roadblock to large-scale use of these products, but advances in technology have helped. Instead of using traditional synthetic chemistry pathways, these products can use the chemistry of fermentation—similar to the production process at your favorite microbrewery. This production process helps reduce costs, making these products more competitive in the market.

Bacteria with bite

Biopesticides and bio-control agents are especially desirable as more consumers become interested in purchasing products made with naturally derived ingredients. *Bacillus thuringiensis* (*Bt*), a soil bacterium, is a well-known global success story when it comes to selectively managing pests. Individual strains of this bacterium can target specific insects or closely related groups of insects, making it ideal for eliminating pests while protecting beneficial insects.

Whether it's applied topically as a crop protection product or its genes are integrated into crops themselves through genetics, *Bt* can be an important tool. But *Bt*'s best characteristic may be what it doesn't do: A 2019 analysis found

that more than one billion acres of *Bt* crops have been grown globally without harming the environment or human health.

Still, this agricultural superhero has its kryptonite: *Bt* resistant insects are on the rise due to its widespread use. To combat this issue, farmers use IPM strategies to rotate and alter their pest management tools—ultimately attacking the targeted pests with multiple modes of action. This approach reduces the pest's ability to build resistance traits.

And innovation continues. Scientists are now looking at an additional tool called RNA interference, which in the future may be used in combination with *Bt* to provide another layer of defense against insects. The EPA approved an RNAi pesticide for the first time in 2017, and with researchers now working on cost-effective ways to apply it on a larger scale, its widespread use could be right around the corner.

Effective pest management and sustainability go hand in hand, and with the tenets of IPM, farmers are only getting better at protecting crops with solutions that are both environmentally and economically beneficial. And, as new innovations emerge to support forward-thinking pest management strategies, we can continue to build up our capabilities to care for crops, and our environment, at any scale.