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Agriculture chemical firms' interest in biopesticides rises

Natural born killers

09 June 2009 00:00 [Source: ICB]

Interest in biopesticides is on the rise, as demand for healthier and safer agricultural products expands

THE BIOPESTICIDES market sector is abuzz with all kinds of activity this year, including product introductions, business alliances, and acquisitions.
Biopesticides are defined by the US **Environmental Protection Agency** (EPA) as pesticides derived from natural materials, such as animals, plants, bacteria and certain minerals. The industry is still considered a niche sector, accounting for 1-2% of the overall global pesticide market. The challenge of new and more stringent chemical pesticide regulations, combined with increasing demand for agriculture products with positive environmental and safety profiles, is boosting interest in biopesticides.
"The biopesticides market is growing at more than 20%/year, particularly in conventional agriculture," says Pamela Marrone, CEO and founder of California-based **Marrone Bio Innovations** (MBI). She estimates that the global chemical pesticide market was worth $32bn (€22.5bn) last year.
"It is harder and harder to discover new chemical pesticides that meet all of today's environmental and safety requirements, so biopesticides can fill the market need for new active ingredients," Marrone says.

"We project the biopesticides and low-chemical sector will grow rapidly in response to the increasing need for food; regulator and consumer demand for lower chemical residues on food; and growers' needs for improved toolkits for pest control," says Marcus Meadows-Smith, CEO of California-based biopesticides manufacturer **AgraQuest**. He estimates that the biopesticides market is growing at 10%/year.
Some companies value the global biopesticide market at $500m-800m, while others say it is hard to quantify because of different definitions for what is considered a biopesticide.

"There is no definition for biopesticide on a global basis," says strategist Roma Gwynn of UK-based Rationale Biopesticide Consultants. "Right now, there is no up-to-date data on the market worldwide. It's always pegged at around 2% of the global crop protection market and that hasn't changed so far."

The EPA defines three kinds of biopesticides: microbial, consisting of microorganisms; biochemical, which are naturally occurring substances such as extracts and pheromones; and plant-incorporated protectants, which are substances that plants produce from genetic material added to the plant.
Some players include macrobials, such as beneficial insects and nematodes, as another biopesticide type. Genetically modified crops, however, are generally excluded.

CHEMICAL SYNTHESIZERS

While biopesticides are typically seen as an alternative to synthetic chemicals, some see biopesticides as complementary to conventional pesticides already on the market. AgraQuest highlights the emerging low-chemical pesticide sector, where biopesticides can be added in a spray program to reduce the amount of synthetics to their lowest label rate. Meadows-Smith estimates that this sector will grow to be worth $5bn-10bn by 2017. "The positive impact we have on the environment can be far greater by targeting conventional growers with biopesticide products, as opposed to selling exclusively into the niche organic market," says Meadows-Smith. "There are many biopesticide companies unwilling to adopt this approach, but we've found that positioning our products as part of a low-chem spray program or in a tank mix alongside synthetics is an excellent way to reduce chemical load and manage resistance without sacrificing the efficacy conventional growers demand."

Big agricultural chemical companies will invest heavily in this area, he says, citing AgraQuest's recent licensing, supply and distribution deal for its biofungicide *Serenade* with German chemical company **BASF**. AgraQuest has its own direct sales and marketing network in the NAFTA region, but is seeking distribution deals for its *Sonata* biofungicide and the recently launched *Requiem* bioinsecticide.

One agchem company that also expanded into biopesticides this year is Germany-based Bayer, notes William Dunham, owner and CEO of US-based **International Bio Consultants**. German agchem company **Bayer CropScience** acquired the biopesticide technology and assets of Israel-based **Agrogreen** in March. Dunham says Bayer is also rumored to have recently acquired a stake in Dutch biopesticide company **Koppert**.

"The industry is very dynamic right now compared to a few years ago. Alliances of biopesticide companies with major agchems seem to be picking up," says Dunham. "Agchems are looking for technology that complements what they already have or complement a segment that they're focused on. We will see this trend continue in the next few years."

AGCHEMS ON THE SCENE

Aside from Bayer and BASF, Marrone points out that other companies such as US-based **FMC**, Japan's **Arysta LifeScience**, Switzerland's **Syngenta**, Israel's **Makhteshim** and US-based **Monsanto**, have their own development efforts in biopesticides through collaborations with smaller firms.

"Biopesticides can enhance and synergize synthetic chemical active ingredients and also fill unmet market needs," she adds. MBI also notes its exclusive license with US-based chemical giant **DuPont**, which provides them access to more than 20 proprietary natural product discoveries from DuPont's marine microorganism screen. Marrone says DuPont's compounds and mixtures that are too complex for chemical synthesis often make good candidates for biopesticides.

DuPont itself launched in April its new insect repellent active ingredient from the catmint plant *Nepeta cataria*. The refined oil extract, which DuPont says has the same efficacy such as DEET, is the first new insect repellent biopesticide to be registered by the EPA in eight years.

Another major agchem firm offering its own green pesticide products is **Dow AgroSciences**. The company's spinetoram and spinosad insecticides are said to be derived from fermenting a natural soil organism followed by chemical modifications. The products are not registered under the EPA's biopesticide route, but under its reduced-risk pesticides. Don Kelley, Dow AgroSciences global product manager for new insecticides, says the EPA's biopesticide definition is sometimes difficult to meet. "Our products could very closely be considered biopesticides, but we took the approach to register it under conventional pesticides since in order to market it worldwide, we will have to do the studies anyway to prove our products are environment-friendly and safe," he says. Both the spinetoram and spinosad insecticides won the EPA's Presidential Green Chemistry Challenge award. Reduced-risk or green pesticides is a growing sector, says Kelley. "Competitors are striving to discover new products for that market segment."

While biopesticides may be safer than conventional pesticides, the industry is plagued by the lack of critical mass to effectively develop and market its products, as well as compete with multinational synthetic pesticide producers.
"The industry is composed mostly of small to medium enterprises, and it is difficult for one company to fully and properly fund research and development, field development and provide the marketing services required to make a successful biopesticide company," says Tim Damico, vice president, NAFTA at Maryland-based **Certis USA**. "What companies need to do is to be clear in their objectives and allocate resources appropriately."

Another problem is the lack of product stewardship, which the US-based **Biopesticide Industry Alliance** (BPIA) is trying to address, says Damico, who is also on the BPIA press relations committee.
"We as an industry are trying to become much better stewards of our technology so that people who use our products will be more confident that what we say is credible," Damico says. "The perception is changing, but unfortunately it is a slow process." Another challenge is the lack of innovative blockbuster products to the marketplace.

But several companies are hoping to change that.
AgraQuest says registrations are underway in Europe, Latin America and Asia for its *Requiem* bioinsecticide, which was launched in the US early this year. The company has 13 other products in the pipeline in various stages of development.

This year, MBI expects to submit to the EPA a new rice bioherbicide and microbial bioinsecticide candidates, as well as launch its *Zequanox* invasive mussel control product. Also in MBI's pipeline is a plant-extracted insecticide and a systemic organic herbicide.

Certis is in the process of introducing two new technologies in the market: a -bio-nematicide called *MeloCon* and a soil-applied fungicide under the *SoilGard* brand. "We plan to launch at least two new products developed by Certis within the next two to three years. We've also entered a material testing agreement with another biopesticide maker for a unique biofungicide that we hope to launch within the next three years," says Damico.

Marrone says it takes an average of three years and less than $5m to develop a biopesticide, compared with 10 years and $200m for synthetic pesticides. Meadows-Smith says it costs about $15m-20m to develop and register a biopesticide globally. "However, biopesticides have an accelerated registration path in the US and could get to market in three or four years, versus eight to 10 years for a synthetic pesticide, whereas in Europe, the times are six to eight years and eight to 10 years, respectively."

Read Doris de Guzman's green chemicals blog

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