AgroPages.com
The Agribusiness Magazine
October 2016

AGROPAGES

2016 Biopesticide Supplement

Commercial Challenges for Bringing Biopesticides to Market: What Does it Take to Survive?

By Pam Marrone
CEO/Founder of Marrone Bio Innovations, Inc. (MBI)

Biopesticides represent approximately $2–3 billion of the $56 billion pesticide market. Growth of biopesticides is projected to outpace that of chemical pesticides, with compounded annual growth rates of more than 15%. With global population expected to increase to 9 billion by 2050, there is an increasing need to produce more food more sustainably. While considerable progress has been made with biopesticide adoption into the market, biopesticides are less than 4% of the agrichemical market and barriers remain.

Lack of awareness and understanding of biopesticides among the public

Perceptions persist about efficacy & cost, but more importantly, there is a lack of awareness and understanding of biopesticides by agronomists, growers, crop consultants and key influencers such as university and government researchers. Therefore, biopesticides are often not tested or used properly based on their modes of action. An example of a product with a novel mode of action this is our company's microbial insecticide, Grandevo®, based on the novel bacterial species, *Chromobacterium* subtsugae. The bacteria produce several compounds of different chemical classes in fermentation and when applied onto a crop as a wettable powder or granule (dead cells and compounds), repel pest insects, stop feeding in seconds and reduce adult insect fecundity. The insects do not start dying until about four days, with peak mortality at 10 days. Using this product like a knockdown insecticide, of course may lead to disappointment. Therefore we are educating our own sales force, users and key influencers to use the product early before pest populations increase. Or if pest populations are already high, start with another insecticide that has contact activity (such as our other bioinsecticide Venerate®) or with more knockdown effects, followed by Grandevo. Incorporated into a program, Grandevo (and Venerate) can be used in conventional programs for resistance and residue management and to increase efficacy of chemicals. And of course, these products can be used with other organically listed biopesticides for the fast growing organic segment.

Other things to watch for when integrating biopesticides is water pH, mixing order in the tank and the choice of adjuvant, which can increase or decrease efficacy. In addition, it is quite common to hear a grower of consultant say they used a biopesticide for the first time when nothing else would work, including chemical pesticides. “I tried everything but the kitchen sink, so I think I’ll try a biopesticide.” This is exactly the wrong time to try biopesticides. One bad experience can linger for many years. While there is an increasing number of sales and field development specialists trained in biopesticides, an individual coming solely from a chemical background may or may not understand the best use of biopesticides.

A formulation can make or break a biopesticide. Formulation innovation can transform biopesticides with new inerts and formulations to extend field residual life & improve consistency. To take advantage of the synergies of biologicals and chemicals, companies are developing premixes of chemicals and biopesticides (e.g., Poncho/Votivo) for better efficacy and functionality. We are also seeing premixes of multiple biopesticide Active Ingredients (e.g. Becker Underwood’s Biostacked® seed treatments of *Rhizobium* + *Bacillus*). Marrone Bio Innovations and Groundwork Bioag are developing an all-biological stacked seed treatment that contains a Mycorrhizae-based biostimulant and nutrient uptake enhancer along with nematicidal, insecticidal, and fungicidal microorganisms.

Getting through the distribution channel

Small startup biopesticide companies typically focus on getting their first product through the regulatory process. This is important but then what? The go-to-market strategy is fraught with challenges. The agrichemical market is very crowded and hyper-competitive. For a small one-product company to get the attention of a distributor who is the gatekeeper for the relationship with the grower in the U.S. is not easy. For Marrone Bio Innovations, we have a strategy to be a leading innovator and to develop a full portfolio of products across the full range of customer needs (insect, nematode, plant disease and weed control). A distributor then expects that we will continue to have something new for their customers, meeting multiple needs. Companies bringing products to market, whether chemical or biological, see faster adoption when filling an unmet need. For example, faster adoption may occur when entering with a new bionematicide, an effective bioherbicide (especially for organic production), or an effective and safer fumigant. This compares to coming to market with another similar biofungicide for powdery mildew and leaf spots, which is a crowded segment.

Another possibility is to partner with a large agrichemical company to do the sales and marketing of your biopesticide product. This takes careful consideration since you will sacrifice profit margin by having another entity along the chain to the farmer. In theory, higher volumes should make up for lost margin, but experience by many small companies has found that this is not always the case. For large acre row crops, partnering may be the nest model as it takes a large sales force to access hundreds of millions of hectares of corn and soybeans.

Some new venture capital-backed biostimulant companies are testing a new model, which bypasses the distributor by going direct to the grower. Time will tell whether status quo will continue, or disruptive, innovative new entrants with roots outside of ag will change the difficulty of accessing the grower via distribution.

Confusion about Different business models

One of the misunderstandings about biopesticides is the different business model compared to the business model for developing and launching a synthetic chemical pesticide. Because of the long time (12 years) and up front capital cost (more than $280 million USD) for developing a chemical, by the time a chemical pesticide reaches the market, there are thousands of field trials and demos, the manufacturing process and formulations are perfected and global regulatory approvals are pending. Therefore, when a chemical is launched, it is expected that it will reach its peak sales in three years.

For a biopesticide, often developed by smaller companies without the deep pockets of multi-billion dollar companies, there is a different model applied, called the ‘Innovate at Speed’ or ‘Agile Innovation Model,’ which is capital efficient and “fund as you go” model. Because of the 70-year history of safety and low risk of biopesticides and short development time and favorable regulatory process in the U.S., a small company can enter the market with Version 1.0 biopesticide and place the product with a few early adopter customers. This provides valuable early insight from customers and feeds back into R&D for the next generation product, Version 2.0, allowing rapid and continued innovation. Because an early version may have only a U.S. label with a few crops and uses, peak sales do not occur in three years, but will take longer (5+), as more uses and crops and international approvals are achieved over time. Neither the capital intensive model nor the “Agile Innovation Model” are “right” or “correct”. They are simply different and understanding this will lead to better expecations for biopesticides when they enter the market. The “Agile Innovation Model” is used widely in places like Silicon Valley and consumers are accustomed to having continued new versions released of their iPhone hardware and software. Imagine if a biopesticide had $280 million in R&D (instead of $3-7 million) behind it before being launched? It would be a very different product!

Regulatory as a key barrier

Another key biopesticide barrier to entry is that regulations are increasing in complexity and cost in some region and there is no global regulatory harmonization. The United States leads the way with the most streamlined biopesticide regulations. Harmonization with Canada has had limited success. Submission of a product concurrently to both the EPA and the PMRA (Pest Management Regulatory Authority) of Canada for joint review has not reduced the time for approval, and often increased the time (Personal experience and Personal Communication with Biopesticide Industry Alliance members). Although Europe would like to accelerate more biological tools to the market due to the restriction and elimination of so many chemical active ingredients, complex European case by case rules cost several millions of dollars more than a U.S. registration and may take several years for approval. Brazil and China see the need for more biopesticides and have programs to accelerate biologicals but they still take more time than the U.S.

The Biopesticide Future

"Big data" is being applied on the farm to increase yields by understanding soil types, soil and crop water, crop varietal effects, weather and microclimates, and the microbiome, among others. What has lagged, however, is the application of "big data" to pest management. While there are certainly some pest and disease-specific degree-day models developed at universities and government institutes, "big data" and precision farming have not been as extensively used in local and regional prediction of pest and pathogen populations for more accurate spraying in time and space. Fungicides are still largely applied on a calendar basis. Because timing of a biopesticide application is so critical based on their unique modes of action and need to spray early, better scouting and pest/disease population prediction tools will make biopesticide application timing more efficient and effective. Vision/video and drone-based systems to record pest populations in the field real-time can reduce or eliminate manual scouting. Infrared sensors can assess how well a pesticide application has reduced pest populations. How about crowd scouting apps – farmers/PCAs/consultants enter pest population data and these apps show locations of the hot spots? Sensor-triggered spraying with variable rates depending on pest population is already here with companies like Semios, where pheromones are released via a sensor-controlled system based on moth populations detected by a vision-based trap. The future is technology and we are truly just beginning to marry "the connected farm" with pest management. Biopesticide adoption will increase substantially as technology, data and pest management are married.