

# Biocontrol in Asia: Gaining momentum!

"Agriculture is backbone of Indian economy and almost 60% of India's population still directly or indirectly depends on agriculture. In last 4-5 years, there has been a significant increase in the number of biological control agents registered for use in India and the use of biological products is gaining momentum as it is all over the world.", said Mr. Pradip P. Dave, President of Pesticide Manufacturers and Formulators Association of India (PMFAI) in his opening words of the first-ever international

conference on biological pesticides organized in Asia, sponsored by Bayer CropScience, Koppert and T-Stanes. The organizers, 2BMonthly and New Ag International, together with co-organizer IBMA, welcomed close to 200 delegates from 31 countries to the inaugural Biocontrol Asia conference in New Delhi on March 17-18 to join in discussions on the dynamic biocontrol market in India and Asia. Speakers from both local Indian companies as well as high profile speakers from Europe and North America provided presentations on a wide range of topics to fuel the exchange of ideas. Mark Trimmer, Editor of 2B Monthly, reports.



## THE ASIA BIOCONTROL MARKET: SOLID GROWTH BUT CHALLENGING!

The Asian biocontrol market is growing at an annual rate of more than 15%, however biocontrol represents less than 5% in value of the total pesticide market in Asia according to keynote speaker Dr. Thomas Jaekel, GIZ-CIM Expert on Biological Plant Protection. The number of biocontrol products approved for use in Asia is growing explosively, as shown by the increase of nearly 50% in registered biocontrol products from 2012 to 2014, according to Dr. Jaekel, which suggests continued strong growth of the Asian biocontrol market. While these statistics are promising, Dr. Jaekel observed that the pest management paradigm in Asia as currently practiced does not follow the original

prevention concepts outlined by IPM principles, but instead reacts to pest problems, creating a "pesticide treadmill". This approach makes the successful introduction and use of biocontrol challenging. Biocontrol agents perform best in sustainable, holistic programs in which pest problems are anticipated and treatments are applied before pest populations reach critical levels. In Dr. Jaekel's view, a change in grower mindset in pest management is needed before biocontrol can become a larger portion of the market.

## THE INDIAN BIOCONTROL MARKET: MORE THAN \$100 MILLION HOWEVER FRAGMENTED

The Indian biologicals market is valued at approximately \$450 million and growing rapidly, according to Mrs. Lakshmi Narayanan, Wholtime Director of T. Stanes and Company. Biostimulants make up approximately 50% of the total, with biocontrol and biofertilizers at 25% each. Challenges to biological market growth are the highly fragmented market in India and the need to provide education to growers on how to use biocontrol effectively in a preventative manner, similar to the observations from Dr. Jaekel. Indian growers are accustomed to the quick knock-down of pests and immediate results from curative applications with synthetic chemicals in contrast to the preventative approach needed with biopesticides. Mrs. Narayanan sees the opportunity to create new markets, through grower education and consumer awareness programs explaining the benefits of biological products for the grower, the consumer, and the environment.



"The use of Biologicals is gaining momentum in India as it is all over the world"

PRADIP DAVE, PRESIDENT OF PMFAI

**KEYWORDS OF INDUSTRY TRENDS:  
IPM, PLANT MICROBIOME,  
FORMULATION INNOVATION**

The dominant emerging trend of the use of biological control together with synthetic chemistry in an integrated approach was stressed as key in the expanding use of biocontrol by Mr. Ashish Malik, Vice President, Global Marketing, Biologics, for Bayer CropScience. Traditionally, biological control agents had a low concentration of active ingredients which required higher use rates at higher cost and as a result only fit in niche markets, but modern biologicals have improved



**“Pest management paradigm in Asia is just reacting to pest problems, creating a pesticide treadmill”**

DR THOMAS JAEKEL, GIZ CIM EXPERT

dramatically. Mr. Malik stressed that a thorough understanding of the factors that influence biological performance is critical to positioning biologicals in an integrated pest management system with synthetics to meet the demands of food marketers, regulators, and consumers. The identification of

natural compounds that provide biocontrol performance is getting faster with more accurate genetic tools and fermentation improvements which drive higher concentration of active compounds and lower production costs. This view was supported by discussion about the dramatic growth of biological control in Brazil in recent years by Mr. Harald Mikkelsen, Manager of the Microbial Business Unit at Koppert Biological Systems. One important factor was the emergence of the pest *Helicoverpa armigera* in the BT corn and cotton areas of Brazil in 2012. The BT crops were not resistant to this pest and no chemical insecticides were registered, resulting in substantial losses for growers. A biological solution was identified and a number of baculovirus based bioinsecticides were approved rapidly by Brazilian officials in response to the crisis. This event resulted in a new understanding and mindset among growers of the importance of IPM and the value of biocontrol as a viable option for pest control. Although she was unfortunately unable to attend the conference in person due to an unanticipated last minute schedule conflict Dr. Pam Marrone, CEO and Founder of Marrone Bio Innovations, reinforced these views on innovative trends in biopesticides through a video in which she discussed the market drivers of biocontrol market growth. She also provided her presentation which was made available to all attendees of the conference, in which she discussed some of the emerging trends in biopesticides. Among the topics she highlighted were the characterization of the plant microbiome by a number of com-

panies to identify new biologically active microbials. She also pointed out the increasingly large investment in field testing of biologicals, with the Monsanto BioAg



**“I see the opportunity to create new markets, through grower education and consumer awareness programmes explaining the benefits of biologicals”**

LAKSHMI NARAYANAN,  
WHOLETIME DIRECTOR T-STANES

and Novozymes alliance leading the way in this effort, investing more than \$100 million per year to field test more than 2000 strains each year. The investment in fermentation manufacturing facilities, with Valent Bio investing

\$150 million to build a new 12000 square meter fermentation plant which opened in June of 2014, signals that many companies see a bright future for biologicals. Formulation innovations are also enhancing biopesticide stability and field performance, but more truly revolutionary formulation innovations are needed. Dr. Marrone shared how formulation improvements dramatically improved Grandevo performance. In closing, Dr. Marrone observed the biologicals are an essential part of the crop production toolbox, along with synthetic crop protection chemistry and plant genetics, which will provide a sustainable solution to feeding a growing population.

**REGISTRATION OF BIOPESTICIDES:  
A GLOBAL CHALLENGE**

Delays in registration approval for biocontrol products are a challenge in many parts of the world, and Dr. Robyn Kneen, Head of Regulatory Affairs – Biologics, Bayer CropScience, provided global insight into this issue from a manufacturer’s perspective. Review and approval processes vary widely, from the US which has had a well-established regulatory framework specific to biologicals for more than 20 years, to

Market Size of Biological Products in India		
	\$ USD million	INR Mio
Bio-stimulants (Seaweed extracts (Zyme), Humic Acid liquid, Nitrobenzene, Amino Acids and n-ATCA)	226	14000
Microbials (bioinsecticides), natural products Excluding neem based products	93	5760
Bio-fertilizers	87	5400
VAM	24	1470
Neem products	16	1000
<b>Total</b>	<b>446</b>	<b>27630</b>

Source: Industry estimates

Source: T-Stanes



**“The identification of natural compounds that provide biocontrol performance is getting faster with more accurate genetic tools”**

ASHISH MALIK, VP GLOBAL MARKETING BIOLOGICS, BAYER CROPSCIENCE

Latin America and Asia Pacific, where many countries have no specific framework for biological products and try to adapt chemical regulatory processes to biocontrol product reviews. The result is approval timelines vary widely, from 18 months in the USA to nearly four years in the EU, in the best case. One of most challenging aspects is the complex nature of biologicals, particularly microbial products. In comparison to synthetic chemistry in which activity is derived from a single chemical compound, biologicals are complex mixtures, and in many cases, the active ingredients are not isolated. Dr. Kneen stressed that industry associations must work with regulators to adopt a flexible approach to register biopesticides while maintaining consistency with other already established biopesticide regulatory frameworks. Dr. Willem Ravensberg, President of IBMA, echoed this viewpoint, pointing out that ensuring proportionate regulation of biopesticides and accelerating the strong growth in the use of biocontrol products were focal points for the organi-

zation. IBMA acts as a spokesman for the industry through global, regional, and national associations which interact with governmental, non-governmental, and associated industry bodies to promote biocontrol products and their use. In the eyes of IBMA, regulatory harmonization is a key need to support continued growth of the biocontrol industry.

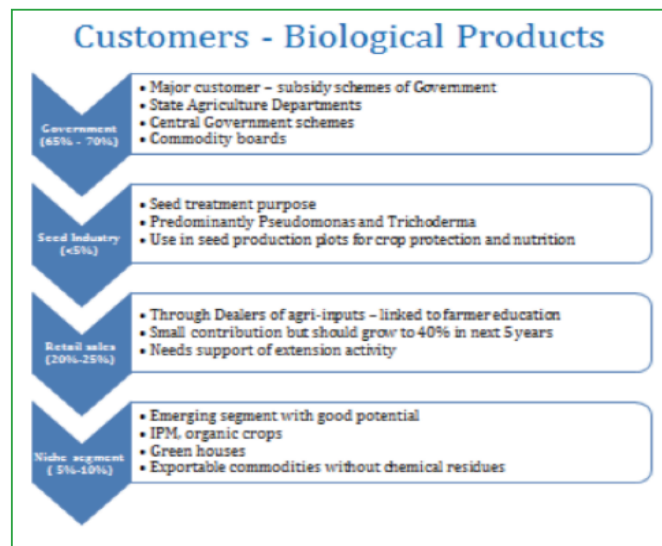
### MICROBIALS: THE RISING STARS IN BIOCONTROL

Microbial biopesticides continue to be a fast growing and innovative segment of the industry. Many of the major company acquisitions have focused on microbial technology. Nematode control would appear to offer a promising fit for biologicals, particularly because many of the chemical products in use have potential for negative side effects for the user and the environment. Despite this, only a few bionematicides have been commercially developed successfully and Dr. S. Marimuthu, Associate Vice President, R&D – Agri, for T. Stanes, discussed the development of Bio-Nematon, a



**“There has been a dramatic growth of biological control in Brazil because of growers realizing the importance of IPM”**

HARALD MIKELSEN, MANAGER MICROBIAL BUSINESS AT KOPPERT



Source: T-Stanes

Paecilomyces lilacinus based solution for nematode control. While there are more than 70 Paecilomyces lilacinus based products provisionally approved in India, Bio-Nematon is the only one that has received a permanent registration. Dr. Marimuthu presented field efficacy results demonstrating nematode control comparable to chemical standards in a range of crops from locations both in India and other countries. Examples of the use of microbial bioinsecticide solutions, including Ampelomyces quisqualis, Metarhizium anisopliae, Verticillium spp., Trichoderma spp., Pseudomonas spp., and Paecilomyces lilacinus, were presented by Mr Deepak Singhal, President of International Panaacea Ltd. He discussed the value of these biological control options and suggested policy changes by government are needed to incentivize growers to adopt them more rapidly.

One of the most innovative areas of research involves searching the plant microbiome for useful new microbial strains to be developed as biocontrol agents. While several companies have been founded on basis of identifying each microbial strain individually, Mr. Marcus Meadows-Smith, CEO of BioConsortia Inc., discussed their unique approach, which involves



**“Many countries in Asia have no specific framework for biologicals and just try to adapt chemical regulatory processes to biocontrol products, and this is creating a variety of problems”**

ROBYN KNEEN, HEAD OF REGULATORY AFFAIRS, BIOLOGICS, BAYER CROPSCIENCE

using the plant to select from the soil the microbial teams, or consortia, which provide unique benefits based on the conditions under which the plant is growing. Employing a proprietary, patent pending process, BioConsortia identifies effective microbial consortia utilizing high throughput DNA sequencing of the plant microbiome. The approach has proven to be an effective

approach to screening large numbers of strains rapidly. Using this technique, BioConsortia hopes to submit their initial products for registration by late 2015 with a goal of beginning commercial sales in 2017.

**NATURAL EXTRACTS:  
ALSO ON THE RISE**

Innovation is not limited to microbials, and many novel biochemical approaches are being investigated as well. Chitosan is an abundant biopolymer, sourced from exoskeletons of crustaceans, which has demonstrated antibacterial as well as antifungal effects and also possesses plant growth promoting and plant defense inducing activities. Ms. Anne Vorkamp, a PhD candidate from the University of Münster, discussed her research into optimizing chitosans for plant protection aimed at improving their efficacy which is often not sufficient for use as a stand-alone product if disease pressure is high. The approach taken was to combine



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DR WILLEM RAVENSBERG,  
PRESIDENT OF IBMA

chitosan with a copper-based fungicide in which the chitosan is formulated as nanoparticles which are then loaded with copper. Field results were presented showing impressive control of

Phytophthora infestans in potatoes. Future plans include development of a triple combination of chitosan, copper, and Trichoderma. The research was funded and supported by a joint effort involving a public and private partnership between Indian and Germany organizations. Another novel biochemical prod-



**“Searching efficiently and quickly the plant microbiome for useful microbial strains is essential. Our approach using high throughput DNA sequencing of the plant microbiome has now proved itself”**

MARCUS MEADOWS SMITH,  
CEO OF BIOCONSORTIA

uct, Vacciplant, is sourced from seaweed, as presented by Mr. Kim Watson, Head of Global Licensing and Product Development, Arysta LifeSciences. The active ingredient in Vacciplant is laminarin, which has a similar structure to oligo glucans which are degradation products contained in the walls of pathogenic fungi. When applied foliarly to plants, Vacciplant stimulates the natural plant defenses through the production of phytoalexins and the production of PR proteins. Vacciplant currently has 34 registrations in Europe for preventative control of plant diseases in a range of annual and perennial crops. Arysta is promoting Vacciplant for use in conjunc-

tion with chemical disease control tools to manage pest resistance and reduce pesticide residues on crops.

Neem seed extract has been used as an effective biological insecticide for many years in India. Dr. S. Balaji, Associate Vice President – Bioproducts, E.I.D. Parry, shared how their product, Avana, has been developed successfully for use against paddy rice pests. Field trials in India, China, and South Korea have demonstrated control of key rice pests, including stem borer, leaf folder, and rice water weevil, which is comparable to chemical standard treatments. Avana is also approved for use in sugarcane and many vegetable crops.

**INNOVATION ALSO IN MACROBIALS**

In the microbial segment, Biobest is recognized as a leading biological company in production of bumblebees for pollination as well as predator insects and mites. Dr. Felix Wackers, Director of R&D for Biobest shared some of their innovative approaches. One of key challenges in using



**“We are promoting our laminarin based product Vacciplant for use in conjunction with chemical disease control tools”**

KIM WATSON, HEAD OF GLOBAL  
LICENSING AND  
PRODUCT DEVELOPMENT, ARYSTA  
LIFESCIENCES

**BioPesticides in India - Regulatory Overview**

(source Bayer CropScience)

**Established regulatory framework – regulated under Insecticides Act, 1968**

- Biopesticides" includes 2 main sub-categories as microbials and botanicals (which includes natural products, extracts, plant growth regulators)
- The Guidelines / Data requirement for registration these biopesticides are well defined.
- Registration (Review) timeline : Approx. 18 – 24 months
- Many local microbial biopesticides (viz., strains of pseudomonas, Trichoderma, Azadiractin, Bacillus thuringiensis, Beauveria, Metarhizium, versticillium, NPVs) and Botanical extract/terpenes (Neem Extract, Eucalyptus Extract, Pyrethrum extract, Cymbopogan extract are registered in India.

**Moving Forward**

- Facilitate import of the biopesticide samples for Research and field trial evaluation in India
- As new types of biopesticides are emerging, guidelines need to be developed or evolve to address how to handle these products
- The need for adoption of a robust scientific based yet pragmatic regulatory approach towards the assessment of Biologics due to their natural origin and complex nature.

predator insects and mites effectively is maintaining a healthy population. Many predators rely on pollen as a secondary food



**“One of the key challenges in using predator insects and mites effectively is maintaining a healthy population”**

DR FELIX WACKERS,  
DIRECTOR R&D AT BIOBEST

source, and Biobest research determined that by applying a supplemental pollen food source with a product called Nutrimite, they could successfully establish healthy predator mite populations even before the pest arrived, greatly enhancing effectiveness of the predator. A second innovation shared by Dr. Wackers was the development of the “Flying Doctors” system in which bumblebees are used as targeted vectors of biopesticides to flowers. By developing a patented hive design, Biobest was able to achieve targeted application of a reduced use rate of the biopesticide with less labor and deliver effective control of Botrytis in strawberries. Dr. Wackers indicated that more disease targets are under evaluation with the system.

**SEED TREATMENTS WITH BIOLOGICALS: THE NEW AND MOST PROMISING FRONTIER**

The use of biologicals as seed treatments is one of fastest grow-

ing market segments in India as well as the rest of the world. Dr. Venkatesh Devanur, CEO of Agri Life, discussed the use of seedcare biologicals. In contrast to conventional chemical seed treatments, Dr. Devanur provided examples of biological seed treatments that can be applied by growers immediately prior to planting, either alone or in conjunction with chemical treatments. He suggests biological seed treatments have the opportunity to capture as much as 20% of the global seed treatment market. Dr. Ketan Mehta, Director and Owner of Ecosense Labs, also stressed the opportunity for biologicals in the seed treatment sector in India. Based on Indian government estimates, 80% of seeds sown in India are untreated versus nearly 100% seed treatment practiced in developed countries. Given that seed treatment improves productivity by 8 to 10%, Dr. Mehta suggested increasing the adoption of seed treatment could dramatically improve Indian yields.

The wide range of topics covered and the high quality of papers presented certainly reinforces the impression that the biocontrol market in India and Asia is on the



**“Biological seed treatments have the opportunity to capture up to 20% of the global seed treatment market”**

DR VENKATESH DENAVUR, CEO AGRILIFE



**“Adoption of seed treatment could dramatically improve Indian yields”**

DR KETAN MEHTA,  
DIRECTOR & OWNER OF ECOSENSE LABS

upswing. 2BMonthly and New Ag International announced their plans to return to Asia in two years for another similar conference. In the meantime, plans are already moving forward to meet again in November 2016 in Brazil for Biocontrol Latin America, once again in cooperation with IBMA.