August 2019

2B MONTHLY

The Global Biocontrol & Biostimulants E-Newsletter

A DunhamTrimmer and New Ag International Publication
www.2BMonthly.com

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Mergers, Acquisitions and Partnerships

Univar Solutions' NexusAg has entered into a sole distribution agreement with Novozymes in Canada. With the start of this agreement, NexusAg was renamed NexusBioAg. The new NexusBioAg team welcomes 11 former BioAg Alliance and Novozymes employees as part of the agreement.

Koppert Biological Systems has acquired the Argentine company Nitrasoil. In addition to the physical expansion within South America, the purchase takes the company into a new sector in the agricultural market: inoculants. The company estimates the inoculants market for large-scale farmers in the Southern Cone reaches 120 million doses per year, and it expects to obtain a 10 percent share of the market within five years.

Certis Europe B.V. and the German company Progema GmbH have entered into an exclusive cooperation agreement for the development and distribution of Neudosan, covering the European Union. The product is a fatty acid-based potassium salt with insecticidal and acaricidal activity. Neudosan is already EU-approved and currently sold in Germany on both greenhouse and open-field crops, as well as on organic crops. Registrations in other EU countries are anticipated via Mutual Recognition procedures according to EU Regulation No. 1107/2009.

NewLeaf Symbiotics and Joyn Bio entered into a long-term partnership valued at up to $75M to bring a new class of microbes they say will benefit crop health and protection. Through this deal, Joyn will gain

access to NewLeaf's extensive library of proprietary, highly-characterized strains of plant colonizing microbes. Joyn will engineer these microbes to bring innovative disease and pest control options to farmers. It is expected the collaboration will reduce the time to market for Joyn's nitrogen-fixing microbe by two to three years and will support the company's expansion into crop protection. Joyn will have an exclusive license to leverage select NewLeaf microbes for developing solutions that deliver a range of important benefits to plants, including nitrogen-fixation and crop protection capabilities. NewLeaf will receive an upfront payment and payments for achieved milestones throughout the agreement term.

AgBiome Innovations Inc. and Sumitomo Corporation announced a joint development, registration and commercialization agreement for AgBiome's broad spectrum biofungicide Howler in the crop and non-crop agriculture markets in Mexico. The development and commercialization activities for Howler will be done by Summit Agro Mexico S.A. de C.V., a subsidiary of Sumitomo Corporation. Summit Agro Mexico S.A. de C.V. will have certain rights to distribute Howler Fungicide for crop protection applications in Mexico.

Farmers Exchange Fertilizer, Inc., a retail agronomy company in Farmersville, Illinois (USA), was acquired by the BRANDT organization. The combined company has 26 retail locations throughout central Illinois, serving over one million acres of production farmland. Farmers Exchange will be integrated into BRANDT's retail agronomy division, under the leadership of chief operating officer and executive vice-president Tim McArdle. Larry Lucas, owner of Farmers Exchange, will remain with BRANDT as a consultant, providing strategic operations management and key account leadership.

Andermatt Biocontrol announced acquisition of a 22 percent stake in Agricheck SRL (Argentina). Agricheck is a leading provider of biological solutions mainly in fruit production in Argentina. Since 2007, Agricheck has distributed MADEX, the *Cydia pomonella* granulovirus manufactured by Andermatt Biocontrol. Andermatt Biocontrol has invested over the last decade in a worldwide distribution network, and in broadening its international product portfolio based on various microorganisms and basic substances.

SePRO Corporation and Isagro S.p.A., announced an agreement under which SePRO will market the Isagro *Trichoderma*-based biofungicide Bio-Tam 2.0 to agricultural crop markets across the United States. Bio-Tam 2.0, is labeled for the control of soil diseases including *Fusarium* spp., *Phytophthora* spp., *Pythium* spp., *Rhizoctonia* spp., *Sclerotinia* spp., *Sclerotium rolfsii, Thielaviopsis basicola,* and *Verticillium* spp., as well as *Armillaria* spp. and *Rosellinia* spp. Bio-Tam 2.0 is currently labeled for use on numerous row crops, vegetables including brassicas, cucurbits, fruiting and leafy vegetables, and a host of berry and tree crops. This is SePRO's first entry into specialty agriculture markets.

Corteva, Inc. and Evogene Ltd. announced that Corteva will make an investment in Lavie Bio, Evogene's agriculture biologicals subsidiary. The transaction includes the exchange of all shares of Corteva's wholly-owned subsidiary Taxon Biosciences along with an equity investment by Corteva in Lavie. As consideration for the Taxon Biosciences shares and equity investment, Corteva will be issued approximately 30 percent of Lavie's equity while Evogene will retain the remaining 70 percent. Taxon Biosciences' assets, including a large microbial collection and product candidate pipeline, will be integrated into Lavie's pipeline, accelerating Lavie's "biology driven design" approach and its product development. Corteva's investment in Lavie will also provide to Corteva certain rights with respect to Lavie's corn and soy pipelines, allowing Lavie to benefit from Corteva's corn and soybean market access.

Phibro Animal Health Corporation has acquired the business and assets of Osprey Biotechnics, Inc., a privately held developer and marketer of microbial products. Acquiring the Osprey business strengthens Phibro's portfolio of nutritional specialty products and provides new opportunities in a fast-growing sector of the animal health industry. Osprey manufacturers and markets numerous products for a variety of applications and industries. Osprey also produces the key components for Phibro's recently launched Provia Prime direct fed microbial product for poultry. Osprey's leadership of Lauren Danielson and Vince Scuilla will remain with the business. Phibro expects the transaction to be accretive to adjusted EBITDA and adjusted diluted EPS for the fiscal year ending June 30, 2020. Phibro funded the acquisition through its existing credit facilities.

Marrone Bio Innovations Inc. announced that it has entered into a definitive purchase agreement to acquire Pro Farm Technologies OY, for an agreed enterprise value of $31.8 million, including a combination of $6.2 million cash and 12.7 million shares of Marrone Bio with an additional $7.5 million of shares based on achievement of milestones. Pro Farm, based in Finland, expands Marrone Bio's international presence with a portfolio of products with a new mode of action to stimulate plant growth and improve plant health, resulting in improved yields and crop quality. The Pro Farm products are based on lignosulfonate derived from pulp and paper industry streams which enhance plant vigor and health when used as seed treatments or applied foliarly in major row and specialty crops. Pro Farm has distribution agreements in most of the major global agricultural production areas, with particular strength in Europe and the Commonwealth of Independent States (CIS), and expansion under way in Latin America, North America, Africa and Asia. Marrone Bio intends to retain Pro Farm's key employees, and Pro Farm's partial ownership of its manufacturing facility will transfer with the acquisition.

Company News

MustGrow Biologics Corp. is working with Canada's National Research Council (NRC) on a biopesticide R&D program conducting a series of efficacy assessments of MustGrow's patented natural biopesticide as a natural pre-plant, pre-pot soil treatment for soil-borne pests and diseases, including but not limited to *Botrytis* (gray mold, bud rot), and *Fusarium* and *Rhizoctonia* (root rot), that affect cannabis production. MustGrow intends to seek Health Canada approval of its natural biopesticide for eventual use by Canada's licensed cannabis producers.

FMC submitted two new biopesticide strains to the EPA for use as seed treatment, in-furrow and

transplant application to target diseases such as sudden death syndrome in soybeans, and *Fusarium*, *Rhizoctonia* and *Phytophthora* in a variety of crops. FMC hopes these biopesticides will receive EPA approval in late 2020. Included with these submissions were petitions to establish exemptions from the requirement of tolerances.

NewLeaf Symbiotics announced the launch of a new corn product, Terrasym 408. The fourth product in NewLeaf's Terrasym portfolio, Terrasym 408 improves early stage root development and has shown increased nutrient uptake, improves corn stands and increases corn height. Independent research organizations and universities have conducted Terrasym 408 trials demonstrating an average yield benefit of 8.8 bushels per acre and a win rate vs. control of 78 percent. The results translate to a farmer ROI of $30.00+ per acre.

MustGrow Biologics Corp. intends to seek approvals for a potential bionematicide as an for use by tobacco growers. MustGrow and *Virginia Tech's* Southern Piedmont Agricultural Research and Extension Center in Blackstone, Virginia, conducted trials of MustGrow's patented granular organic biopesticide as a natural pre-plant soil treatment. The R&D program targeted tobacco cyst nematodes. Field trials compared nematode reproduction on, and growth and productivity of, flue-cured tobacco in soil treated with MustGrow's formulated mustard meal to that treated with standard nematicides. After the final harvest, the highest nematode egg densities were found in plots fumigated with Pic+ (chloropicrin + a surfactant) with significantly lower nematode egg densities for plots treated with all rates of MustGrow's natural granular mustard product above 500 lb/acre rate. MustGrow is developing a more concentrated liquid formulation, potentially allowing for considerably lower use rates.

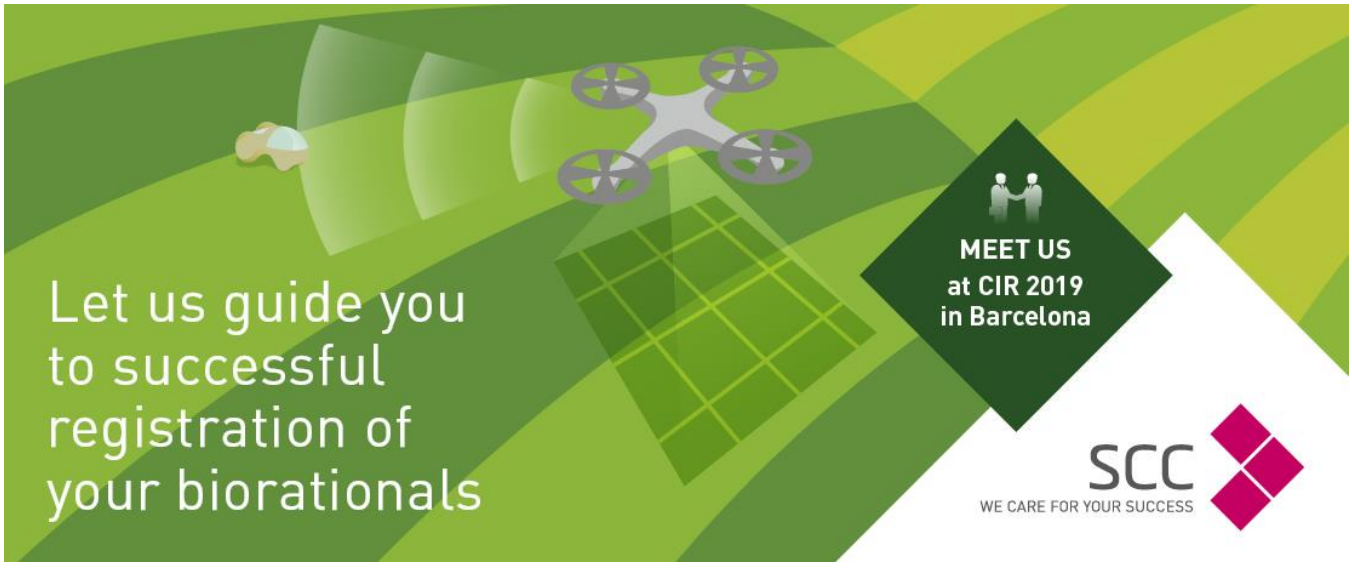
UAV-IQ is offering aerial biocontrol, a new integrated pest management (IPM) service that uses drones to release beneficial biological control agents bred by Koppert Biological Systems. According to UAV-IQ, drone-based aerial biocontrol offers a new way for conventional and organic growers to combat pests, reduce the environmental impact of pesticide usage and address a growing labour crunch. In addition, drone-based application of biocontrol offers a more efficient distribution than traditional application techniques.

Grupo Agrotecnología has opened a new subsidiary in Colombia, part of its international expansion strategy, reinforcing and strengthening its presence in this Central and South America where it has other operations in Brazil, Mexico, Chile and Peru. In coming years, the company plans to open new international markets in the United States, Argentina, Poland, Germany and Italy.

Joyn Bio has joined the International Phytobiomes Alliance as a sponsoring partner. The Phytobiomes Alliance, an international nonprofit consortium of academic institutions, private companies and government agencies, facilitates and coordinates international efforts toward expanding phytobiomes research. Joyn Bio, a joint venture between Ginkgo Bioworks and Leaps by Bayer, uses synthetic biology techniques to address sustainability challenges in agriculture.

Evogene Ltd. announced financial results for the first half 2019 with gross profit of approximately US$0.4 million in comparison to approximately US$0.2 million for the first half of 2018. Net cash usage during the first half 2019 was US$8.7 million. As of June 30, 2019, Evogene had approximately $46 million in cash, short-term bank deposits and marketable securities. R&D expenses for the first half of 2019 remained stable at approximately $7 million in comparison to the first half of 2018. Operating loss for the first half of 2019 was approximately $9.4 million in comparison to approximately $9.6 million in the first half of 2018. Net financing income for the first half of 2019 was approximately $1.5 million in comparison to net financing expenses of approximately $0.5 million in the first half of 2018. Net loss for the first half of 2019 decreased to approximately to $7.9 million in comparison to a loss of $10.1 million during first half of 2018. Key developments in the period included announcement of positive trial results in spring wheat biostimulant trials by Lavie Bio and completion of Evogene's transition to its new corporate structure.

Marrone Bio announced 2Q2019 revenue of US$7.0 million, a 22% increase over the same



period a year ago. Gross profit also increased by 40% as well. The company attributed revenue growth to increased foliar applications of Venerate, Grandevo, and Regalia in a range of specialty markets for tree fruits & nuts, annual fruits & vegetables and vines. Gross margin on sales increased to 54.4% versus 47.3% a year ago. Operating expenses for the quarter were US$10.2 million, resulting in a net loss for the quarter of US$6.8 million. Key operational highlights noted were recent collaborations announced with Compass Minerals and Valagro. In addition, Marrone Bio also announced it has established a US$36.6 million financing facility which will be used on an as needed basis. An initial US$10 million draw of these funds will be used in the Pro Farm Technologies acquisition as well as current operations and other near-term strategic alternatives.

❖2BMonthly Feature Article❖

Comment Period to EPA Draft Guidance on Plant Biostimulants Comes to a Close

The EPA released its "Draft Guidance for Plant Regulators, Including Plant Biostimulants" as originally reported in the April issue of ***2BMonthly.*** At the request of the industry, the comment period for this draft guidance was extended until July 28, 2019 to allow time for the development of substantive comments on this important issue.

The EPA initiated work on the Draft Guidance for Plant Regulators, Including Plant Biostimulants at the request of regional offices and state regulatory partners, which expressed confusion about labeling treatment and regulatory requirements for some biostimulant products. The stated intention of this draft guidance was that "this draft document gives guidance on which products are (and are not) subject to regulation under FIFRA as plant regulator pesticides, and what kinds of claims can be made for them."

The Biological Products Industry Association (BPIA) and Biostimulant Coalition have provided a joint response in which they both expressed an interest in the perspective of the EPA on the emerging category of biostimulant products and technologies. David Beaudreau, executive director of the U.S. Biostimulant Coalition and Keith Jones, executive director of the BPIA commented jointly: *"BPIA and the Biostimulant Coalition are pleased that EPA is working to clarify its perspective regarding the rapidly developing category of products known as biostimulants."*

They did, however, note several areas for improvement in the draft guidance in their response. They stressed the differences between plant biostimulants and plant growth regulators, which are subject to EPA oversight. They point out that plant growth regulators are intended to alter or modify the growth habit of a plant or its produce, through direct physiological action, in a way that it would not normally behave under optimal growing conditions. In contrast, plant biostimulants are neither intended nor claimed to alter or modify the natural growth habit of the plant, but rather to support optimal nutritional processes that enable the plant to realize as much of its innate genetic growth potential as possible. Further, they pointed out the draft guidance does not recognize there are products excluded from regulation under FIFRA that enhance plant growth such as germination, seedling growth, root and shoot growth, yield quality and fruit size.

Another concern of the draft guidance was it did not recognize that plant biostimulants may have more than one function depending on the timing of application, application rate or concentration, use pattern, formulation process and/or intent. The BPIA and Biostimulant Coalition observed the EPA and state regulatory bodies have a long history of regulating the same product for multiple uses. Failure to consider this would be inconsistent with EPA regulation definition of a pesticidal product and pesticidal purpose.

Importantly, the two associations observed that in its present form, the draft guidance does not adequately remove the ambiguity nor include the flexibility for application to future products. Product claims outlined in the draft guidance are highly specific and may not be applicable to future new technology and cause state regulators to interpret the claims as binding. Stakeholders in the biostimulant industry need consistent parameters so they can determine if a product will be regulated under FIFRA.

While providing comments on all the tables included in the draft guidance, the BPIA and Biostimulant Coalition specifically requested that Table 4 be removed. Table 4 includes a list of active ingredients the EPA suggested would automatically trigger regulation under FIFRA as a pesticide, regardless of label claims. The list included some ingredients that were surprising to the industry, such as humic acids, fulvic acids, L-glutamic acid and seaweed extracts, among others. The BPIA and Biostimulant Coalition noted the list was confusing and was already being interpreted by state regulators as requiring any product containing these substances to be subject to registration as a pesticide by the EPA. They also pointed out that seaweed extracts, humic and fulvic acids, and certain amino acids account for nearly 60 percent of the entire plant biostimulant market. They questioned how these entire classes of substances met the FIFRA definition of a plant growth regulator, in particular the phrase "alters the behavior of plants or the produce thereof."

David Beaudreau and Keith Jones observed: *"The biostimulant industry generally agrees that the proposed Table 4 undermines other positive aspects of the EPA's draft guidance. With the removal of Table 4 and some other edits proposed in our comments, the guidance would better elucidate the existing regulations for both the regulated community and regulators and help facilitate the growth of the biostimulant industry."*

Regulatory

Biocontrol

The Australian Pesticides and Veterinary Medicines Authority (APVMA) approved BASF's Serifel biofungicide for the control of *Botrytis cinerea* in grapes and strawberries. Serifel is a preventative fungicide based on *Bacillus amyloliquefaciens* strain

MBI600. Serifel has a favorable profile that makes it very safe for users, the environment and consumers.

On July 29, Eden Research announced that its commercial partner, Sumi Agro France, received a 120-day "emergency use" authorization for Eden's fungicide, Mevalone, from the French authorities for the treatment of storage diseases on apples. This 120-day approval represents the first authorization for the use of Mevalone on apples and for the treatment of post-harvest storage diseases.

BioWorks has launched a new formulation of its RootShield *PLUS*$^+$ biological fungicide. The company says the new formulation mixes more readily with little to no dust. The new RootShield *PLUS*$^+$ has the same efficacy as the previous formulation BioWorks has produced since 2012. The new formulation is a greener color due to a change in the inert ingredients and has a lower bulk density.

Certis USA has released AgriPhage Citrus Canker to combat bacterial diseases and antibiotic resistance in citrus. Growers can apply AgriPhage Citrus Canker either as a preventative to protect growing leaf tissue or when conditions are conducive to heavy disease pressure or as a curative when disease symptoms are first visible. Approved for use in organic production, AgriPhage Citrus Canker can be applied up to and including the day of harvest with weekly applications as needed. Applied with conventional equipment as a foliar application, it can also be tank-mixed with several commonly used fungicides, liquid fertilizers, herbicides and insecticides.

Biostimulants

Olmix-Micromix biostimulant products C-Weed 50 and C-Weed AAA have achieved certification from the Organic Farmers and Growers. Both products contain a concentrated extract of the seaweed *Ascophyllum nodosum*, which help to alleviate stress and stimulate growth in land plants. C-Weed AAA also has additional plant-based amino acids, which are essential for cell growth. Both products can be used in a tank mix throughout the season with micronutrients or other organic treatments to support the plant at different growth stages, from establishment to flowering.

Executives Speak

Dr. Pedro Coelho, Co-founder and CEO, Provivi

Provivi is unique in being the only biocontrol company that can claim a Nobel Prize winner as one of its founders. What is the story of the founding of Provivi?
I had the privilege and fortune of working at Frances Arnold's lab at Caltech as a graduate student. Frances is an inspiration not only as a scientist and engineer but also as a serial entrepreneur – Provivi is her fourth company. Frances introduced me to her former student, Dr. Peter Meinhold, and the three of us teamed up to start Provivi in 2013.

Pheromones have achieved success, particularly as mating disruption tools, in high value crops. Your objective is to extend their use to row crops. What are the major hurdles you need to overcome to succeed in this endeavor?
We asked this question to farmers, academics and industrial scientists when we first started working with pheromones. The two answers we consistently heard were: (1) cost of goods is too high and (2) lack of an easy to use formulation that can be readily integrated into existing practices – think about the mega farms in Brazil. Therefore, we have been systematically investing in cutting edge methods of producing pheromone active ingredients and next generation formulations, particularly those that can be applied as a liquid spray using existing farm equipment.

Provivi has announced it has an aggressive pipeline of products with 13 product launches planned in the next five years. What are the key geographies you are targeting with these launches?
Latin America, Europe, Africa and Asia.

In addition to cost of production, the application of pheromones in row crops has been a main barrier. Dispensers cannot be adapted easily in most broad acre crops. How have you overcome the challenge of developing a sprayable formulation technology for pheromones?
It all starts with people. We decided to recruit the best

formulation scientists that we could find and have continued to expand that team. We see formulation chemistry as a central science in our industry – it is the bridge between synthesis and field efficacy.

You received you first EPA registration in April 2018 for a fall armyworm (*Spodoptera frugiperda*) dispenser product. With the spread of fall armyworm to Africa and parts of Asia, will Provivi look to launch in these markets in the near future?
Yes, of course. We initiated our first trials in Africa this year. We are encouraged by the results we have seen in Latin America and would like to bring the product as quickly as possible to where it is most needed.

A major challenge for many start-up companies in the biocontrol space is market access, particularly for row crop markets, which are dominated by the global ag-chem companies. How does Provivi plan to succeed in the row crop markets globally?
We are testing both approaches of direct sales and B2B partnerships. As a start-up, we see a lot of upside in partnering with the major crop protection companies since we are able to expand our reach by leveraging their resources and expertise. In both models, we are stressing the importance of integrating the product solution as part of a more holistic pest control service.

Provivi announced an expansion to your Series B financing to a total of US$36.5 million in late 2018. How will you use these funds to advance your program in 2019 and beyond?
We focused our use of proceeds on three key areas: field trials, production scale-up, and sales and marketing launch preparation. We have substantially increased the number of trials we are running across our key target markets in LatAm, Asia and Africa. We are taking the care to carefully understand the value created by our products to the growers prior to the launch.

Pheromones have benefits from a friendly regulatory treatment. Despite this, is there any aspect of the approval process that presents a substantial challenge?
Lack of harmonized requirements across different countries. While most countries provide some form of regulatory relief for pheromones, different countries require different data packages and different underlying tests. This slows down our ability to bring the products to multiple geographies.

Mr. Giuseppe Natale, CEO, Valagro

Let's begin with regulation before moving on to hear more about Valagro. As a former president of EBIC, you must have been pleased to see the new fertilizer regulation being passed by the EU parliament in March 2019, beginning the process for the incorporation of biostimulants. What was your reaction and what are the next challenges?
The European Parliament and subsequent council approvals of the new EU fertilizing products regulation means that the intensive work of all the relevant stakeholders from the EU bodies, national authorities and the industry federations has finally come to an important positive conclusion. This is a tribute to the work of many people. The new regulation will introduce an EU-wide regulation for all the fertilizing products, previously not harmonized. This in itself is innovative and creates a European market. A particular satisfaction is the formal recognition of plant biostimulants as an important tool for agriculture. This will create a European market for plant biostimulants and will help EU farmers meet the challenges of the future. Furthermore, the rest of the world, particularly the USA and India, are monitoring the new developments in Europe, and they are also moving to create a plant biostimulant market in their countries. All the stakeholders, including EBIC, played a part in this achievement. The Fertilising Products Regulation (FPR) (EU) 2019/1009 has been published on 25th June in the European Official Journal and will enter into force on 15 July 2019. Now our attention has already turned to the implementation of this new regulation: there is a lot of technical work to be done (e.g. standards and guidelines), and to how the new regulation can be further improved. Our work never stops!

Looking back to last year, what were the key highlights of Valagro's financial performance in 2018? How has the revenue breakdown (%) by region changed in the last couple of years? [From Valagro's previous interview with 2BMonthly, 90 percent of turnover was generated from EMEA and the Americas, nine percent in Asia-Pacific].
In 2018, Valagro generated €141.6 M revenue. Today, Valagro is a global company with a presence in more than 80 countries. Almost 90 percent of its turnover is generated from the Americas and EMEA region, while 13 percent is generated in Asia-Pacific – that it is a huge opportunity for our future growth.

In January 2019, Valagro signed an agreement with Malagrow, which is now the exclusive distributor of Valagro in Romania and Slovakia. What are the key market sectors or crops in these countries that can benefit from Valagro's product range? Could you please comment on other Eastern European countries where you see expected growth for biologicals.
Looking at Romania, there are different areas, with many small (0.1-0.2 ha) growers in horticulture and big farms with "special" backgrounds in Industrial crops. Overall, in this market the knowledge about the plant biostimulants benefits is rising thanks to the presence of Italian, Spanish, Bulgarian and also local companies. Thanks to this growing awareness, it will be easier for us to increase the knowledge and interest into our offer for crop solutions, especially in key markets such as row and industrial crops. This trend is generating the need from growers to learn more about innovative and effective solutions as biobased products such as biostimulants: they miss technical information that is fundamental to properly apply these solutions, and for this reason, it becomes a strategical point to have a professional sales team. In this regard, Malagrow is the right partner which fully embraces the group's approach, namely to satisfy the need of farmers to have more abundant, better quality and more profitable crops, which are obtained in a more sustainable way.

Valagro has also been in acquisitive mode, with Grabi Chemical in July 2018. Grabi's product portfolio includes chelated microelements. How does this acquisition fit into Valagro's long-term strategy?
The acquisition of Grabi Chemical aims to greatly enhance supply in the group's industrial sales sector. We have to consider that Grabi Chemical is a leading manufacturer of chelated microelements (EDDHA, EDDHSA, DTPA, EDTA,

LS), complexes and other nutritional specialties, which operates in the business-to-business field; its range of nutritional solutions is aimed at companies and multinationals in the agricultural and agro-chemical international market, through its sales network in over 40 countries. Thus this acquisition played a key role in reinforcing our corporate positioning as a leading player in ag-nutrition and biologicals by integrating and delivering advanced products and value-added tech-based services to farmers globally. This partnership was made possible by the sharing of not only market objectives but above all essential values, such as the passion for innovation and putting the customer first, values that have fueled mutual trust and success in the market over time. This is why the acquisition of Grabi Chemical really takes on crucial value: it is a partner with which we share a common growth path outlined by Valagro's long-term strategy.

In terms of production facilities, Valagro inaugurated a site in Sao Paulo, Brazil in April 2017. In May of last year, Valagro announced the construction of a new plant in South Carolina, USA. Is the plant complete and could you describe what will be produced there?
We are working hard for entering in the operational phase for the construction of a new plant located in the USA. The production facility in Orangeburg County largely supports our efforts to better serve some of the most important strategic markets such as USA, Canada and Mexico. This means completely implementing the principle of customer centrality pursued by Valagro: the plant will allow us to improve our ability to meet customer needs by providing them with a wide range of sustainable and effective nutritional solutions. Furthermore, the new American plant is a fundamental part of Valagro's global production strategy and, more broadly, is further evidence of the company's continued and solid global growth. This is in line with our long-term strategy driven by the desire to affirm the key role of Valagro in the global agricultural market.

And moving to India, Valagro acquired in 2015 Sri Biotech, which now has offices in Hyderabad and is called Valagro BioSciences. The intention was to introduce some of Valagro's biostimulant products to the market. Viva, Kendal Nem and Megafol were mentioned – have more been added? Have there been any synergies on the other side for taking products out of India?
In 2018, the company name has been changed to Valagro BioSciences. Drivers of this acquisition was to acquire the fermentation technology, develop the Valagro production hub for the Asia Pacific region and enter more significantly into the domestic market with Valagro solutions. Initially, we have introduced some Valagro biostimulants aimed to improve yield and quality of crop production. We have also introduced our high-efficient lines of micronutrients (Brexil's) and water-soluble fertilizers (Master and Plantafol). More recently, in 2019 we have also introduced for the Indian market a new line of biofertilizers, biostimulants and two biocontrol solutions based on microbials. Valagro is developing new solutions in India where we have our R&D team and our microbial hub. Solutions which will be developed and produced in India adhering to the India government campaign "Make in India". These innovative solutions would be taken out of India in the next few years. We are thinking first of all on biofertilizers for the European and Americas markets.

Regarding China, you opened your subsidiary in 2016. What changes have you seen over the previous years in this market?
I think that the most important trend is the raising of a greater awareness about the next challenges, which need to be faced by agriculture in China. Among these, the possibility to combine productivity with efficiency, which is the main feature of biostimulants: this means enhancing farming efficiency while minimizing environmental impact and thus ensuring higher yield and higher quality to farmers. This means higher profitability to them but obtained in a sustainable way: this is the true challenge. In this framework, the Ministry of Agriculture in China announced that by 2020 China must have zero growth in the use of chemical fertilizers. Organic fertilizer should be scientifically matched and more attention should be paid to quality. Increase in quality and efficiency is the mission of fertilizer development in the future.

We understand you went to Beijing in July for the Valagro for Future Farming project. Could you briefly describe this series of events and what you would like them to achieve?
The 2019 event in Beijing – Steering the Chinese Agriculture Efficiency – marks the 1st edition of the global project Valagro for Future Farming in China; the 2019 edition took place also in Delhi (22 February) and Brazil with a tour which stopped in some key regions for the row crop sector, such as Goiás (21 March), Passo Fundo (21 May) and Guarapuava (23 May) in the framework of the Valagro for Future Farming on Tour. The event in Delhi was very important, and successful too: this was organized in Delhi together with Valagro BioSciences and hosted the launch of Valagro's new line of microbial-based solutions. It represented a concrete step forward towards realizing Valagro's long-term global strategy, which is to take a leading role in the biologicals sector for the agriculture of the future, an agriculture that is truly more productive, more efficient and more sustainable. Overall, thanks to this global project, started in 2018 with events in France, India and Brazil, the company intends to promote and strengthen its commitment to the main reference markets to shape the agriculture of tomorrow by developing and supplying increasingly innovative and sustainable solutions and technologies.

Scientific Findings

Researchers at Boyce Thompson Institute have found that compounds from microscopic soil roundworms could protect crops from pests and pathogens. As described in the May 2019 issue of *Journal of Phytopathology*, researchers investigated the effects of a roundworm metabolite called ascr#18 on plant health. Ascr#18 is a member of the ascaroside family of pheromones, which are produced by many soil-dwelling species of roundworms for chemical communication. The researchers treated soybean (*Glycine max*), rice (*Oryza sativa*), wheat (*Triticum aestivum*) and maize (*Zea mays*) plants with extremely small amounts of ascr#18, and then infected the plants with a virus, bacteria, fungus or oocmycete. When examined several days later, the ascr#18-treated plants were significantly more resistant to the pathogens compared with untreated plants. Interestingly, the optimal concentration appears to be dependent on the plant species and not the pathogen. These discoveries are being commercialized by a BTI and Cornell University-based startup company, Ascribe

Bioscience, as a family of crop protection products named Phytalix.

A recent USDA Agricultural Research Service (ARS) study, published in *The Journal of Invertebrate Pathology*, shows that beneficial nematodes (also called entomopathogenic nematodes) treated with pheromone extracts are more effective at killing an economically important insect – the pecan weevil – as well as the black soldier fly. The pecan weevil is a major pecan pest which if left uncontrolled, can reduce crop production up to 70 percent. In earlier research, David Shapiro-Ilan, an entomologist at the ARS Southeastern Fruit and Tree Nut Research Laboratory discovered that pheromones produced by beneficial nematodes direct their behavior – telling them to disperse or infect insects. Using this knowledge, he sought ways to use pheromones to enhance nematodes' behavior to kill more insect pests. Under a cooperative research agreement with Pheronym, an ag-biotech pest control company that develops and produces nematode pheromones ARS researchers tested the efficacy of Pheronym's beneficial nematodes exposed to pheromone extracts. The research showed that pheromone induced nematodes were 28 to 78 percent more effective in controlling pecan weevils and black soldier flies in greenhouse soil than non-exposed nematodes. In addition, a higher number of pheromone-treated nematodes invaded insect larvae compared to the non-treated nematodes.

Agriculture and Agri-Food Canada scientists are investigating naturally occurring bacteria for their potential use as biopesticides against the potato pathogen *Phytophthora infestans*. Researches undertook a three-year project to screen potential bacterial biopesticide organisms. Several naturally occurring bacterial strains isolated from Canadian soils were discovered and showed great promise in controlling the late blight disease (>90% control) on potato under laboratory and greenhouse conditions. The team selected the top six candidates for further screening with *Pseudomonas* sp. strain 189, an organism that produces a suite of a family of chemical compounds that contribute to its biopesticide control, emerging as the top candidate. The project team is now focused on strategies for scale-up and the commercialization of the biopesticide.

A team of scientists led by the U.S. Department of Energy's Oak Ridge National Laboratory have discovered the specific gene that controls an important symbiotic relationship between plants and soil fungi, and successfully facilitated the symbiosis in a plant that typically resists it. The discovery could lead to the development of bioenergy and food crops that can withstand harsh growing conditions, resist pathogens and pests, require less chemical fertilizer and produce larger and more plentiful plants per acre. The discovery came after 10 years of research exploring ways to produce better bioenergy feedstock crops such as *Populus*, or the poplar tree and the symbiosis formed by certain species of *Populus* and the fungus *Laccaria bicolor (L. bicolor)*. Researchedrs identified a particular receptor protein, PtLecRLK1 and created an engineered version of *Arabidopsis* that expresses the PtLecRLK1 protein, and then inoculated the plants with the fungus. The fungus *L. bicolor* completely enveloped the plant's root tips, forming a fungal sheath indicative of symbiote formation. Researchers believe they can make other biofuel or food crops also interact with fungus and confer similar benefits.

Tomato yellow leaf curl disease (TYLCD) caused by tomato yellow leaf curl virus-like viruses is among the most destructive disease of tomato. To combat this disease, many farmers opt for intensive application of insecticides or plant TYLCD-resistant tomato varieties, but these hybrid varieties often lack other beneficial qualities. A team of scientists at the Spanish Council of Scientific Research (IHSM UMA-CSIC) identified two environmentally friendly control alternatives to insecticides. First, they discovered that protecting tomato crops with UV-blocking plastics led to reduced TYLCD damage. Secondly, they found that the application of a salicylic acid analogue strengthened tomato plant defenses amd reduced TYLCD-associated losses. For the most effective results, the team recommends that farmers combine both control practices.

Personnel

Adam Burnhams has joined AgBiome as Vice President of Market and Customer Strategy. In this role, Burnhams will be focused on AgBiome Innovations' customer and branding strategy. He joins AgBiome Innovations from Sipcam Agro USA, where he spent 10 years serving in senior commercial roles, most recently as vice president of marketing and sales. Prior to Sipcam Agro, Burnhams held various commercial and technical roles with BASF Agricultural Products and American Cyanamid in the USA, Germany and the UK.

Job Vacancies

Marrone Bio Innovations, a leading provider of bio-based pest management and plant health products is seeking to fill multiple open positions including:
Senior Research Scientist – Chemistry
Group Leader – Bioprocess Technologies
Principal Scientist – Formulation Chemist
To learn more about these positions and apply, visit hiips://marronebioinnovations.com/company/careers/ for a full job description. MBI is an equal-opportunity employer.

Bioline Agrosciences specializes in the production and marketing of biological control agents, and in particular macro-organisms active against insect pest in fruits, vegetables and flower crops. We're looking to recruit **ambitious horticultural specialists with a passion for advising, supporting and developing new customer relations as Technical sales Specialist North Europe (Benelux – Germany) and as Technical sales specialists for Florida, Virginia, North Caroline, South Carolina, Texas, in the United States..** Please send applications to Cora Perez (cperez@biolineagrosciences.fr) and Carolyn Grinsted (CGrinsted@biolineagrosciences.com).

Upcoming Events

The Biocontrol LATAM 2019 will take place 28-30 August in Campinas, São Paulo State, Brazil. More than 25 speakers from 12 countries including leading researchers, company executives, and government officials have been confirmed for the Technical Agenda at this International conference. Visit hiips://lifesciences.knect365.com/biocontrollatam/ to register to attend this event today! THE LARGEST INTERNATIONAL EVENT COVERING BIOCONTROL IN LATIN AMERICA. After the successful Biocontrol LATAM 2016 in Brazil and 2018 in Colombia, the industry is gathering back to Brazil in 2019. REGISTER NOW! (Please use this link: hiips://www.newaginternational.com/index.php/en/conferences/our-conferences/1711-biocontrol-latam-2019-brazil-conf#register-online)

TOPICS TO BE COVERED BY TOP LATAM AND INTERNATIONAL SPEAKERS:

- Global Biocontrol Market – current status and future direction
- Regional Biocontrol Market in LATAM – the most dynamic sector of global biocontrol market, trends and opportunities
- New and emerging technologies in microbials, natural extracts and semiochemicals
- Integrating biocontrol solutions and chemicals in successful IPM programs
- Synergistic uses of biocontrol and biostimulant technologies
- Precision Ag impact and integration with biocontrol
- Biocontrol successes – case studies of adoption by grower and distributors
- Novel approaches to production and formulation of biologicals
- Emerging trends and developments in LATAM Regulatory for biocontrol

The Crop Innovations and Regulations Conference will take place 10 - 12 September 2019 at the Crowne Plaza Barcelona -Fira Center, Barcelona, Spain.

STRENGTHEN YOUR CROP PROTECTION TOOL BOX THROUGH DEVELOPMENT, FORMULATION, AND REGULATION INSIGHTS
Jump into the world of Synthetic and Biocontrol Crop Protection with updates from the European Commission, Member States, EFSA and leading Industry Case Studies. hiips://lifesciences.knect3 65.com/cir/

The Biocontrol Asia 2019 will take place 23-25 September 2019 in Sichuan Province, Chengdu, China. The event will be co-located with the New Ag International China Conference and Exhibition. Some of the topics covered will include the regional biocontrol market and industry trends in Asia, the regulatory environment and issues for biocontrol products in Asia, biopesticide product production and formulation, new biocontrol technologies and many more.
New Ag International, 2BMonthly and IBMA join forces once again to host the Largest International Event covering BIOCONTROL in ASIA. The last edition took place in Bangkok in June 2017. Over 200 delegates from the whole Asia-Pacific region gathered to discuss the advancements of the biopesticides industry in the region.

REGISTER NOW! (Please use this link: hiips://www.newaginternational.com/index.php/en/conferences/our-conferences/1770-biocontrol-asia-2019-china-conf-en#register-online)

TOPICS to be covered by top INTERNATIONAL SPEAKERS:

- Global Biocontrol Market
- Regional Biocontrol Market in Asia
- Industry trends in Asia
- Biocontrol Regulatory in China and other Asian countries
- How IPM is helping adoption of Biocontrol
- Biocontrol as a business – adoption by growers and distributors
- Biologicals Production and Formulation
- Emerging technologies in microbials, natural extracts and semiochemicals
- Synergistic uses of biocontrol and biostimulants

ABIM 2019 will take place 21-23 October 2019 in Basel, Switzerland at the Congress Center. JOIN

MORE THAN 1000 DELEGATES TO SHAPE THE FUTURE OF A BOOMING AND INNOVATIVE INDUSTRY.
hiips://www.abim.ch/home.html

The 4th Biostimulants World Congress will be held at the Palau de Congressos de Catalunya in Barcelona (Spain) on 18-21 November 2019. Dr. Patrick du Jardin, Professor, Gembloux Agro-Bio Tech, University of Liege, and chairman of the scientific committee for the conference, says biostimulant use has grown dramatically based on the value they provide to growers. Topics on the agenda include new avenues on development and new substances being used as biostimulants as well as regulatory challenges, taking advantage of participation from regulators, scientists, agronomists and producers. Interested companies should contact Jacqui French, sales manager as soon as possible for information at biostimulants@newaginternational.com, as demand will be very high for the world-leading event on biostimulants, where more than 1,200 attendees are expected.
hiips://lifesciences.knect365.com/4th -biostimulants-world-congress/

REGISTER NOW! (Please use this link: hiips://www.newaginternational.com/index.php/en/conferences/our-conferences/1808-the-4th-biostimulants-world-congress-conf-en#register-online)

ABOUT THE CONGRESS
The Congress has established over the years as the world leading event in this field. It is an international scientific and technical gathering to review the latest knowledge on agricultural biostimulants, which are increasingly used in crop production around the world.
Conference papers contributed to the understanding of the role and use of biostimulants in agriculture, including:

- The use of biostimulants to improve yield and abiotic stress tolerance
- The use of biostimulants to improve plant nutrition, development and quality
- Mechanisms of biostimulation and structure function relationships
- Developing new biostimulants: new targets, sources and screening tools.
- Best practices, market trends and legislation.

Keynote speakers include:

- **Dr. Davide Bulgarelli**, Principal Investigator at the Division of Plant Sciences at University of Dundee, UK; Topic: Plants - microbiota interactions at the root - soil interface as drivers of mineral dynamics in soil
- **Prof. Xavier Draye**, Professor at the Faculty of Bioengineering at UCLouvain, Belgium; Topic: Root phenotyping and root ideotypes
- **Dr. Maximino Manzanera**, Researcher to the Water Institute at University of Granada, Spain; Topic: Drought stress response of plants and PGPRs
- **Prof. Dr. Nicolaus von Wirén**, Professor at Dept. Physiology & Cell Biology at Leibniz-Institute of Plant Genetics & Crop Plant Research, Germany; Topic: Ammonium nutrition and signaling.

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