

November 2020



MONTHLY

The Global Biocontrol & Biostimulants E-Newsletter

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

Welcome to November 2BMonthly

Greetings, and welcome to the November 2020 issue of 2BMonthly.

As predicted here in our September issue, M&A and strategic partnership activity in the biological space continues to trend upward. A total of eight such agreements are highlighted this month, including activity among such industry stalwarts as Seipasa, Rovensa, Plant Health Care, Valent BioSciences, Wilbur-Ellis, and ADAMA. DunhamTrimmer also reports that the number of requests for market intelligence data in the biocontrol/biostimulant sector is the highest in its 10-year history.

In our November Executives Speak, we're excited to bring you an exclusive, in-depth interview with representatives from Syngenta and Valagro surrounding this major acquisition and their combined vision for the future for the biostimulant industry, as well as insights on drone applications of biocontrols and fertilizers in Latin America from Nicole Engels at VOA.

Finally, we encourage you to check out our insider's coverage from ABIM 2020, the first-ever virtual adaptation of this premier industry event held annually in Basel. Our on-the-ground editorial team from New Ag International recaps all of the major sessions and issues presented to a virtual audience reported to have exceeded 500 attendees.

As always, please don't hesitate to reach out to us with feedback, suggestions, and all of your company news. A mention in 2BMonthly ensures the best visibility in the biocontrol and biostimulant segment.

~2BMonthly Editorial Team

Trending Now

Valent BioSciences LLC and SATT Paris-Saclay have signed a joint agreement to develop sustainable biopesticide technologies for agricultural applications.

Read more on page 2.

Rovensa is acquiring Oro Agri, a provider of environmentally friendly biocontrol solutions, from the Omnia Group.

Read more on page 2.

Spain Oman Private Equity Fund (SOPEF), the investment fund managed by MCH Private Equity, has completed its fourth transaction through the investment in Symborg.

Read more on page 4.

AMVAC announced that Vintec, a biological fungicide, is now registered in the US by the Environmental Protection Agency.

Read more on page 6.

The 15th Annual Biocontrol Industry Meeting (ABIM) was conducted in virtual style.

Read more on page 7.

The world's largest kelp farm is being built off the coast of Namibia with an investment of USD\$60 million.

Read more on page 12.

CABI scientists have led new research on a natural enemy of the prolific Asian fruit fly, *Drosophila suzukii*.

Read more on page 12.



Executives Speak:

Syngenta Group made big news in October by acquiring Valagro, a clear market leader in the Biostimulant space. This month, 2BMonthly caught up with Syngenta Crop Protection and Valagro leadership to explore the implications of this acquisition both from a corporate and industry perspective.

Read more on pages 8-10.

Nicole Engels, Head of Growth, VOA

Read more on pages 10-11.

Mergers, Acquisitions and Partnerships

Plant Health Care and Wilbur-Ellis Agribusiness have entered into a joint-development agreement for the development of products selected from Plant Health Care's PREtec peptide portfolio. Plant Health Care's plant response elicitor (PREtec) peptides represent a novel class of technology that stimulate the plant to defend itself. Derived from natural proteins, PREtec is an environmentally friendly approach to protecting crops and increasing yields and is compatible with mainstream agricultural practice. Wilbur-Ellis has been working with PREtec over the last growing season to understand how the technology works and where to best position it in the market. The first launch is expected as early as the end of 2022, subject to regulatory approvals.

ADAMA Ltd. has acquired a majority stake in its key crop protection distributor in Paraguay, FNV S.A. Founded in 2015, FNV is a distributor of crop protection, fertilizers, seeds and biostimulants in Paraguay, the world's sixth largest producer and fourth largest exporter of soy. The acquisition will allow ADAMA to introduce its product portfolio in the country, and capture the full end-to-end value chain, from manufacturing to the end customers.

SynTech Research and Acceres have successfully met all the requirements to merge their businesses to form a global Agricultural R&D contract research organization (CRO). Consisting of Acceres (Biotek Agriculture, GAB Consulting and Promovert) and SynTech Research, the new company will be a leading global player in this sector, with over 600 laboratory, field and regulatory staff providing services in over 40 countries, in all regions. Dr Khosro Khodayari has been appointed as CEO of the new company, chairing the global executive committee, leading further integration activities and serving on the board of directors. Dr Francis Lacroze, former SGS, who has been involved with EKKIO Capital in the development of Acceres, has been appointed as chairman of the board. EKKIO Capital are the majority shareholders and will provide the additional investment required for rapid growth of the new company through acquisitions and Greenfield expansion projects. Once integration activities have been completed, the name of the new company will be formalized as SynTech Research.

The companies will now commence further integration activity, but the group is already positioned to provide complete packages of services globally, including field trials (agrochemical and seeds/traits), laboratory studies

(analytical, ecotoxicology), and regulatory services for chemicals, biopesticides and biocides.

Valent BioSciences LLC and SATT Paris-Saclay have signed a joint agreement to develop sustainable biopesticide technologies for agricultural applications. The organizations will focus on introducing emerging technologies and products that are environmentally friendly, effective, and commercially viable. SATT Paris-Saclay is working in partnership with Micalis unit (part of INRAE: France National Research Institute for Agriculture, Food, and Environment), one of the most important microbiology laboratories in the Paris region. By collaborating with leading technology companies, SATT Paris-Saclay intends to bring new innovations to the marketplace. Valent BioSciences offers deep experience, state-of-the-art manufacturing capabilities, a global distribution network, and a longstanding track record of developing innovative technologies.

Spain-based Seipasa and Agromilenio, a Colombian agricultural solutions company, have entered into an agreement for the distribution of Seipasa products in Colombia. Seipasa's Natural Technology products will be marketed in Colombia through Agromilenio's network of distributors, technicians and advisors. José Luis Egas, commercial director of Seipasa in Latin America, said the company has a wide international trajectory, with products under a process of continuous improvement. "The fact of being present in 25 countries with 44 phytosanitary registries allows us to incorporate into the products all the knowledge and experience that we are acquiring in each of the agricultural systems and scenarios in which we work." Egas added the products of the current Seipasa catalog in Colombia are registered by the Colombian Agricultural Institute (ICA) and aimed at high value-added crops such as avocado, rice, potato, coffee, banana or flowers, among others.

Rovensa is acquiring Oro Agri, a provider of environmentally friendly biocontrol solutions with international reach, from the Omnia Group. The acquisition of Oro Agri expands Rovensa's geographical footprint, particularly across the US, Asia and South Africa. Completion of the acquisition is expected to take place prior to 2020-year end and remains subject to the approval of the shareholders of Omnia Holdings Limited, as well as certain merger control and other clearances. The deal is worth US\$146.9 million. Owned by the private equity firm Partners Group, Rovensa was active earlier in the year acquiring bio-ag businesses, such as Grupo Agrotecnología in March 2020 and Agrichem Bio in February 2020. Omnia acquired the Oro Agri business in 2018 for a reported US\$100 million, bringing the brand under its Omnia Fertilizers business.

Anuvia Plant Nutrients has entered into a strategic relationship with ATP Nutrition to promote, sell and service Anuvia's SymTRX products in Canada. SymTRX is a bio-based granular fertilizer line (16-1-0-20S and 14-24-0-10S) engineered to increase nutrient availability to the plant while contributing to improved soil health. The partnership allows Anuvia to reach farmers and agricultural retailers in Canada who are looking for strong, economically viable nutrient management strategies using sustainable crop nutrition solutions.

Isagro S.p.A. announced the closing of the acquisition of Phoenix-Del S.r.l.. The value of the

transaction is €3.6 million. Isagro, an Italian company established in 1993, offers agricultural solutions at low environmental impact, with a growth project focused on copper-based products and biosolutions as part of its new business model, and capitalizing on its current product portfolio for integrated crop management. Phoenix-Del is an Italian company involved in the registration and sale of copper-based agrochemicals. Further details of the transaction were not disclosed.

Company News

BioWorks has launched its RootShield PLUS⁺ Granules biological fungicide into Canada.

The PLUS⁺ formulation contains the additional active ingredient *Trichoderma virens* strain G-41. This active broadens the disease spectrum to include *Phytophthora* and better control of hot season *Pythium* – in addition to RootShield’s prevention of *Fusarium* and *Rhizoctonia*.

Marrone Bio Innovations, Inc. released its financial results for the third quarter ended September 30, 2020.

The company’s 27 percent increase in third-quarter revenues reflected growth from its strategic expansion in international and seed treatment markets. In the US, Marrone Bio’s biological seed treatments for corn and soybeans are entering their third year in the market, delivering positive performance that supported the sales increase in the quarter. Sales in the quarter also benefitted from the introduction of a new foliar treatment to promote plant health for soybeans in Latin America. Gross profit and margins benefitted from the positive mix effect of sales into high-value markets.

Gross profit in the quarter rose 40 percent to \$5 million, with gross margins of 56.7 percent. Operating expenses in the third quarter declined 22 percent to \$10.4 million, reflecting the benefit of cost savings measures put in place earlier in the year in response to the COVID-19 pandemic, partially offset by the addition of operating expenses from the acquisition of Pro Farm. In comparison, operating expenses in the third quarter of 2019 were \$13.4 million, which included \$3.7 million in acquisition-related expenses. The operating expense ratio – a key performance indicator that compares operating expenses to revenues – declined

by 7,300 basis points to 118 percent as a result of lower expenses and higher revenues.

Net income (loss) in the third quarter improved 63 percent to a loss of \$6.1 million, and benefitted from increases in revenues and gross profit, and a decrease in operating expenses. In comparison, the \$16.4 million net loss in the third quarter of 2019 included \$6.3 million in non-cash charges related to the estimated fair value of a warrant exercise and modification. Adjusted EBITDA improved 18 percent to a loss of \$3.6 million in the third quarter. The improvement reflected the increase in revenues and gross profit, as well as lower operating expenses. Cash used in operations in the third quarter was \$0.9 million, an 85 percent improvement when compared with \$5.7 million of cash used in operations in the third quarter of 2019. The combination of higher revenues and lower operating expenses contributed to the reduction.

Asfertglobal, a Portuguese company that manufactures biofertilizers and biostimulants

based on microorganisms, indicates it remains committed to meeting the company’s growth objectives and has an important investment plan underway, totalling over €2 million in the short term. The company will increase its biofertilizer production capability by acquiring new bioreactors equipped with the latest technology, and will also have two additional laboratories. Work to expand the facilities is already underway and should be completed by January 2021. The aim of this investment is to continue to broaden commercial horizons across borders. This year, the company’s turnover regarding internationalization will exceed 60 percent. In addition to Russia and several countries in Europe and Africa, the company began selling to the US this year, and has now captured Latin America, with its first sale to Chile.

Novozymes and World Wide Fund for Nature (WWF) are partnering to safeguard water

resources around the world. Novozymes has a global presence with factories in Denmark, the US, Canada, Brazil, Argentina, India and China. To produce Novozymes’ biological solutions, energy and water is needed. Starting in China, WWF will help Novozymes assess water risks and develop contextual water targets and action plans at the sites where Novozymes operates. The UN has made Clean Water and Sanitation one of the Sustainable Development

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Goals (SDGs), and in 2015 Novozymes made the SDGs a part of its strategy.

Novozymes' water programs aim to support SDG number 6. "In Novozymes, we are working to deliver biological solutions that enable clean and efficient water use," said Graziela Chaluppe dos Santos Malucelli, Novozymes executive vice president of operations, supply and quality. "This makes it only natural that we pioneer a new approach to secure water resources. WWF has offices in China that have been implementing water stewardship projects on the ground for 10 years. WWF partners with governments, businesses, international financial institutions and communities to ensure healthy freshwater systems exist to conserve wildlife and provide a sustainable future for all.

Spain Oman Private Equity Fund (SOPEF), the investment fund managed by MCH Private Equity, has completed its fourth transaction through the investment in Symborg. Symborg was established in Murcia in 2009 and specializes in biotechnology research and development with agricultural innovation. SOPEF and Symborg's shareholders aim to promote and consolidate the international growth strategy of the company, taking advantage of the industry trends which are evolving towards sustainable solutions.

The objective is to meet the food demand of a growing population facing the challenges that climate change will present in the coming years. Symborg's expansion plan includes the construction of a production plant in Alhama de Murcia to incorporate new products into the existing portfolio. This will facilitate the international consolidation to key agricultural markets such as the United States and Latin America. The Fund's entry has been a minority investment through a capital increase.

Evogene Ltd. has closed the previously announced registered direct offering pursuant to which the company entered into a definitive securities purchase agreement with an existing institutional shareholder and certain Israeli institutional investors providing for the issuance of an aggregate of (i) 3.92 million ordinary shares at a purchase price of \$2.50 per share, and (ii) 883,534 pre-funded warrants each to purchase one ordinary share (Pre-Funded Warrants).

The Pre-Funded Warrants were sold at a price of \$2.49 each, with an exercise price of \$0.01 per ordinary share. The Pre-Funded Warrants are exercisable at any time after the date of issuance upon payment of the exercise price. Cantor Fitzgerald & Co. acted as placement agent in the offering.

The ordinary shares and Pre-Funded Warrants offered in the registered direct offering described above were offered by Evogene pursuant to its shelf registration statement on Form F-3 (File No.333-240249) previously filed and declared effective by the Secus andritie Exchange Commission (the SEC) on August 10, 2020. A prospectus supplement and accompanying prospectus relating to the offering have been filed with the SEC and is available on the SEC's website.

Amoéba announces the issuance of the eighth tranche of bonds convertible into shares (OCAs) of its bond financing with incentive program, namely 26 OCAs numbered from 183 to 208 fully issued to Nice & Green S.A. This issue is part of the issuance agreement entered into with Nice & Green S.A. on Dec. 17, 2019 and amendment no. 1 to said agreement entered into on March 9, 2020, with a view to setting up a bond financing with a

profit-sharing program through the issuance of 312 OCAs with a nominal value of EUR 20,000 each, representing a total nominal amount of the bond issue of €6.24 million (the Issuance Agreement). The relative prospectus to this operation has been approved by the AMF (visa no. 20-011) on Jan. 16, 2020 (the Prospectus).

The chairman and chief executive officer of the company, using the sub-delegation granted to him by the board of directors at its meeting on March 13, 2020, decided, in accordance with the announced issuance schedule (see press release of March 9, 2020), to issue on November 6, 2020, 26 OCAs numbered from 183 to 208 to the benefit of Nice & Green S.A. corresponding to the eighth tranche of the bond financing.

As provided for in the issuance agreement, these OCAs were fully subscribed at a price equal to 96 percent of their nominal value, representing a eighth tranche of OCAs for a total net amount of €499,200. It is recalled that under the terms of the Issuance Contract, Amoéba will have to issue the other four tranches of OCAs according to the following issuance schedule and subject to the satisfaction of certain conditions precedent.

Bee Vectoring Technologies International Inc. is seeing accelerated revenue growth for fiscal 2021 and has already exceeded revenue booked in all of fiscal 2020 growing season. This comes at an early stage of the sales cycle for securing commitments for the 2021 growing season, with more than two-thirds of the sales cycle still to come, showing strong promise for revenue acceleration in the year ahead.

BVT has secured 17 grower deals for the next blueberry growing season in Georgia, the company's second season selling commercially following EPA approval in August 2019. This includes a 100 percent customer retention rate, with all 11 growers from the last growing season committing to using BVT again in the next growing season, plus six new grower customers secured.

The objective for BVT in its current fiscal year, which is the 2021 growing season, is to secure CAD\$1 million in revenue from a repeat customer base with increasing acreage combined with contracts derived from new customers, noted Ashish Malik, CEO of Bee Vectoring Technologies. During its first US growing season (in 2020), the company commercialized its natural precision agriculture system using Vectorite with CR-7, generating CAD\$292,000 in revenue through Q3 2020 (ended June 30, 2020) from two crops (strawberries and blueberries) across four states (Florida, Georgia, Michigan, North Carolina).

PureAcre has launched as part of BPS Agriculture's portfolio of companies, bringing new biostimulants and nutritionals to field crop growers in the coming months. The line of agricultural products utilizes PureAcre's proprietary technology, OpusMAX, to improve nutrient delivery and up-plant performance. PureAcre is currently working on a product concept with potential to increase nutrient assimilation by double-digit percentages as demonstrated in internal trials. PureAcre has a flexible go-to-market strategy, offering agriculture retailers the option to sell PureAcre-branded products directly, partner with the company to create their own private-label products, or license OpusMax for use in their in-house manufacturing. PureAcre joins Verano365 and Farm Shield in the BPS Agriculture portfolio of companies.

Eden Research PLC is partnering with UK-based family-run farming business M H Poskitt to develop and trial a new biofungicide designed to protect and improve the quality of vegetables. Eden stated the partnership has been established to support an R&D project that M H Poskitt has been engaged in, investigating the effect of mugwort plant extract on key plant diseases. Over the coming two years, Eden, which has expertise in plant-derived sustainable chemistry and developing and registering biopesticide products, said it will be conducting wider testing with the aim of developing a commercially viable product. The project could eventually provide farmers with a naturally derived product to help protect against late blight, which costs farmers an estimated £55 million each year in the UK alone.

Biostimulants push SICIT Group to growth in the first nine months of 2020. SICIT Group has reported a revenue of €48.2 million for the first nine months of 2020, up 11.5 percent y-o-y. The company said they had seen 25 percent growth in the biostimulants business, with revenue for the first three-quarters reaching €29.3 million up from €23.4 million on the prior year period. SICIT manufactures biostimulants based on amino acids and peptides. In its financial statement, the company said it continues to record sustained demand for its biostimulants, which form 61 percent of its revenue total for the financial period.

SICIT is the major producer of amino acids from animal origin in Europe. Another business unit, animal fats, also showed an increase for the first nine months of 2020 (€5.0 million up from €4.6 million). Animal fat for biofuel production was up 8.4 percent and had recovered from the drop of -1.1-percent from the first half of 2020.

The retardants business for the plaster industry had an 8.8 percent decline, which the company attributed to the Covid-19 pandemic and a slow-down in the global construction industry.

Regarding the growth markets for its products, Europe was up 5.1 percent, with Italy +8.6 percent, APAC was up 21.6 percent and the Americas showing the highest increase at +25.6 percent. The rest of the world, which referred to Middle East and Africa, was up +8.3 percent.

Revenues from tanning waste also recorded a down-turn due to the lockdown of tanneries in spring in Italy. When

making its statement, the company said: "A possible renewal or extension of the restrictive measures against Italian tanneries could have negative effects on the supply of its raw material inputs and, consequently, on its production capacity and commercial activity. Similarly, any renewal or extension of the lockdown in countries where the Company markets its products could weaken demand for the Company's products, particularly in the construction sector, to which retardants are addressed to (agriculture, on the other hand, seems to be much less affected by emergency dynamics)."

Staphyt has launched operations in Brazil, Staphyt Brasil Agro Consultoria Ltda. The move was driven by the company's desire to continue its development and to offer its services and skills to its clients in one of the most important agricultural regions in the world, today the world's fourth largest agro-exporter. The Brazil operation is headed by Dr. Luiz Antônio Alves José who has extensive experience in agribusiness working around the world and holding various leadership positions in R&D for more than 25 years in multinational companies both in Brazil and abroad.

Univar Solutions Inc. announced the addition of three new Novozymes BioAg inoculants – BioniQ, TagTeam BioniQ, and Optimize LV – to the NexusBioAg portfolio of crop biological and fertility products. NexusBioAg, a division of Univar Solutions, is the exclusive distributor of Novozymes inoculants in Canada. The addition of these innovative inoculants expands NexusBioAg's portfolio of inoculants, micronutrients, nitrogen stabilizers, and foliar for the Canadian agricultural market. The three new inoculants are proven to increase yields and enhance crop performance for pulses including lentils and peas, cereals (small grains), canola and soybeans. These inoculants will be on farms in time for the 2021 spring planting season across Canada.

Sumitomo Chemical has announced the realignment of its group subsidiaries to further strengthen its biorational business. Valent BioSciences LLC (VBC) in the US will now be responsible for all biorational-related business functions of Sumitomo Chemical Group. A chief commercial officer (CCO) position has been created at



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VBC to oversee the global biorational sales operations via a Sustainable Solutions Business Unit (SSBU), focusing on sales and services of biorationals in each region.

Sumitomo Chemical also plans to create new SSBU's at its regional headquarters for the crop protection business in South America and Europe. Sumitomo Chemical currently has six new products expected to be launched soon and many other promising product candidates in the early and middle stages of development. The six new products will launch following registration approval anticipated in 2022 or later. The SSBU in each region will be responsible for marketing these products.

MycoApply Injector Ecto, a wholly owned subsidiary of Valent BioSciences, has introduced MycoApply Injector Ecto, which contains a very high spore concentration of a diverse array of ectomycorrhizal fungi species on a soluble humic carrier, designed to benefit most conifers and hardwoods, some woody shrubs, as well as several commercial nut trees. MycoApply Injector Ecto features five species of ectomycorrhizae: *Pisolithus tinctorius*, *Laccaria laccata*, *Scleroderma cepa*, *Rhizopogon villosulus*, and *Suillus granulatus*. MycoApply Injector Ecto is formulated for application via horticulture injection and dosing equipment. MA is.

EcoSwing, a botanical-based fungicide from Gowan USA, is now registered for use in California. EcoSwing has shown efficacy against key pathogens in almonds, grapes, berries, and stone fruit. The active ingredient, extract from the *Swinglea glutinosa* tree, works to desiccate fungal hyphae. Preliminary research also indicates that EcoSwing may aid in triggering innate plant responses to help boost plant defense mechanisms against fungal pathogens.

XiteBio Technologies Inc.'s XiteBio Yield+ liquid, the phosphate solubilizing PGPR (plant growth promoting rhizobacteria) inoculant, can now be used by farmers growing organic crops across North America. XiteBio Yield+ increases plant-available soil phosphates, and releases phytohormones and chelating iron via siderophores. Featuring three modes of action, XiteBio Yield+ works to increase early root development and overall plant health resulting in better yield.

Belgium has approved the registration of an Inatreq active product from Corteva Agriscience. Questar and Aquino fungicide with Inatreq active are a new, naturally derived fungicide that offers curative and protectant control on all *Septoria* strains. The products will be available for sale in Belgium in time for the 2021 growing season. Inatreq is already approved in France and the Republic of Ireland, with the registration process continuing across the Europe region.

AMVAC, an American Vanguard Company, announced that Vintec, a biological fungicide, is now registered in the US by the Environmental Protection Agency (EPA) and is pending state regulatory approval. The product will be distributed by AMVAC, a shareholder of Belgium-based Biological Products for Agriculture (Bi-PA) and a distribution partner for Bi-PA's product portfolio in the Americas. Vintec fungicide contains a new microbial strain as the active ingredient called *Trichoderma atroviride* strain SC1 which is a naturally occurring fungus that obtains nutrients from decaying organic matter.

It is anticipated that growers will apply Vintec fungicide using their current conventional equipment to control grape

esca and almond canker disease following pruning. The product's multiple modes of action provide excellent, long-lasting control of these disease complexes. Vintec fungicide was discovered by Fondazione Edmund Mach and Trentino Sviluppo S.P.A. and developed and registered by Bi-PA in Europe in 2017. American Vanguard Corporation recently announced that AMVAC Chemical Corporation had acquired the Agrinos group of companies, see 2BMonthly October 2020.

Groundwork BioAg, Ltd. and BIOFLORAL Inc. have launched DYNOMYCO C mycorrhizal inoculants in Canada. Based on 30 years of joint R&D by Groundwork BioAg and Israel's Volcani Center, DYNOMYCO C is a potent mycorrhizal inoculant, ideally suited for cannabis cultivation. It contains 2,500 endomycorrhizal propagules per gram and is registered for commercial use by the Canadian Food Inspection Agency (CFIA),

Farmer's Business Network, Inc. (FBN) has launched FBN Biological On-Farm R&D Network, which connects developers of agricultural biological solutions directly with farmers and full-scale testing environments. This program creates a direct line to commercialization that benefits farmers, manufacturers and the environment.

Through its member-based farmer network, FBN will connect biological developers directly with farmers through the FBN Biological R&D Network so that large-scale trials can optimize biological input programs to deliver the best return on investment for the grower. With the aid of FBN's data science, participating biological manufacturers will also be able to collect valuable insights on product efficacy and performance by environment. After enrollment of participating biologicals manufacturers and FBN members this fall and winter, the first trials will commence in the spring of 2021 in the US market.

Brazilian group Vittia has launched Bio-Immune, Brazil's first biological fungicide and bactericide for controlling Asian soybean rust. Bio-Immune was developed from the isolate, BV02, of the bacterium *Bacillus subtilis*. Its formulation contains endospores of BV02 and its metabolites, such as the enzymes and lipopeptides, surfactin, iturin and fengicin.

Such metabolites act indirectly by activating the plant's defense mechanisms, and directly inhibiting the germination of *Phakopsora pachyrhizi* spores, the pathogen that causes Asian soybean rust. The BV02 endospore, when applied to plants, germinates and colonizes the leaf surface, forming a biofilm rich in these lipopeptides and enzymes that protect plants against pathogens. Bio-Immune is also registered for controlling anthracnose (*Colletotrichum truncatum*), a disease that affects the initial stage of the formation of pods of crops such as soybeans and beans.

DunhamTrimmer, the global leader in business intelligence for the biocontrol and biostimulant industries, has named Massimo Toni the company's new Vice President of New Business Development. As an established professional in the biocontrol and biostimulant space, Toni brings more than 40 years of experience in product development, marketing, business development, and general business management along with 20 years experience in biologicals expertise to the organization.



System in a category of its own," stated Biobest in its statement acknowledging the award.

ABIM Goes Digital for 2020

The 15th Annual Biocontrol Industry Meeting (ABIM) kicked off in virtual style. An army of avatars – or rather delegates and exhibitors – queued outside the entrance for the three-day event.

There were a number of firsts for this edition of ABIM. It was the first virtual event, owing to the COVID-19 global pandemic. It was the first time there were joint winners of the Bernard Blum award. The event saw the first speaker from the Forum for the Future in the keynote address by Dr. Sally Uren, and it was the first time a speaker with Canada's Pest Management Regulatory Agency (PMRA), director Peter Brander, gave a presentation. All in all, there were 500 delegates registered, representing 232 companies or organizations, and attending from 30 countries.

Bernard Blum Award

For the first time, there were joint winners of the Bernard Blum Award, announced by the International Biocontrol Manufacturers Association (IBMA) at the opening of the 15th edition of ABIM, the Annual Biocontrol Industry Meeting. The joint winners from a shortlist of four were **Biobest for Eupeodes System** – larvae of hoverfly *Eupeodes corollae* for aphid control, and **e-nema** with **Dianem** – an entomopathogenic nematode *H. bacteriophora* to control larvae of western corn rootworm.

When announcing the winners, David Cary, member of the ABIM executive board and former executive director of IBMA, said the judging panel found it difficult to separate the two entries, and so for the first time, joint winners were awarded.

Congratulations were also expressed to Bio Bee and UV Boosting, which rounded out the shortlist and which also made presentations at the morning's session at ABIM. The Bernard Blum Award was launched in 2015 by the IBMA to commemorate its founding president. The award goes to the most innovative biocontrol product of the year. The award recipient should have a high impact in the management of pests or diseases whilst having a low impact on human health and the environment, says IBMA.

Prof. Dr. Ralf-Udo Ehlers from e-nema commented: "The award is a recognition of our six years breeding programme, many years of field work and a continuous scaling-up of production capacity at e-nema. Dianem is another milestone for biocontrol targeting arable crops. The award will support our efforts to translate the biocontrol technology into agricultural practice," Prof Ehlers told the ABIM daily blog, which was produced by New Ag International, the media partner for the event.

Biobest's new addition to its aphid control strategy – Eupeodes-System – was the other joint winner of this year's Bernard Blum Award. "A naturally occurring hoverfly, *Eupeodes corollae*, is indigenous throughout Europe and further afield," said Apostolos Pekas, R&D senior scientist and Biobest's team leader for beneficials in Belgium.

"While the larvae are voracious aphid predators, Biobest has shown the adults simultaneously aid crop pollination, making it the first proven case of a beneficial insect providing two ecosystem services. This puts Eupeodes-

Keynote address

After the welcome address by Christoph Brutschin, head of the department of economic, social and environmental affairs, Basel, the opening session moved to the two opening presentations. Lucius Tamm (CEO ABIM AG and FiBL director) spoke about the importance of the biocontrol industry to solve major agricultural challenges.

"The biocontrol industry is needed to facilitate transition of agriculture towards sustainability. New biocontrol products need to be rapidly developed and brought to the market but current registration processes in Europe are slow. However, the urgent need for COVID-9 vaccines shows that if necessary, even strict and complex registration procedures can be accelerated to facilitate rapid approval of much needed innovations. If we succeed in transferring this approach to PPP registration, then the COVID-9 challenge also offers opportunities to biocontrol."

Tamm also spoke about the importance of promoting functional biodiversity, which is a strategy to strengthen pre-existing populations of beneficials.

Jennifer Lewis, IBMA executive director and member of the ABIM executive board, spoke about positioning the biocontrol industry in its core role within a sustainable food production chain. She stressed the time is now for biologicals.

The title for this year's keynote address was: *The role of biocontrol in delivering sustainable development and food system transformation*. Dr. Sally Uren highlighted how the biocontrol industry was already making a significant contribution to sustainability by, for example, promoting biodiversity, promoting quality nutritious food production and minimizing freshwater consumption, and she urged the biocontrol industry to put more back into the environment and society than it takes out with shared goals on productive, viable and profitable food safety.

Questions from the floor, included: "If you were sitting in our industry, what would be your first step?" Uren answered that in many ways the industry should carry on doing what is doing, while encouraging it to learn from other industries. A number of case studies were also presented during the session that reflected current pest control issues in the world, such as fall armyworm (FAW) and locust outbreaks.

Market update

Dr. Mark Trimmer of DunhamTrimmer provided market insights, sharing the results of an informal qualitative survey to see how biological companies have coped in 2020 with the COVID-19 pandemic. While many companies noted the move to teleconferencing was fine for established relationships, Trimmer said companies were finding it harder to establish new relationships using this tool. He also added that for some companies, the pandemic would be transformative with many looking to maintain some of the new ways of working.

From a market perspective, Trimmer said DunhamTrimmer had estimated the global biocontrol market for 2019 at \$4.5 billion, with North America and Europe being the largest markets. The annual growth rate was a healthy 16 percent year-over-year, with some of that being attributed to Latin America in 2019. It's too early to predict what 2020 will

look like, said Trimmer, but he tentatively proposed a lower growth rate for 2020, down by three to six percentage points.

On the side of mergers and acquisitions, Trimmer said he expects to see more consolidation in the biologicals space. There was the recent acquisition by Syngenta of Valagro, and of Omnia selling Oro Agri to Rovensa.

After his talk, Trimmer told the audience that as a result of slowed growth in 2020-21, the forecasted revenue for 2025 will likely not be achieved. DunhamTrimmer will revise the forecast revenue following a quantitative study in an updated biocontrol market report to be released in 2021.

Panel discussions

In the global regulatory harmonization session-European and global focus, Roma Gwynn (vice president IBMA) noted that regulation still represents the greatest financial and time burden for companies trying to get products into the hands of farmers.

"Companies recognize the importance of good regulation but maintain that it should be proportional to the risks of the biocontrol technology; at present there are few examples where this is so. Plus, across the world there are different approaches, standards and expertise in regulation of and for biocontrol technologies, each country being slightly different in their requirements," she said.

"This means companies have to prepare new studies and dossier in each country; this adds to the burden for companies. By having dialogue between countries for regulations and working towards harmonization, this will reduce the burden for companies (many of whom are micro and small companies) and result in many more biocontrol technology products to get into the hands of farmers and in less time. Farmers need 'biocontrol first' IPM solutions now to allow them to meet the challenges of growing food in resilient agriculture systems."

When asked what her summary message for the session is, she told the ABIM blog: "Biocontrol technologies need to have good, proportional and harmonized regulations to reduce the time to market and financial burden on biocontrol companies, and so get products into the hands of farmers and other users quickly. The environment and society are best served if regulators work together to have a proportional and harmonized regulatory system for biocontrol technologies."

Rick Melnick, of DunhamTrimmer and 2BMonthly, chaired the session on "Update on *B. thuringiensis*: A valuable biocontrol agent caught in the *B. cereus* debate."

The ABIM daily blog contacted Melnick and asked him to put the discussion in context. "Many consider *Bacillus thuringiensis* to be the cornerstone of the biocontrol industry. With nearly 50 years of commercial use, the importance of the commercial strains of Bt is twofold: one, its powerful and highly specific insecticidal activity; and two, its veritable lack of activity against non-target organisms (beneficials, birds, bees, fish, mammals)," he said. "The technology is so safe, in fact, that Bti – a species of Bt used for mosquito control and vector management in the public health sphere – is approved for applications directly into drinking water.

The challenges for the biocontrol and food industries are that Bt is closely related to *Bacillus cereus*, a known human pathogen, so much so that produce samples treated with Bt close to harvest are known to trigger false positives for Bc in the food lab. This creates a dilemma – particularly

when growers and food companies, collectively, are progressing ever faster toward integrated production systems using both conventional and biological controls. The good news, as we learned from our panel of expert speakers today, is that steady progress is being made to develop new laboratory testing methods that will help us differentiate between Bt and Bc. We also learned that regulators and policy makers are active and collaborative in helping us find solutions."

Executives Speak

Syngenta Group made big news in October by acquiring Valagro, a clear market leader in the Biostimulant space. This month, 2BMonthly caught up with Arne Pingel, Marketing Lead Biostimulants at Syngenta and Marco Rosso, Global Corporate Affairs Director at Valagro to explore the implications of this acquisition both from a corporate and industry perspective.

2BM: Congratulations! This announcement really invigorated the biostimulant competitive scenario, and probably accelerates the way the biostimulant industry will move forward.

This was a major decision for each organization. What were the key factors that led you to the conclusion that bringing your two organizations together was your best path forward in the biostimulant market?

Syngenta/Valagro: *Nowadays agriculture is facing strong pressure for a paradigm shift in order to succeed in the challenge of producing more and healthier food for the growing global population in a more sustainable way. Growers are facing increasing pressure to meet consumers' changing demands regarding how their food is produced: consumers are more aware and informed these days, are oriented towards the purchase of healthy, quality products, obtained in a sustainable manner. At the same time farmers are increasingly facing the negative effects of climate change on crop productivity.*

This attention to sustainability is also promoted by international green policies: in addition to the sustainable development goals of UN 2030 agenda, we have not to forget that the request for a transition to a more sustainable food system has been recognized as a key priority for the next decade by the Farm to Fork strategy, that is at the heart of the European Green Deal.

For all these converging reasons, biologicals like biostimulants and biocontrol products are considered indispensable and no longer nice-to-have products, as science is able to demonstrate their benefit to plant health, mainly allowing plants to fight environmental stress and form better-quality produce.

Biologicals can help growers to manage resistance especially in high-value crops, enhance soil health and reduce residues in crops. When used in product rotation, biologicals can help delay resistance and protect the longevity of existing chemistries.

This is the main reason that led Syngenta and Valagro to join efforts and increase their presence in the space of plant biostimulants and other biological products: both companies are driven by the same view on sustainability, which means the ability to bring about development and



wellbeing by using fewer resources and thus reducing the environmental impact.

2BM: What are the most important synergies are you expecting to achieve from this agreement?

Valagro/Syngenta: The acquisition of Valagro by Syngenta Crop Protection will result in considerable synergies between the two companies will provide new growth opportunities for Valagro and to be even more competitive in the rapidly evolving global biologicals markets and will enable Syngenta Crop Protection to build a world-leading biologicals business.

Both Syngenta Crop Protection and Valagro have a foundation in science-based innovation, so we expect to collaborate, share knowledge, and learn and build on each other's capabilities.

Valagro has a complete crop offer that is backed by best-in-class R&D capabilities, production and commercialization, complementing Syngenta's existing portfolios with additional solutions that will provide growers with more choices.

Like Syngenta Crop Protection, Valagro has a strong focus on its customers, with a global commercial capability to sell biologicals. Valagro will benefit from Syngenta Crop Protection's R&D and commercial scale, while continuing to foster their innovative, entrepreneurial culture.

2BM: What are the foremost challenges and opportunities you anticipate in the middle-term, or you are already finding in the short-term? How do you plan to approach them?

Valagro/Syngenta: The combination of Valagro and Syngenta marks one of the first steps in the companies' commitment to accelerate innovation for more sustainable agriculture and to help farmers deal with the increasing effects of climate change.

In this regard, the acquisition of Valagro is strategic in terms of contributing to the ambitious goals of the new Good Growth Plan launched by Syngenta Group in June 2020, which provides \$2bn invested in sustainable agriculture by 2025 and two technological breakthroughs delivered to market each year.

In the long-term, Syngenta Crop Protection aims to become a leader in the rapidly growing biologicals market, which is expected to nearly double in size over the next five years, giving growers additional tools to manage their crops effectively and sustainably. This means creating the best biologicals business in the world and delivering an innovative and differentiated science-based portfolio to growers.

The strategy is to seize opportunities to shape and lead a growing market and build a pipeline to meet grower needs in addressing value-chain requirements and consumer demands. Valagro's well-established portfolio will complement Syngenta's crop protection range.

2BM: From a go-to-market perspective, do you anticipate having to make significant changes in your business model and how you communicate the value of biostimulants to the channel and end users?

Syngenta/Valagro: Nothing will change in the go-to-market strategy of both companies. Valagro will continue to operate as an independent brand in the market and thus will keep selling its products to leading agrichemical distributors, dealers and cooperatives, with direct sales and technical force presence in several major markets like Spain, France, Greece, Turkey, Italy, the UK, US, India, China, Mexico, Columbia and Brazil. The companies are open to exploring opportunities and providing mutual access to their product portfolio in markets and segments where it makes business sense.

2BM (to Valagro): As a result of this deal, what do you anticipate being the most immediate impact(s) for your existing and future clients relating to Valagro's relationship and strategic position in the biostimulant market?

Valagro: The acquisition of Valagro is a strategic choice for us. The aim of the agreement is to enhance Valagro's growth opportunities and be even more competitive worldwide. So, we expect that the synergies developed through this operation will provide Valagro with considerable resources that could help the company advance its efforts to develop environmentally compatible, safe and efficacious products, with advantages for the business, for our customers and for our commercial partners in Italy and worldwide.

2BM (to Valagro): You celebrated the 40th anniversary of Valagro last Monday 19 October with a virtual event, having hundreds of attendees from your team, customers and partners. Congratulations from the 2BM team!

From the feedback we received, it appears very clear that Geapower and YieldOn are more than just words, but part of strong belief in putting customers and people at the center of the strategy, backed with science approach, as it shows the recent opening of your new research center. What is the success formula of Valagro?

Valagro: Thank you! This was a milestone in the history of Valagro Group and we were proud - and thankful - to celebrate this special moment with all those who contributed over the years to making Valagro what it is today: a respected, solid and globally recognizable brand.

There are some key ingredients of this successful story. First of all, the ability to create the future. It is not by chance that the title of Valagro's 40th anniversary has been "Creating the future. Since 1980." At Valagro we believe that the ability to dream, to imagine things that do not yet exist, to challenge what has already been done, is - and will be - our greatest asset.

Indeed, we were pioneers in the biostimulant industry: it was 1984 when we launched our first biostimulant, Megafol; Valagro was one of the first companies to understand and believe in the value of biostimulants as a disruptive category of products able to ensure both sustainability and productivity in agriculture.

This is also linked to another key ingredient: the strong belief in science and innovation. Since the company was



founded, we have invested in research and development, and our rigorous scientific approach, which we call Geapower, has immediately seen the use of the “omic” sciences and particularly genomics. Thanks to this approach, we have contributed significantly to bringing innovation into the field of biostimulant development.

Last but not least, the distinctiveness of our company culture, the most powerful means by which our people feel to be part of the wider, challenging mission of contributing to produce healthy food for a healthy planet.

2BM (to Syngenta): With this important entry into the biostimulant space, what are your next planned steps to further consolidate your strength in this segment? Are there additional technology, products, or regional moves that could complete your offer and/or market access in the short-term?

Syngenta: Valagro will continue to operate as an independent brand in the market, leveraging the resources of Syngenta Crop Protection to innovate and grow. The Syngenta biologicals team will be responsible for Syngenta Crop Protection’s pre-existing biologicals portfolio and Valagro’s business, with the aim to build upon the Valagro platform.

Both companies have a foundation in science-based innovation and are eager to collaborate, share knowledge and build on each other’s capabilities. Our teams will fully explore innovation opportunities and investments centered on developing and delivering best in class biological technologies to our customers.

2BM (to Syngenta): Does this major announcement suggest that Syngenta sees greater opportunity in biostimulants than in bioprotection, or is Syngenta continuing to evaluate opportunities in the bioprotection market as well?

Syngenta: There are great opportunities in both markets. The overall global biologicals market is growing, expected to nearly double over the next 10 years. We see the market growing from ~\$4bn today to \$10bn by 2030, a compounded annual growth rate of 9 percent. Biologicals are an attractive market and critical to our crop protection strategy, and Syngenta is continuing to evaluate opportunities for collaboration in markets where it makes sense.

2BM: As mentioned in the introduction, it seems clear this announcement represents a strategic shift in market dynamics to which other biostimulant and global ag-input companies will need to evaluate and respond. How do you think this agreement will impact the overall biostimulant market and the competitor strategies within the industry?

Syngenta/Valagro: We can say that the entry of Valagro into Syngenta Crop Protection unveils a trend that will impact the biostimulant market in the coming years. First of all, we can consider this acquisition as a recognition of biostimulants as a necessary and effective crop input. And as they are increasingly perceived in this way from farmers and retail chain, analysts expect more consolidation and

investment from traditional agriculture companies in this space. This acquisition is a game changer for the biostimulant market as it brings together the global scalability of Syngenta with the entrepreneurial spirit, long history and successful products of Valagro to create a new powerhouse in the growing global market for biologicals, expected to double in size over the next five years.

Executives Speak

Nicole Engels, Head of Growth, VOA

At 2BMonthly, we’re following the use of drones for biocontrol and fertilizer application. VOA has an online platform where farmers in Brazil can book a drone to perform an application. Could you describe the service that you offer?

VOA’s solution seeks to sustainably protect crops from pests and diseases, by deploying a fully integrated drone service through our platform VOAline.com, that allows for precise monitoring and application of biological agents and rational application of chemical pesticides, and fertilizers.

Our platform, and competitive advantage to other drone ag-tech companies, is a ‘marketplace’ for farmers (demand) and pilots with drones (supply), creating connections based geographic location, availability and technical capacity. It also allows for a traceable and transparent services, as the services are pre-programmed by the farmer himself on the platform, and once the order is complete, the farmer can evaluate the service report and rate the quality of the service.

When we spoke, you mentioned that VOA does not manufacture drones, but it does modify them depending on what is being applied. Can you elaborate on this, with reference to your ‘family’ of drones?

Indeed, selling drones is not our business model, but we do have them available in case a pilot needs one (we provide them to the pilots for free), and sell them to franchises as part of the contract with them. Actually, we would love another company (like DJI) to flood the market with the drones we need but at the moment no company has all the application mechanisms that are required in the Brazilian market; hence why we buy the parts and assemble them ourselves in the case of VOA-001, and 3D print them in the case of VOA X1.

We have 2 different types of drones, with several application mechanisms. VOA-001 has the following application mechanisms: Spraying of micro-organisms or liquids, application of macro-organisms in form of living eggs, application of macro-organisms in form of biodegradable capsules.

The drone will be taken to the location by the drone pilot. Apparently, it won’t become activated and take off unless it is in the right start location specified by the farmer – what’s the main problem that this functionality overcomes?



Actually, the wider problem VOA is trying to solve, specific to drone ag-techs, is that other drone ag-techs out there that carry out these application services are not connected to a platform that runs the entire fleet. From planning the operation, executing the operation, and evaluating the operation – it is not possible to do this smoothly without a platform. Current Brazilian companies book the applications via WhatsApp – quite literally texting the farmer asking for a good day. This way of working is not scalable, and so VOA’s vision was to create a scalable operation that can only be done with a platform like ours.

The technical fact that the drones do not take off if they are not in the right place at the right time, just speaks to the fact that they are connected to a platform that is able to manage the drones. If we do not know where the drone is, we are not able to tell where it could go after (for another service in another location), nor whether it has actually done the service it needs to do, nor if the quality of the service was up to the quality that it needs to be. Additionally, of course, it creates a level of security that our drones will not just disappear, and pilots will go off to do their own applications and receive payment outside the platform.

Your largest drone can carry 15 kg of liquid fertilizer. What kind of grower in Brazil will use this service?

Many, among them vegetable and fruit growers. So usually high value crops, with smaller distances than large sugar-cane plantations for example.

VOA refers to itself as the Uber of drone services in Brazil. Could you explain this relates to your business model?

VOA is like the Uber of drone services because it acts as a ‘market place’ where supply (pilots with drones) can find access to demand (farmers that need services). Same as Uber, which acts as a market place for drivers and riders. VOAline.com matches pilots and farmers through an algorithm that optimizes efficiency based on geographic location, availability and technical capacity of the pilot.

Moreover, VOA is different to other drone application companies that don’t have a platform; it allows for a traceable, manageable and transparent service.

Your largest sector is sugar cane by area – do you know roughly how many hectares of sugar cane that VOA has serviced? Would this be *Trichogramma* application or other?

Yes, our platform logs everything.

Trichogramma (living eggs) 15,000 hectares and *Cotésia* (capsules - living wasps) 710,000 hectares. We will be doing more by end of year.

Moving to your company structure – how has VOA been financed? Will you be doing any further funding rounds?

We have angel investors who financed USD\$800k, and we are just closing a second round with an international accelerator (to be announced shortly).

You’ve mentioned the US market. When do you think that might be and are there any specific modifications (equipment or otherwise) that you will need for that market?

We are still doing the due diligence of what is the best way to enter the US market. But we are not changing our business model; the market is quite concentrated on five main crops with very similar needs in terms of protection and nutrition.

Regulatory

A list of 16 generic formulated pesticides or products that will be available for use by Brazilian farmers has been published in that country’s Act No. 60 of the Department of Plant Health and Agricultural Inputs of the Secretariat for Agricultural Defense, in the Federal Official Gazette. Among the registered products, three of them are composed of microorganisms such as *Bacillus amyloliquefaciens* and *Trichoderma harzianum*, biological agents of pest control.

Registered products are recommended for the control of *Rhizoctonia solani*, *Sclerotinia sclerotiorum*, *Deois flavopicta* and *Euschistus heros*. In 2020, 63 products were considered to be of low impact (biological and organic). This is the largest number of product registrations in this profile in the same year.

The U.S. Department of Agriculture’s (USDA) Animal and Plant Health Inspection Service (APHIS) is accepting comment on an environmental assessment (EA) that addresses the environmental impacts of releasing leaf spotting fungus (*Ramularia crupinae*) to manage common crupina (*Crupina vulgaris*). After careful analysis APHIS has determined the release of leaf spotting fungus within the continental United States will likely not have a significant impact on the environment. Common crupina, or “bearded creeper,” is a winter annual native to Eurasia. This invasive plant is spreading in northwestern U.S. pastures and rangelands and reducing areas with quality forage as it displaces other species.

It grows up to a meter in height and has inconspicuous lavender to purple flowers and rosettes that develop through the fall and winter. APHIS plans to issue permits for leaf spotting fungus to reduce the severity of common crupina infestations in northwestern States. APHIS will review and consider all public input submitted during the 30-day comment period and use the information to complete a final environmental assessment. Members of the public can review and comment on the assessment through Nov. 30, 2020.

The government of India has patented a new biological pesticide developed by a team of researchers from Gauhati University. The team developed the biological pesticide to control red spider mites, *oligonychus coffeae* (one of the most destructive pests in all the tea-growing regions of the country’s northeast) that

attack tea bushes and cause heavy crop loss annually. The new pesticide is a low-cost bio-formulation created with an indigenous fungal bio-agent.

Scientific Findings

The world's largest kelp farm is being built off the coast of Namibia with an investment of USD\$60 million. The joint project involves Kelp Blue, Climate Investor Two (CI2) and the Namibia Infrastructure Development and Investment Fund (NIDIF). The funding will cover the initial five-year phase, and will come from both international and local Namibian sources through CI2 and NIDIF, pending investment approvals, while Kelp Blue will seek the necessary Namibian regulatory approvals and will liaise closely with local authorities. The farmed seaweed will be harvested to produce alternative agri-food, biostimulant and textile products.

The research interest on plant biostimulant applications in vegetable crop production is gradually increasing and several reports highlight the beneficial effects that such products may have not only on crop performance but also on the quality of the final product. Moreover, numerous products with biostimulatory activity are being developed which need further evaluation under variable growing conditions and different crops. Plant hydrolysates which contain amino acids and peptides have been acclaimed with several positive effects on crop performance of diverse horticultural crops, while macro-algae are also considered effective biostimulants on plants grown under stress conditions.

A recent study evaluated the use of protein hydrolysates and brown macro-algae (*Ascophyllum nodosum* and *Ecklonia maxima*) as innovative and cost-effective approaches for sustainable vegetable production. A [new study](#) from the University of Thessaly in Greece provides an overview of the main findings of that study, while discussing the practical applications that biostimulants may have in the greenhouse production of vegetable crops, aiming to increase the yield and the quality of the final produce and improve crop tolerance to abiotic stressors.

Scientists around the world have been working to grow arbuscular mycorrhizal fungi (AMF) without host plants because they can be used as organic fertilizer in agriculture and forestry. AMF help plants receive nutrients from the soil through a network that is efficient and far more reaching than their own roots can provide. A group led by graduate students Yuta Sugiura, Rei Akiyama and Associate Professor Katsuharu Saito of Shinshu University successfully demonstrated that AM fungi can be grown asymbiotically when given myristate as a carbon and energy source. "Although it was considered difficult, AMF has been successfully grown in a culture medium. With advancements, microbial materials for agricultural use can be produced," said Saito. "The growth speed and efficiency is still low and we are working on spore formation so the next generation can be grown. We hope to work on a collection of cultures that can be grown independently and be applied for use in agriculture."

Leiden University (Netherlands) reported it started field experiments in late October with the Japanese knotweed psyllid (*Aphalara itadori*) as a weapon against Asian knotweed. Entomologist Suzanne Lommen of the Institute of Biology Leiden coordinates research on the Japanese knotweed psyllid and coordinates field trials. She said many things have been tried to control Asian

knotweed, but that complete pest control is extremely difficult and very expensive.

"We will have to combine various methods to get the Asian knotweed under control," she said. "We know from the Japanese knotweed psyllid that it can kill young shoots and slow down or even stop the growth of the plant by sucking up sap – nutrition – from the plant. If the psyllid can establish, reproduce and spread, and do the damage we see in the breeding trials, it can hopefully inhibit the growth and spread of Asian knotweed."

Then you have a very cheap and environmentally friendly solution with many years of effect that you can combine with the more expensive methods." Extensive risk analyses have been performed for plant species in North America, England and Northwestern Europe, and results show the Japanese knotweed psyllid does not pose a risk to native plants or plants of economic value. All native Dutch species of the knotweed family have also been tested, and none proved to be a suitable food source for the Japanese knotweed psyllid.

The Netherlands Food and Consumer Product Safety Authority (NVWA) has concluded that the Japanese knotweed psyllid does not pose a threat to native biodiversity. The knotweed psyllid was released on three field locations. "After the winter we hope to find specimens there as proof of successful wintering," said Lommen. "Next spring, we will release them again to see if they establish and reproduce. Only when the psyllid appears in large quantities can we tell if it is doing enough damage to the Asian knotweed to push it back. It will take a few years before we see any results."

CABI scientists have led new research that reveals strong evidence that a natural enemy of the prolific Asian fruit fly *Drosophila suzukii* – previously believed to be *one* species – is in fact *two*, with only one proving suitable as a biological control agent against the pest. The scientists from CABI's Swiss Centre in Delémont, as well as colleagues from INRAE in France, used a combination of molecular analysis and crossing experiments to gather evidence that *Ganaspis brasiliensis* is a complex of at least two cryptic species. The study, published in the journal *Scientific Reports*, demonstrates that with complimentary behavioral experiments, individuals from one genetic group readily parasitized several drosophila species regardless of their food source while individuals from the other were almost exclusively specific to larvae feeding in ripening fruits.

Dr. Lukas Seehausen, lead author of the study said, "Because only *D. suzukii* attacks ripening fruits in its area of invasion, parasitoids from this second group appear to be well suited as a biological control agent. Our study demonstrates the need for a combination of biosystematics with biological and ecological investigations for the development of safe and efficient biological control programs." *Drosophila suzukii* is a frugivorous insect native to Eastern Asia that was accidentally introduced to the Americas and Europe in the 2000s, where it rapidly spread. Unlike sympatric *Drosophila* species in invaded areas, *D. suzukii* females are able to lay eggs inside unwounded ripening fruits due to their sclerotized serrated ovipositor, providing it with a unique niche virtually free from competition. Other biological factors that facilitated the invasion are its broad host range that includes many crops and non-crop fruits as well as the absence of

coevolved natural enemies able to control the fly in its invasive range.

Brazilian and American scientists have managed to perfect the submerged liquid fermentation technique (FLS), aiming at the industrial scale production of filamentous fungi biomass, used in the composition of biological pesticides for crop protection. The method is aimed especially at entomopathogenic fungi and mycoparasites of agricultural importance. The production of fungi through liquid fermentation was improved during the doctorate of the analyst at Embrapa Environment (SP) Gabriel Mascarin, in the United States, in 2015, supervised by the researcher Mark Alan Jackson, from the Agricultural Research Service of the Department of United States Agriculture (ARS-USDA). The research was successful with the fungi *Beauveria bassiana* and *Trichoderma*.

The research culminated in the registration of two patents in common use in the countries. The technique can also be adapted to produce other beneficial fungi, such as *Cordyceps (Isaria)*, *Akanthomyces (Lecanicillium)*, *Hirsutella* and *Metarhizium*, among others. Mascarin highlights the strategic value of the new system for the industry, as it makes possible the rapid and economical production of high concentrations of fungal cells that are more tolerant to desiccation, more stable and infectious than those obtained by the process that the industry has used, that is, the solid-static fermentation system (ESF). In this second system, moist cereal grains are commonly used as substrates for obtaining conidia, but it is an expensive, time-consuming process, difficult to quality control and one that requires a good deal of labor.

Mascarin explains that with solid fermentation, conidia require up to 20 hours to germinate after rehydration. With liquid fermentation, *Beauveria's* blastospores, for example, reach a germination rate of up to 90 percent in just seven hours. It is also possible to produce these blastospores in just two or three days with FLS, while in solid fermentation, the production takes more than 10 days.

In the case of the production of *Trichoderma microesclerodes*, fungal biomass is obtained in a period of three to five days, while solid-static fermentation can take more than seven days.

"Another highlight is the fact that microesclerodes consist of a resistance structure never before described for *Trichoderma*," said Mascarin. "Its formation is unprecedented under conditions of submerged liquid fermentation. For this reason, these micro sclerodes are ideal for seed treatment and application to the soil,". He also points out that the technological domain of the process has been demonstrating its capacity to meet a demand from the biological pesticide industry, which yearns for the development of more efficient and low-cost methods, capable of making economically viable the large-scale production of these fungi, used in biocontrol of pests and diseases as an alternative to the use of chemical pesticides. He says the new technology was born from the need to overcome the limiting barriers imposed by the solid fermentation method.

"Our research was able to demonstrate the technical and economic viability of producing these structures and, in the particular case of *Trichoderma* and *Beauveria*, this is the first time that this has occurred. We understand it as a contribution of science to society, with an enormous potential to positively impact the entire sector of biopesticides, with equally large impacts on the market."

Pengbo Biotechnology, based in Shandong, China, has

provided the crude extract of the endophyte *Paecilomyces variotii* known as ZhiNengCong (ZNC) for two recently published academic papers. ZNC has been the subject of investigations as a plant biostimulant. In 2019, in a paper published in the journal *Plant Soil*, showed that ZNC "exhibited ultrahigh activity in promoting plant growth and enhancing disease resistance, even at concentrations as low as 1–10 ng/ml." In the conclusion, the authors of the paper concluded that ZNC was an "effective plant elicitor that promotes plant growth by inducing auxin accumulation at the root tip at low concentrations and enhances plant disease resistance by activating the salicylic acid (SA) signaling pathway at high concentrations." Research was also carried out on combining the biostimulant with a fertilizer.

In 2020, a paper was released that studied the effect of ZNC on maize yield and root morphological characteristics when combined with diammonium phosphate and controlled release diammonium phosphate (CRP). Published in the journal *Field Crops Research* in May 2020, the research aimed to measure the effect on phosphate use efficiency as well as yield and root growth.

Pengbo Biotechnology provided the recommendation for usage at 1.5 g/ha in liquid form based on the common practice of fertilizer application by local farmers. When describing the results, the paper stated both the CRP and DAP+ZNC increased root length. Interestingly the combination of controlled-release DAP and ZNC (CRP+ZNC) showed no significant difference to average maize yield and net income over the separate treatments of controlled release phosphate and DAP+ZNC. "Hence the application of CRP or ZNC could increase maize yield by improving soil P supply intensity to meet maize P demand and promoting root morphological characteristics and vitality," the paper concluded, adding that further work was needed on biostimulant-enhanced fertilizer.

ZNC has also been the subject of studies with controlled-release urea. Pengbo Biotechnology provided the ZNC for a study published in April 2020 in *BMC Plant Biology* in a paper entitled "Ultrahigh-activity immune inducer from Endophytic Fungi induces tobacco resistance to virus by SA pathway and RNA silencing."

The plant pathogenic nematode *Heterodera schachtii* infects more than 200 different plants,

including sugar beets, and causes significant economic losses. In a recent study from plant pathologists at the University of California, Riverside, researchers examined a soil fungus that parasitizes the nematode's females and eggs. This fungus, *Hyalorbilia aff. multiguttulata* (formerly *Dactylella oviparasitica*), was originally shown to cause a long-term suppression of cyst nematode populations in a field at the University of California Riverside's Agricultural Operations. Other scientists have detected closely related fungal species in Arkansas and California that were able to parasitize and destroy different important nematodes, including the soybean cyst and root-knot nematodes.

In a current study, the authors showed that similar fungi inhabited sugar beet fields in California, suggesting that a group of naturally occurring fungi, given the right conditions, might be able to dramatically reduce nematode populations in one season. Researchers detected identical or closely related *Hyalorbilia* species in 21 of 25 field soils. More importantly, baiting with young female *H. schachtii* and its host Swiss chard led to an approximately 10,000-

fold increase in the population densities of these fungi over one nematode generation.

Plant-microbiome interactions from a recent article by Bakker et al. (2020; Molecular Plant).

Key message: microbial activity in the rhizosphere stimulates processes such as nutrient mobilization, denitrification, litter decomposition, soil remediation, biocontrol of soil-borne pathogens. The study's authors distinguished four prominent rhizosphere microbiome processes: 1. Rhizosphere effect: plants nurture a vast community of commensal and mutualistic microbes in the rhizosphere; 2. Soil fungistasis: in microbially active soils, soil microbiota inhibit germination of spores of soil-borne fungal pathogens; 3. Microbiome recruitment: in response to biotic or abiotic stress, plants can actively reshape their root microbiome and recruit specific beneficial microbes to their roots that can aid in the alleviation of the experienced stress, while repressing others; 4. Root immune suppression: beneficial rhizosphere microbiota can evade or suppress MAMP-triggered immunity in roots.

Soil fungi act like a support network for trees, a new study shows. The University of Alberta

(Canada) study, published in the *Journal of Ecology*, is the first to show that the growth of adult trees is linked to their participation in fungal networks living in the forest soil. Though past research has focused on seedlings, these findings give new insight into the value of fungal networks to older trees – which are more environmentally beneficial for functions like capturing carbon and stabilizing soil erosion. When they colonize the roots of a tree, fungal networks act as a sort of highway, allowing water, nutrients and even the compounds that send defense signals against insect attacks to flow back and forth among the trees.

The network also helps nutrients flow to resource-limited trees "like family units that support one another in times of stress," said researcher Joseph Birch, who led the study for his Ph.D. thesis in the university's Faculty of Agricultural, Life & Environmental Sciences. Cores taken from 350 Douglas firs in British Columbia showed that annual tree ring growth was related to the extent of fungal connections a tree had with other trees. "They had much higher growth than trees that had only a few connections." The research also showed that trees with more connections to many unique fungi had much greater growth than those with only one or two connections.

"We found that the more connected an adult tree is, the more it has significant growth advantages, which means the network could really influence large-scale important interactions in the forest, like carbon storage. If you have this network that is helping trees grow faster, that helps sequester more carbon year after year." It's also possible that if the trees grow faster, they'd have some ability to better survive drought that is expected to intensify with climate change, he added. "These networks may help them grow more steadily even as conditions become more stressful and could even help buffer trees against death." Birch hopes his findings lead to further studies in different kinds of forests in other geographical areas, because it's likely that the connections among trees change from year to year.

"It's a very dynamic system that is probably being broken apart and re-formed quite a bit, like family relationships, so we don't know how they will change under future climates either. Maybe a dry year or a beetle outbreak impacts the network. Knowing whether fungal networks are operating the same way in other tree species could factor into how

we reforest areas after harvesting them, and it could inform how we want to plant trees to preserve these networks."

A European project has been launched to seek biological alternatives for mushroom cultivation.

The goals of Europe's Bioschamp project – which brings together five research technology centers, three large companies, and four SMEs from the Netherlands, Spain, and the United Kingdom among other countries, including the Fertinagro Biotech company from Teruel, – are to find an alternative, of biological origin, to fungicides and pesticides in order to combat diseases that affect mushrooms, as well as an alternative sustainable substrate and biostimulant. According to Herminia de la Varga, the project's technical manager and head of research projects at Fertinagro Biotech, the initiative comes at a time when "these substances of chemical origin are going to disappear due to changes in European regulations.

Currently, there is only one product of biological origin," she said. "The substrate on which these mushrooms are grown has a peat base. It isn't banned at the moment, but it is a component of fossil origin that will also be regulated because it is a limited resource." According to data from 2017, the mushroom industry is valued at 33,000 million euro in the EU and projections indicate it will reach 66.8 billion euro in 2026. The Netherlands is the main European producer.

Personnel

Symborg has named Francisco Javier García Domínguez as new chief marketing officer. He will

lead the company's marketing strategy at the international level as well as product positioning in the more than 50 countries where the company has presence. Domínguez has over 15 years of experience as an agricultural engineer specialized in plant biotechnology. He has held technical and commercial positions and led teams in multinational companies in the agrobusiness sector, such as Dow AgroSciences. Recently, he has worked as a director of plant response in Europe, the Middle East and Africa.

Salman Mir, executive vice president and chief operating officer of Pace International LLC and Mycorrhizal Applications LLC, both subsidiaries of Valent BioSciences, has been named chief commercial officer of Valent BioSciences and is being promoted to president of Pace International. He returns to Valent BioSciences headquarters in Libertyville, IL, where he served as vice president of global marketing and business management earlier in his career. Mir was also head of AgroSolutions Division International (Asia Pacific) and general manager of Sumitomo Chemical Asia (SCA).

In his new role, Mir will strengthen the company's overall commercial organization and elevate the development and execution of its global sustainable solutions platform in partnership with Valent U.S.A. and Sumitomo Chemical Co., Ltd. affiliates around the world to generate increased global growth. Mir will relocate to Valent BioSciences' global Biorational Headquarters in Libertyville from Pace International's headquarters in Wapato, Washington.

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CropLife America (CLA) has elected Paul Rea as its newest chair of the CLA board of directors. Rea



Upcoming Events

New Ag International Brazil: 17-19 November 2020

★ FREE TO ATTEND! ★

Join us this November for an online digital experience that will provide the latest technical insight into Biocontrol, Biostimulants/Biofertilizers and Slow- and Controlled-Release Stabilized Fertilizers (SCRSFs) within the Brazilian markets. This digital event will be delivered in English and Portuguese.

will hold the position for two years and will work with CLA's president and CEO Chris Novak. Rea succeeds Susanne Wasson of Corteva Agriscience. Born and raised on a farm in New Zealand, Rea is the senior vice president of BASF Agricultural Solutions North America.

He oversees production, research and development, sales, marketing and all other operations for BASF's crop protection and seed business in the US and Canada, as well as the turf and ornamental, and pest management lines of business in North America.

David Zilber joins fermentation forces with Chr. Hansen. For the past five years, Zilber was the head of fermentation at Noma restaurant in Copenhagen. Zilber will grow his ideas in his own fermentation kitchen which Chr. Hansen is currently building.

Sherm Hollins and Tim Riley have joined Certis USA as key account managers. Hollins, with two decades of experience in the agriculture industry, was previously with NewLeaf Symbiotics, Arysta, LifeScience, Becker Underwood/BASF and AgData. He will serve his customers from a base in Waxhaw, North Carolina. Riley has nearly 30 years' experience in the agriculture industry, most recently with Amvac Chemical and previously with Crop Data Management Systems and Caterpillar, Inc.

Robert Sergeant has joined UPL North America as a territory sales manager. He will work directly with customers in western New York and Pennsylvania. Sergeant is a resident of New York and attended the State University of New York College at Oswego, where he received his bachelor's degree in physics. He joins UPL from Nutrien Ag Solutions, where he worked as territory sales manager for more than a decade.

Paul Townsend was appointed to the role of chief financial officer with Nufarm. Townsend's 30-year career includes CFO roles with Asaleo Care, Pacific Hydro, Futuris Automotive Group and, most recently, Monash University. He holds a Bachelor of business (accounting) from Swinburne University of Technology and is a Fellow of the Institute of Chartered Accountants, Australia. He will start his role with Nufarm on Dec. 1.

Edgar Godoy has been named biological solutions advisor at BioWorks. In his new position, Godoy will be increasing BioWorks ability to deliver personalized solutions, programs and support to customers in central and western California. Godoy has 20 years of experience in the agriculture industry, with his most recent experience being an agronomist at AG RX in California serving specialty ag and nursery customers as a PCA, CCA. He previously held positions at USDA-APHIS MOSCAMED and Frutera Real-Fyffes.

2BMonthly Inquiries

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A DunhamTrimmer LLC and New Ag International SARL Publication
Info@2BMonthly.com
<http://www.2BMonthly.com>

DunhamTrimmer LLC
11523 Palmbrush Trail, Suite 301
Lakewood Ranch, FL 34202 USA
Inquiry@dunhamtrimmer.com

New Ag International Sarl
37 avenue de Friedland
75008 PARIS
France
newag@newaginternational.com

Rick Melnick - Editor
Mobile: +1 224.548.0768
Email: Rick@DunhamTrimmer.com

Mark Trimmer - Editor
Mobile: +1 608.628.2654
Email: Mark@DunhamTrimmer.com

Luke Hutson - Editor
Tel: +44 (0)20 755 19943
Email: luke.hutson@newaginternational.com

Manel Cervera - Editor
Mobile: +34.667.93.55.24
Email: Manel@DunhamTrimmer.com

Janet Kanters - Editor
Mobile: +1 403.901.4559
Email: Janet.Kanters@newaginternational.com

Jacqui French - Sales and Marketing
Office: +44 (0)203 4576 305
Email: Jacqui.French@2BMonthly.com

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