

# The biocontrol business world meets at ABIM Basel



**T**he 12th ABIM takes place yet again at the Congress Center Basel, 23rd-25th October and this year's meeting promises to be bigger and busier than ever. ABIM is the premier global meeting for the biocontrol industry and is internationally recognised as the global platform for the industry to network, discover and unveil new products, market opportunities and research areas. This is a sector which is undergoing rapid growth and has been for several years. But as well as promoting biocontrol and networking it is the platform to liaise with and inform policy makers and regulators of the specific needs of our unique growth industry.

During the three days of last year's 11th Conference, 898 delegates from 48 countries representing 426 companies and organisations from all over the globe were present and exchanged experiences and obtained information on the latest products and developments on the world market. This year it is expected that the attendees will break the 1000 delegate number for the first time.

## Exhibition

This year the ABIM exhibition cover the Foyer, Sydney and Singapore Halls. Over 65 exhibitors will fill the rearranged and improved exhibition space. Should you not be familiar with all the names or are a first-time visitor, we have prepared a handy reference guide for you to take around the exhibition hall with you or for reference after the event. We have tried to summarise in a

## Keynote Speakers

The history of commercial mass production of natural enemies spans a period of roughly 120 years and has become a successful, environmentally and economically sound alternative for conventional pest control. For ABIM 2017 the two keynote speakers represent different aspects of biocontrol and will be presenting how their companies have helped change pest management practices; Monday - Paul Koppert and Tuesday - Ulrich (Ulli) Kuhlmann.



*With 50 years history to refer to, Koppert Managing Director, Paul will present '50 Years as a Company in Biocontrol'. A solid family firm, Koppert has grown from a Dutch enterprise to a truly international operation and has expanded its product offering from parasites and predators to a portfolio that now includes pollinators, microbials and biostimulants. Paul will not only look back at the founding of Koppert and the years of endeavour leading up to the present day but consider the opportunities that still lie ahead.*



*Ulli has been with CABI since 1989 and was appointed to his current role of Executive Director, Global Operations in 2016. In his time, he has built up the Integrated Crop Management Team at CABI. CABI not only provides solutions but information and expertise that is applied to solve practical problems in agriculture and the environment. On Tuesday evening, Ulli will explain how, the 'Uptake of Augmentative Biological Control Solutions by Extension Services in Africa and Asia' has improved people's lives worldwide.*

few words what each of the companies do, but please don't take our word for it. Get in touch with them directly; their website details are also included (see p260).

## Programme highlights to look forward to

It seems traditional now at ABIM to kick off with a review of the regulatory issues and consider the hurdles that are still to be overcome. This year is no different. After the near unanimous vote by the European Parliament on a resolution on accelerating low

risk pesticides coming to the market, progress has been slow, even though the industry and its supporters know there is a need to have more low risk pesticides on the market. Biocontrol products however are caught up in the Commission's Regulatory Fitness and Performance (REFIT) programme that is also underway. It is feared that the Refit programme will take many years to conclude, if anything will happen at all. On Tuesday morning Ulf Heilig and David Cary (IBMA) outline the IBMA Strategy for regulation of biocontrol. DG Sante has signed the contract for



conducting the REFIT exercise on 2 pieces of legislation that impact Plant Protection Products (PPPs). One of these pieces of legislation is dealing with maximum residue limits (mrls) and has little direct impact currently on the biocontrol sector. The other piece of legislation is EC Reg. 1107/2009, the major regulation impacting biocontrol active substances and products. In addition on Tuesday morning, two presentations by Patrizia Pitton of DG Sante, will hopefully provide some updates on REFIT of 1107/2009 and the achievements of EU expert group for sustainable plant protection. These talks should prove interesting to all.

As always, the speaker sessions provide opportunities to companies to present information on new products within their own specialised groups - natural and biochemicals, semiochemical, macrobials and microbials although the talks are open to all of course. Among the subjects to be considered this year are

In the natural and biochemical part of the programme Marrone Bio will be giving their update to Grandevo registration in EU, after many years of availability elsewhere and Dow Agrosiences has a new molecule from fermentation product, while IOBC consider new biopesticide characterisation.

Popular as ever, the macrobials have a busy session with Koppert Biological Systems introducing an improved predatory mite release system while Crop Defenders look at the problem, current solutions and future steps towards biological control of pepper weevils (*Anthonomus eugenii*). The science of using bees to deliver plant treatments has been demonstrated by various parties and Bee Vectoring Technologies will be showing how they deliver biologicals to crops using pollinators. Bioline AgroSciences Ltd considers applied genetics and the future of IBCA selection while Biobest take the use of macrobials to new lengths with a consideration of the great outdoors and Wales based Bionema offers an improved and unique solution for better performance of Entomopathogenic nematodes (EPNs) for pest control.

In the semiochemical session there is iScout, a new multiple trapping device from Pessl Instruments and Isonet T a mating disruption product for Tuta absoluta from CBC Europe.

The microbial professional group talks look at the increasing use of microbial pesticides, and developments in the food value chain. A key presentation on the Bacillus food contamination issue and for those who have not read the paper see 'In defence of Bacillus thuringiensis, the safest and most successful microbial insecticide available to humanity—a response to EFSA' (<http://bit.ly/2eZrdkr>), Ben Raymond from the University of Exeter will be giving a recount of his published scientific view of the EFSA opinion on Bacillus. Also in the microbial session, Biocontrol Technologies looks at Communication between plants and *Trichoderma* spp.; AIT consider Technologies to generate endophyte improved seed; Andermatt Biocontrol talks on the use of baculoviruses in IPM strategies and Certis USA present Lifeguard – a new microbial product. David Cary (IBMA Executive Director) also contributes with his talk 'Where to from here?'

Of course, new products do not just arrive on the market by themselves. Research is key. Session six will be of interest to learn how one high profile and EU funded project has fared in delivering new potential products with Wageningen updating the meeting on Biocomes, which draws to a close this December. Project partners expect to have developed 11 new biological control products to control a number of pests and diseases in agriculture and forestry.

From the US, we will also get to hear about the IR-4 project. For over forty years, the Interregional Research Project #4 (IR-4 Project) has been the major resource for supplying pest management tools for specialty crops by developing research data to support registration clearances. Traditionally new pest management products were developed by agrochemical companies who conduct only limited research on specialty crops. This resulted and still results in few pest management options being labelled for specialty crop growers. In 1963, the

## Exhibitors in alphabetical order

Organisation	Stand Number
2B Monthly	39
ACTION PIN	46
Agrauxine SA	59
AGRAUXINE/METASPORA	21
Agri.2000 Net Srl	7
AGRI LIFE	63
Agrifutur SRL	61
AIT Austrian Institute of Technology GmbH	68
ANADIAG Group	51
Andermatt Biocontrol AG	53
Applied Insect Science (APIS) Ltd	10
BASF SE	56
Bayer CropScience LP	31
BEIJING Kingbo Biotech Co. Ltd.	19
BEIJING MULTIGRASS FORMULATION CO., LTD	15
Bernard Blum Award	26
Biobest Belgium NV	66
BIOCOMES, EU project	28
BIOFA AG	50
BIOBERICA S.A.U.	57
Bioline AgroSciences Ltd.	69
Bionema Limited	30
BIOPREPARÁTY, spol. s r.o.	36
BIOTECHNOLOGIE BT S.r.l.	12
CBC (Europe) s.r.l.	43
CEHTRA	1
Chemsafe s.r.l.	8
Cytozyme	22
ÉLÉPHANT VERT	42
E-Nema GmbH	64
Eurofins Agrosiences Services	32
EXPEDIA MRCC SRL	29
Exponent International Ltd.	48
Fortune Biotech Limited	20
FUTURECO BIOSCIENCE S.A.	35
GAB Consulting GmbH	65
HSE (UK)	9
IBMA	25
IDAI NATURE.SL	24
IF TECH	34
Innovative Environmental Services (IES) Ltd.	16
International Panaacea Ltd	11
International Pheromone Systems Ltd (IPS)	5
Janssen PMP	33
JRF GLOBAL	27
Kan biosys Pvt. Ltd.	3
Koppert Biological Systems	54
Lallemand Plant Care	67
Meister Media Worldwide	6
Nico Orgo	41
NSure B.V.	49
OMNIUM AGRICOLE DU SOUSS	58
ORO AGRÍ	60
Progema/Neudorff	2
PROMOVERT CROP SERVICES S.L.	52
Russell IPM	62
Seipasa S.A.	55
Serbios Srl	4
SGS Group	37
SP Sourcon Padena GmbH	23
Sumitomo Chemical Agro Europe	47
Syngenta Crop Protection AG	70
T Stanes and Company Limited	14
Technology Sciences Group Inc.	13
Trifolio-M GmbH	44
Vegenov	38
VEGEPOLYS	45



Land Grant Universities recognized this need and established the IR-4 Project to provide a means for U.S. growers to have specialty crops included on pesticide labels. The success of the IR-4 Project, with additional USDA funding, is proven and can be measured in its development of data to support nearly 20,000 food use and ornamental horticulture label clearances. Krista Coleman of the IR4 Initiative will explain how it can be possible to lower the regulatory hurdles for biopesticides.

How products are regulated continues to be a subject not just for biocontrol products. In July, the imco committee of the European Parliament voted to support innovation and promote a single market for biostimulants. Further they asked for better definition of biostimulants and clarification of the boundary with plant protection products

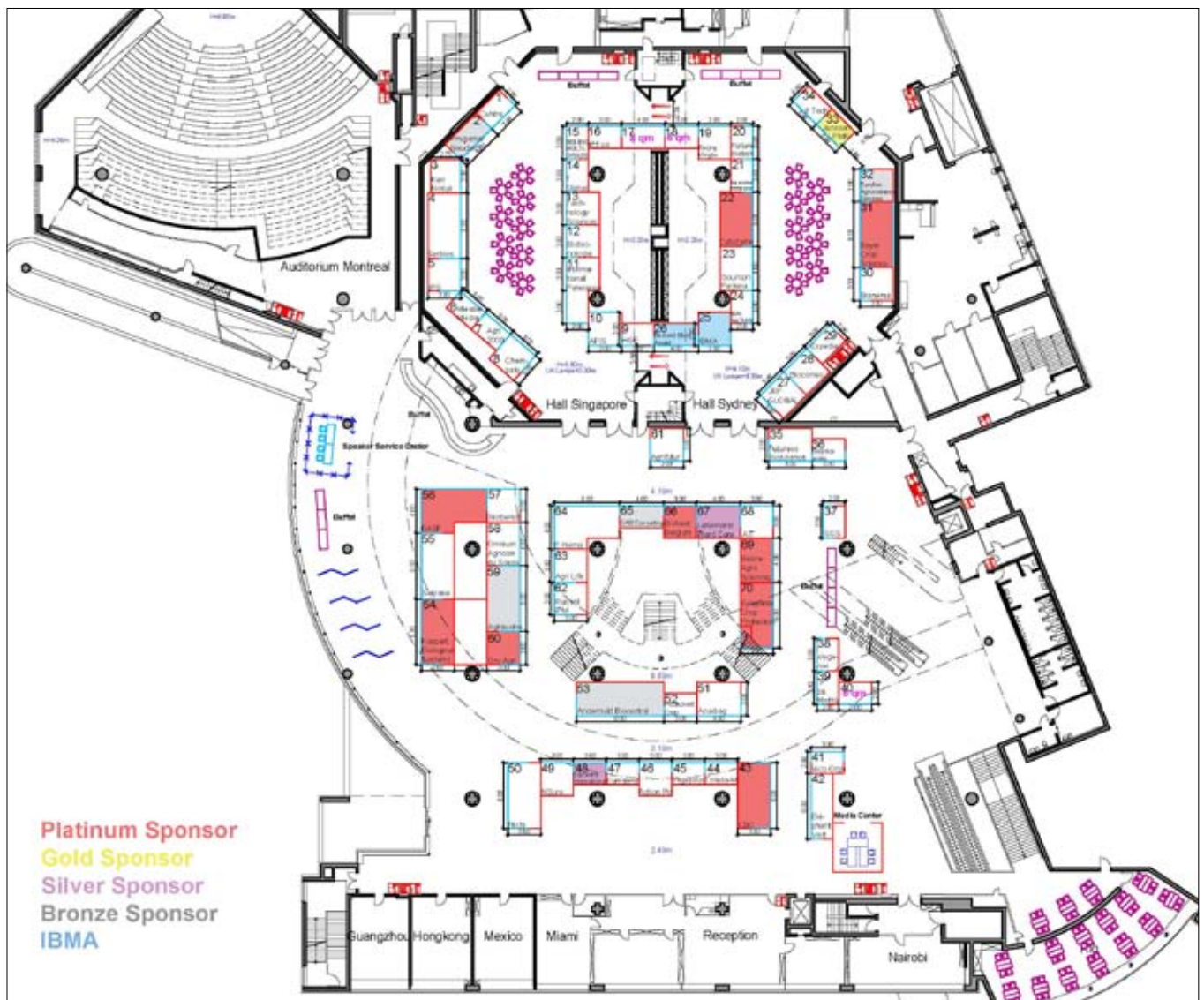
and identified a need to develop safety criteria and harmonized standards, in particular for micro-organisms. As part of Tuesday afternoons session Kristen Sukalac of EBIC will be talking about bringing biostimulants to the market with new regulations – could the grey market for biostimulants be finally closing?

ABIM would not be ABIM without a good panel discussion. On Wednesday, morning the topic is Innovations influencing implementation of biocontrol on farm, with contributions from Hubertus Paetow (DLG), Marc Trapman, Vittorio Veronelli (CBC Europe), Antoine Bonhomme (Bioline AgroSciences), Ingeborg Klingen (NIBIO). The speakers will be joined by Willem Ravensberg, IBMA and Jean-Philippe Azoulay, ECPA.

We can as always only give you a flavour of what is to come at ABIM. We will do our best to capture the key discussions and debates and report back here shortly. However, you could always go and experience the 3 days for yourself. So if you are thinking of going and have not yet booked (we go to print in September) registrations closes on the 15th October. Avoid the queues at the registration desk and book on-line now.

■ Visit [www.abim.ch](http://www.abim.ch) for more information.

The full exhibitor reference guide is shown overleaf on page 260.



**ABIM 2017 Exhibitor List (ordered by stand number)**

Stand Number	Organisation	Country	Website	Activity	Some key brands
1	CEHTRA	France	www.cehtra.fr	Service: Offers scientific and innovative solutions ensuring regulatory compliance of chemicals to international obligations.	
2	Progema/Neudorff	Germany	www.progema-plantcare.com	Progema GmbH is a brand belonging to W. Neudorff GmbH, producing and marketing effective and environment-friendly products of high-quality for professional users.	
3	Kan biosys Pvt. Ltd.	India	www.kanbiosys.com	A specialized agri-biotech company working in the field of plant nutrition and pest management. Committed to bring full plant potential to life by microbial inputs and precision agriculture.	Brigade, Nernastin, Tricho-Shield, Caterpillin-New, Sudo, Spida, Taba, Vitormone, Taba Drip, Bioplin, B-seepe, Phosfert
4	Serbios Srl	Italy	www.serbios.it	Offers a broad line of biocontrol products to the Italian market	Neemik, Asset, Carpostop, Kristal
5	International Pheromone Systems Ltd (IPS)	United Kingdom	www.internationalpheromone.co.uk	Develops, produces and supplies high-quality insect semio-chemical based products and their associated trapping systems	Unitrap
6	Meister Media Worldwide	United States	www.meistermedia.com	Media: From a single magazine, American Fruit Grower, Meister Media Worldwide provides information and networking opportunities to global markets	AgriBusiness Global, American Fruit Grower, American Vegetable Grower, Western Fruit Grower
7	Agri 2000 Net Srl	Italy	www.agri2000.it	Service: Providing solutions and advanced technological services since 1985. in 3 areas Biology division, Economics & Food Chain Division, Environment & Urban Green Division.	
8	Chemsafe s.r.l.	Italy	www.chemsafe-consulting.com	An Italian independent consulting and project management company offering specialized services to Agrochemicals, Biocides, Chemicals, Petrochemicals and Pharmaceutical companies	
9	HSE (UK)	United Kingdom	www.hse.gov.uk/pesticides	Service: The UK's national regulator and provider of guidance on authorisation for pesticides used in agriculture, horticulture or the home garden (plant protection products).	
10	Applied Insect Science (APIS) Ltd	United Kingdom	www.appliedinsectscience.com	Research: a contract research facility for biopesticides. A GLP laboratory providing guideline and bespoke studies for active substances and products with a core expertise in microbial pesticides.	
11	International Panaacea Ltd	India	www.iplbiologicals.com	Specialises in biological solutions for agriculture applications with over 50 products in disease and pest management, plant nutrient & health management, and soil management.	Milgo, Mildown, Phasal Rakshak, Neem Kavach, Nematofree+
12	BIOTECNOLOGIE BT S.r.l.	Italy	www.biotecnologiebt.it	Service: Specialist in GLP and GEP, experienced in Test Facility for environmental impact assessment of agrochemicals, chemical and biological products, veterinary medicinal products, biocides.	
13	Technology Sciences Group Inc.	United States	www.tsgusa.com	Service: provides state, federal and international expertise on a wide range of scientific and regulatory issues.	Symbion
14	T Stanes and Company Limited	India	www.tstanes.com/index.php	Engaged in manufacturing and marketing a broad range of biocontrol and fertilizer products	Nimbecidine, Bio-Cure
15	BEIJING MULTIGRASS FORMULATION CO., LTD	China	www.chinabaicao.com	Besides plant sourced products, the company works with a broad range of biological products including Spinosad.	
16	Innovative Environmental Services (IES) Ltd.	Switzerland	http://www.ies-ltd.ch	Service: Contract research organisation offering scientific studies to ensure the safety of the tested products and confirm that the products adhere to international environmental guidelines.	
19	BEIJING Kingbo Biotech Co. Ltd.	China	www.kingbo.com.cn	Producers of organic botanical products, specialized in extractions and combinations with traditional Chinese insecticidal, bactericidal and antiviral plants	
20	Fortune Biotech Limited	India	www.fortunebiotech.com	The world's largest manufacturers of Azadirachtin from the seeds of neem tree, Azadirachta Indica	FortuneAza, Fortuneem
21	AGRAUXINE/METASPORA	France	www.agrauxine.com	See Agrauxine	
22	Cytozyme	United States	www.cytozyme.com	Proprietary processes technologies that address crop growth. By supporting the formation of natural metabolites in cells, products help improve growth, resilience, and quality.	
23	SP Sourcon Padena GmbH	Italy	www.sourcon-padena.com	100% biological and free from genetic engineering – treatments and soil enhancers from for high quality potatoes, turf and salad plants.	Proradix, Deposan, Salavida, Ekoprop
24	IDAI NATURE.SL	Spain	www.idainature.com	Offer unique natural solutions for growing fruit and vegetables without chemical residues, using mixtures of vegetable and mineral extracts to produce totally natural agricultural inputs.	System Max, Nematicem, Equimax, Vegex
25	IBMA	Belgium	www.ibma-global.org	Association: The trade association representing the manufacturers of biocontrol solutions	
26	Bernard Blum Award	Belgium	www.ibma-global.org	Industry award for novel biocontrol solutions that will make an impact on this rapidly growing market.	
27	JRF GLOBAL	India	www.jrfglobal.com	Service: Offers comprehensive non clinical GLP research services for worldwide regulatory submissions.	
28	BIOCOMES, EU project	EU	www.biocomes.eu	An EU funded project to stimulate the development of biological control products. The BIOCOTES project runs from 1 December 2013 until 30 November 2017.	
29	EXPEDIA MRCC SRL	Italy	www.medregexpedia.com	Service: A regulatory consulting company specializing in regulation and registration of end-user commercial products such as plant protection products, biocidal products, fertilizers etc.	
30	Bionema Limited	United Kingdom	bionema.com	A biopesticide product testing and technology development company, with a product line of nematode products.	Nematrident
31	Bayer CropScience LP	United States	www.biologics.bayer.com	An agrochemical major that has acquired a biological product line through AgraQest and Prophya. Has developed a unique technology for the mass production of filamentous fungi.	Serenade, Rhapsody, Sonata, Ballad, Requiem, Votivo, Contans, BioAct/Meloccon
32	Eurofins Agrosiences Services	United Kingdom	www.eurofins.com/agroscienceservices	Service: Within the Agrosience division, activities involve conducting field and laboratory studies to determine the safety and efficacy of new agrochemicals and crop varieties.	
33	Janssen PMP	Belgium	www.janssenpmp.com	Specialists in post-harvest disease management	
34	IF TECH	France	www.iftech.fr	The product line is based on several natural solutions to protect the plants and optimize their development: beneficial insects, entomopathogenic fungi and nematodes.	Chrysor, Mycor, Nemador
35	FUTURECO BIOSCIENCE S.A.	Spain	futurecobioscience.com	Leaders in industrial R&D&I and in environmental friendly agricultural biotechnology. Has 5 business lines associated with plant protection and nutritional products.	NoFly, Rutastar, Bestcure, Biolasting, Algaliv, Bioradicante, Botamisol, Citogrower, Frutaliv, Futop, Vitalem forte, Fito Maat
36	BIOPREPARÁTY, spol. s r.o.	Czech Republic	www.biopreparaty.eu	Development of Pythium oligandrum to suppress phytopathogenic fungi.	Polyversum
37	SGS Group	Switzerland	www.sgs.com	The world's leading inspection, verification, testing and certification company.	



Stand Number	Organisation	Country	Website	Activity	Some key brands
38	VegeNov	France	www.vegenov.com	Service: a non-profit organization specialized in plant science applied research.	
39	2B Monthly	France/ United States	www.2bmonthly.com	Media: A single source of cutting-edge news on Biocontrol & Biostimulants, the fastest growing industries in inputs supplied to agriculture.	2BMonthly
41	Nico Orgo	India	www.neemnico.com	Manufacturers of Organic agricultural inputs certified by Organic Farmers and Growers	Bioniconema, Neem-F, Neemate, Nico Neem, PowerAll, T-Harz
42	ÉLÉPHANT VERT	France	www.elephant-vert.com	Supplier of natural solutions to Europe and North Africa markets (Morocco, Mali, Senegal) including entomopathogenic fungi (Beauveria, Metarhizium, Isaria) and biostimulants	Organova, Fertinova, Novastim, Novaprotect
43	CBC (Europe) s.r.l.	Italy	www.biogard.it	Merged companies of CBC (Europe) and Intrachem Bio Italy. Combines the worlds leading pheromone mating disruption company (Shin Etsu) with biofungicides and bioinsecticides	Isonate, Isonet, Lepinox, Naturalis, Rapax
44	Trifolio-M GmbH	Germany	www.trifolio-m.de	Supplies biological plant protection products, biocides, pheromones and other ready to use products.	NeemPro, NeemAzal, Tripheron
45	VEGEPOLYS	France	www.vegepolys.eu	Service: a French cluster dedicated to plants, designed to build innovative projects between firms, research centers and training organizations.	
46	ACTION PIN	France	www.action-pin.fr	"Spécialités" department of DRT (Resinic and Terpenic Derivatives), a specialist of the products resulting from the resin of the Pin, and in particular the Landes Pin.	Saniterpen, Enzy-pin, Helioterpen
47	Sumitomo Chemical Agro Europe	France	sumitomochemicaleurope.eu/ sumitomo-chemical-agro-europe	Agrochemical major: Sumitomo Chemical's European Regional Headquarter for Plant Protection activities (insect, disease, weed control), and plant growth regulators	Dipel
48	Exponent International Ltd.	United Kingdom	www.exponent.com	Service: Active in assisting clients with human health, environmental, engineering and regulatory issues associated with new products or processes.	
49	NSure B.V.	Netherlands	www.nsure.eu	A global leader in gene activity measurements in the agricultural chain.	
50	BIOFA AG	Germany	www.biofa-profi.de	A leading provider to the German biological plant protection sector is conducting EU-level registrations for biopesticides with lime sulphur, diatomaceous earth, potassium bicarbonate	AlgoVital Plus, AminoVital, Cocana, CURATIO, Equisetum Plus, InsectoSec, Myco-Sin, PottaSol, SilicoSec, Tillecur, VitiSan
51	ANADIAG Group	France	www.anadiag.fr	One of the leading CROs (Contract Research Organization) in Europe, providing a wide range of services for the registration of synthetic or natural, existing or new, Plant Protection Products.	
52	PROMOVERT CROP SERVICES S.L.	Spain	www.promovert.com	Service: Focused to provide global services for testing Plant Protection Products, BCA (Biological Control Agents), seed varieties, fertilizers and growing agents.	
53	Andermatt Biocontrol AG	Switzerland	www.biocontrol.ch	Company goal is to replace chemical pesticides with good biological alternatives, such as beneficial insects, microbial control products and traps.	Madex, Capex, Bb-Protec, AmyProtec 42
54	Koppert Biological Systems	Netherlands	www.koppert.com	Probably the worlds leader in the supply of beneficial insects and has added other macrobrial biocontrol agents and biostimulants	Numerous beneficial brand names, Triatum
55	Seipasa S.A.	Spain	www.seipasa.com	Produces a full range of natural treatments for a agriculture sector without residues. Active include pyrrtherum and purified vegetable oleins.	Pirecris, Septum, Nakar, Cinnerate, Kynetic4, Sweetsei, Seiland, Seisil, Till-up
56	BASF SE	Germany	agriculture.basf.com/en/Crop-Protection/Biologicals.html	An agrochemical major. Biologicals include Bacillus amyloliquifaciens, Beauveria bassiana, beneficial nematodes (formerly Becker Underwood) and naturally-occurring fungi.	Serifel, Broadband, Nemasys, Green Muscle and Green Guard
57	BIOIBERICA S.A.U.	Spain	www.bioiberica.com/plant-health	Company has developed a specific range of products, based on aminoacids, which act naturally to promote plant biostimulation, nutrition and protection. Also have fruit fly mass trapping technology.	Terra-Sorb, Terramin, Stresal, Inicium, Equilibrium, AminoQuelant, Cer-Trap
58	OMNIUM AGRICOLE DU SOUSS	Morocco	groupesaos.com	Supplier of plant protection products in Morocco	Biogene, Agibbelline, Exilis, Novagib
59	Agrauxine SA	France	www.agrauxine.com	The business unit of Lesaffre, dedicated to plant care. Developing and manufacturing products from microorganisms for crop protection, biocontrol and stimulation of plants, biostimulation.	Esquive, Trisoil, Smartfoil, Pushy,
60	ORO AGRI	Netherlands	www.oroagri.com	Development and commercialization of a broad range of highly effective, low environmental impact biorational products.	Prev-am, Transformer
61	AgriFutur SRL	Italy	www.agrifutur.com	Develops, produces and markets a line of beneficial microorganisms, including soil inoculants.	
62	Russell IPM	United Kingdom	http://www.russellipm-agriculture.com	Originally a pheromone specialist has now extended the range to include biocontrol and biosurveillance products	Antario, Biomax, Biotrine, Ceranock, Fytoclean, Fytomax, Lycocom, Matrixine, Recharge, Zonatrax
63	AGRI LIFE	India	www.agrilife.in	A research based agri-biotech manufacturing enterprise based in Hyderabad, India focusing on bio solutions for crops and soils.	
64	E-Nema GmbH	Germany	www.e-nema.de	Not only produces insect-pathogenic nematodes, but also a range of additional biological plant protection agents based on microorganisms.	
65	GAB Consulting GmbH	Germany	www.gabconsulting.de	Service: A leading consulting company in Europe in the field of biopesticides having submitted dossiers for 27 strains or isolates from 17 microbial species for approval as active substances in the EU.	
66	Biobest Belgium NV	Belgium	www.biobestgroup.com	Primary global supplier of beneficial insects and nematodes and bumble bees for pollination	Asperello T34 Biocontrol, Bluestim
67	Lallemand Plant Care	Switzerland	www.lallemand.com	An active proponent of biological plant care solutions, developing, producing and marketing fungal, bacterial and yeast biocontrol products, biofertilizers and biostimulants.	Mycostop, Rotstop
68	AIT Austrian Institute of Technology GmbH	Austria	www.ait.ac.at	Austria's largest Research and Technology Organization (RTO).	
69	Bioline AgroSciences Ltd.	United Kingdom	www.biolineagrosciences.com	A long established (under different owners) UK based global supplier of beneficial insects.	Amblyline, Encarline, Exhibitline
70	Syngenta Crop Protection AG	Switzerland	www4.syngenta.com	Agrochemical major working with 8 key crops, crop protection products and seeds. Are developing a new line of biocontrols based on RNA	

Prepared as of 15th September - our apologies to any late additions.