

crop protection monthly

international news, comments, features and conference reports

31 December 2012 – Issue 277

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LEAD ARTICLE

ABOUT TURN ON GMS?

In his first major speech on agriculture since taking up his new post in September 2012 the UK government's Environment Secretary, Owen Paterson, said that farmers, policy makers and scientists had a duty to turn around the image of GM. Speaking at the recent Oxford Farming Conference he went on to say: "We should not be afraid of making the case to the public about the potential benefits of GM beyond the food chain, for example, reducing the use of pesticides and inputs such as diesel. I believe that GM offers great opportunities but I also recognise that we owe a duty to the public to reassure them that it is a safe and beneficial innovation."

British author and environmentalist Mark Lynas gave his support too at the conference. He apologised to delegates for previously opposing GM crops. He said: "The risk today was not that anyone will be harmed by GM food but that millions will be harmed by not having enough food, because a vocal minority of people in rich countries want their meals to be what they consider natural." He concluded that people who want to stick with organic are entitled to - but they should not stand in the way of others who would use science to find more efficient ways to feed billions. "The GM debate is over. It is finished. We no longer need to discuss whether or not it is safe...You are more likely to get hit by an asteroid than to get hurt by GM food." (www.marklynas.org/2013/01/lecture-to-oxford-farming-conference-3-january-2013).

Mr Paterson's views on GM food are understood to be shared by a number of his government colleagues, including David Willetts, the science minister. Senior Liberal Democrats are also believed to be open to a change in policy. David Heath, the Lib Dem farming minister, told farming groups last month that GM food was "one of the tools in the box" for increasing food production.

However, the official policy on GM crops is still "precautionary, evidence-based and sensitive to public concerns". It describes the technology as "not wholly good or bad." The Coalition has so far allowed small-scale cultivation trials for GM food but its widespread use is effectively banned.

The government recently ran a low-key consultation exercise about new 'agri-tech' measures to increase the efficiency of British farms. The consultation sought views on options including the increased use of GM crops. A formal ministerial response is due next year, but insiders say the exercise is likely to lead to an increase in the use of the technology.

Environmental campaigners have urged caution. The Soil Association said a survey that showed that the number of people who thought GM food "should be encouraged" dropped from 46 % in 2002 to 27% in 2012. Tom MacMillan, director of innovation at the Soil Association, said the world could be fed through techniques such as plant breeding which do not threaten the environment.

However, Mr Paterson has described consumer opposition to the technology as a "complete nonsense" and said that GM food had "real environmental benefits". People were even eating it in London restaurants without knowing it, he said. The Prime Minister's office has backed Mr Paterson's comments, insisting that the PM was pushing officials at the European Commission to make the regulatory system governing GM crops "more efficient and more effective".

Meanwhile the UK's Rothamsted Research has confirmed it is planning to plant GM wheat in fields in Hertfordshire. A spokesperson said that despite protests in 2012 the research institute will continue with its experiment (www.rothamsted.ac.uk/Content.php?Section=AphidWheat&Page=Protest). The scientists are trying to create the world's first GM strain to repel insects rather than kill them. "The level and extent of the security next year will be dependent on any threats we receive to destroy the experiment," he said. "We do hope opposition groups do take time to engage with us on this occasion." The research institute is also planning to plant GM oilseed rape. Rothamsted director, Professor Maurice Moloney, said at Cereals 2012 that inserting the right genes from marine organisms into crops, such as oilseeds and linseeds, could increase omega-3 fatty acids in the human diet and relieve the pressure on dwindling fish stocks.

EUROPEAN NEWS AND MARKETS

BAYER TAKES BACK SERENADE

Bayer CropScience is to take back the *Serenade* bio-fungicide business from BASF in the UK. The termination of the license reflects Bayer's desire to leverage its recent acquisition of AgraQuest. Under the termination agreement, Bayer CropScience will reacquire the worldwide control of the development and commercialisation of the *Bacillus subtilis* QST 713 fungicides, previously granted to BASF by AgraQuest. "We are pleased to bring the biofungicide family within the portfolio of Bayer CropScience," said Marcus Meadows-Smith, global head of Biologics at Bayer CropScience. "This step immediately enables us to bring growers crop solutions integrating *Serenade* in spray programmes with our portfolio of innovative fungicides." *Serenade* can be used on a wide range of crops, including potatoes and strawberries. Bayer CropScience intends to design solutions that integrate seeds, biologics and chemical crop protection products to deliver pest and disease control or yield gains and to meet the increasing demand for sustainably-produced food.

ARYSTA AND GOEMAR COLLABORATE IN EUROPE

Arysta LifeScience Corporation and Laboratoires Goëmar (www.goemar.com) have announced the conclusion of two agreements to develop and distribute biostimulants and biocontrol products. Arysta LifeScience acquires exclusive rights for identified products to operate in Central Europe (Poland, Czech Republic, Slovakia, Romania, Baltic countries and Hungary) and the Commonwealth of Independent States (Russia, Ukraine, Belarus, Moldova and Kazakhstan). Laboratoires Goëmar acquires exclusivity to develop and distribute the nitrophenol-based plant growth regulator *Atonik* in France, and access to Arysta LifeScience biostimulant and biocontrol products in France plus other countries in Western Europe. The two contracts also make it possible to expand cooperation to include new technologies under development.

"This mutual agreement is the result of a long, fruitful relationship between our companies," said Kevin Smith, CEO of Arysta LifeScience SAS and business unit head of Europe for Arysta LifeScience. "It strengthens the presence of Arysta LifeScience in this market segment with access to modern technologies. Customers may expect 'tailor-made' technologies delivering benefits to various crops." Jean-Pierre Princen, CEO Laboratoires Goëmar, added: "These contracts, combining technologies and the market strengths of both companies, should facilitate broader farmer access to innovative sustainable solutions for their crops, accelerate Goëmar sales growth in Central and Eastern Europe, and offer Goëmar sales force and customers a broader portfolio of solutions."

ECPA ANNUAL CONFERENCE

More than 200 representatives of the crop protection industry, regulators, national authorities and agricultural and environmental stakeholders gathered in Malta recently at the European Crop Protection Association's (ECPA) annual conference. Delegates considered the legislative and stewardship challenges in the context of fostering a productive, competitive, and sustainable European agriculture.

ECPA president Vincent Gros stated: "...in implementing Regulation (1107/2009), we must ensure that it reflects the best science and the realities of modern farming; focus needs to be on the safety of the products on the market." He added: "...through our actions and changes in our behaviour, we are going to ensure that the 'emotional and trust gap' which we experience with the public will not lead to a productivity and innovation gap."

The conference delegates reinforced the need for partnerships and stakeholder engagement to drive sustainability in agriculture. One year on, ECPA's *Time to Change* initiative (*CPM November 2011*) has led to new stakeholder cooperation and exposed the challenges that lie ahead. Hans Friedrich, European director for the International Union for Conservation of Nature (IUCN) and member of ECPA's Independent Advisory Board, stated: "Partnerships are the way forward, and we are willing to work with businesses that are open to change."

EUROPEAN AGRI-FOOD CHAIN CALLS FOR ACTION ON MINOR CROPS

The lack of plant protection products for minor uses and speciality crops is becoming a crucial factor for the future cultivation of these crops in the EU according to Luc Peeters, chairman of the Cop-

Cogeca (a group representing European farmers) working party on phytosanitary issues. He said: "The lack of proper tools compromises not only the competitiveness of the entire agri-food chain, including its sustainability and the employment generated, but also the diversity of high quality food in Europe." The European Commission was due to present a report to the European Parliament and Council on how to tackle the issue of minor uses and specialty crops on 14 December 2011, as foreseen under Regulation (EC) 1107/2009. However, the ongoing delay of its publication is not encouraging for European agriculture.

Since 2009, 10 EU associations representing the entire agri-food chain have been calling for solutions and proper investment schemes to support minor uses and speciality crops and to improve the availability of tailor made solutions for their protection. "This is a unique opportunity to improve the difficult situation on the ground and get ready to face new challenges in future," continued Mr Peeters. "Coordination across all twenty seven member states and support for data generation are key to ensuring the availability of solutions to control pests and diseases. We call on the European Commission to speed up the publication of the report and support an ambitious plan aimed at setting up a permanent EU programme for minor uses and speciality crops, accompanied by a coherent funding programme."

EUROPOL TACKLES ILLEGAL AND COUNTERFEIT PESTICIDES

Up to a quarter of all pesticides in circulation in some EU member states are thought to come from the illegal pesticides market. The illegal trade in pesticides represents over 10% of the total worldwide pesticides market, and is believed to be highly lucrative. Europol's director Rob Wainwright said that it was important to tackle the growing trade in illegal and counterfeit pesticides, especially because of the possible health risks. His comments were made following a recent conference organised jointly by Europol and the European Observatory on Infringements of Intellectual Property Rights (OHIM) and attended by police, customs and regulatory enforcement officers from all over the EU.

Tom McHale, manager for Global Product Defence at DuPont, explained that his company was doing all it could to help combat the growing problem of fake and illicit pesticides. "Our entire organisation is committed to stamping out this illegal and very costly activity. We always act upon any evidence we receive from our staff or our customers and engage the relevant authorities to take the appropriate action. The use of fake or illicit pesticides could result in significant damage to farmers' incomes and to the environment because these products have not been approved for use by regulatory authorities."

FRENCH LAUNCH IPM WEBSITE

The French Ministry of Agriculture has launched a website that brings together information on Integrated Pest Management (IPM) to help educate farmers, advisers and trainers. The website, *EcophytoPIC*, is designed to be a reference point for all sources of information relating to *Ecophyto*, France's National Action Plan (NAP) which has set the ambitious challenge of halving pesticide use nationally over the course of 10 years. As well as crop protection solutions the new site addresses concepts such as monitoring, decision support systems, training, innovation and research. The site also links to the ENDURE Information Centre (www.endureinformationcentre.eu) and IPM Training Guide. Besides the comprehensive French site, a number of other national online resources have been created in countries such as Denmark, Germany, Norway and the UK.

AMERICAN NEWS AND MARKETS

COMMAND HERBICIDE RECOMMENDED FOR CLEARFIELD RICE

At the 2012 Rice Outlook Conference, BASF Crop Protection and FMC Corporation announced that the herbicide *Command* (clomazone) is now recommended for use in the *Clearfield Production System* for rice (www.horizonseed.com/system.htm). “*Command* provides *Clearfield* growers with a different mode of action to control difficult grasses, such as barnyard grass, that threaten profits and return on investment,” said Stu Throop, product manager - herbicides at FMC. Weed management in rice has become more challenging as weed species are developing resistance to existing herbicides. Barnyard grass is a competitive weed in Southern rice that poses a major threat to *Clearfield* growers, especially with the rise in resistant strains. Experts agree that a comprehensive weed management system that includes early weed control and the use of multiple herbicide modes of action are vital to managing resistance concerns.

“BASF is excited to collaborate with FMC to offer solutions to growers by expanding the offerings for the *Clearfield Production System*,” said Nocha Van Thielen, Rice Market manager, BASF. “*Clearfield* is a proven technology rice growers have trusted for more than a decade to control tough weeds in rice.” “We offer a number of stewardship strategies for growers to help protect their fields from resistance. One of these strategies is rotating chemistries, and *Command* will give growers another strong rotation option,” said Alvin Rhodes, technical service representative, BASF. “Applying *Command* pre-emergence, followed by the herbicide *Newpath* (imazethapyr) post-emergence, greatly improves grass control in *Clearfield* rice, reducing the likelihood of resistance and helping protect yields.”

EPA APPROVES DUPONT FUNGICIDE

The US Environmental Protection Agency (EPA) has granted approval for DuPont's fungicide *Approach* (picoxystrobin). The product will give corn, soybean and wheat growers protection from a broad spectrum of foliar and soil-borne diseases including gray leaf spot, Northern corn leaf blight, Southern leaf blight and common rust in corn; soybean white mold, frogeye leaf spot, brown spot and Asian soybean rust in soybeans; and powdery mildew, rusts, tan spot, Septoria leaf blotch and glume blotch in wheat. DuPont says that within its class of fungicides, *Approach* has unprecedented movement into and within the plant. This movement rapidly protects poorly covered leaf surfaces, plus leaves and stems that have not yet emerged, and delivers protection closer to the soil surface where many plant diseases originate. Better coverage, preventive and curative activity, and residual control means *Approach* helps compensate for less than ideal application timing, so growers are better able to defend yield despite challenging conditions.

SUMITOMO INCREASES STAKE IN MGK

Sumitomo Chemical has taken a majority stake in MGK, a Minneapolis-based provider of insect control technologies for use in North America. Sumitomo has been a shareholder in MGK since 1989. A recent share purchase raised its ownership stake in MGK to 76.36% up from 32.88% following an agreement with the Gullickson family, the founders and previous majority shareholders of MGK.

“North America is one of the most important markets for household and public health insect control products and is of vital importance to Sumitomo Chemical's global Environmental Health business sector,” said Ryo Sato, executive officer of Sumitomo. Sumitomo is a long-standing provider of professional pest control products and technologies, as is MGK. Sumitomo also has stakes in several agricultural pesticide markets in the US. MGK claims it is one of the first companies to commercially develop naturally-derived pyrethrum into insecticides. The company and its subsidiaries employ 250 people at its facilities in North America, Europe, Africa and Australia.

CERTIS USA TO INTRODUCE KAKEN FUNGICIDE

Certis USA has entered into an agreement with Kaken Pharmaceutical Co of Tokyo, Japan, to introduce a new polyoxin D zinc salt formulation to the US market under two trade names *Tavano* 5%SC Fungicide for use on grapes and small fruits including strawberries, and *Oso* 5%SC Fungicide for use on citrus, cucurbits, fruiting and leafy vegetables, potatoes and numerous other crops.

Polyoxin D zinc salt was first registered for food use in the US in late 2008. The US EPA has recently expanded the tolerance exemption to include polyoxin D zinc salt residues in/on all food commodities. The US EPA also approved the registration of a new 5% suspension concentrate (5%SC) formulation.

Polyoxin D zinc salt is a novel, broad spectrum fungicide with proven efficacy against *Alternaria* leaf blight and early blight, *Botrytis*, powdery mildew and other diseases on grapes, strawberries, cucurbits, fruiting and leafy vegetables, potatoes, citrus and other crops. Polyoxin D zinc salt is derived through the fermentation of a naturally occurring microbe, *Streptomyces cacaoi* var *asoensis*, which was isolated from soil in Japan. The biochemical active ingredient controls pathogenic plant fungi by inhibiting the formation of chitin, a vital component of fungal cell walls. This unique, non-toxic mode of action (Fungicide Resistance Action Committee (FRAC) Code 19) makes polyoxin D zinc salt ideal for use in rotation with other fungicides for resistance management within Integrated Pest Management (IPM) programmes.

VALENT BIOSCIENCES ACQUIRES PACE INTERNATIONAL

Valent BioSciences Corporation (VBC) has signed an agreement to acquire Pace International LLC for \$65 million. VBC previously owned 25% of the company which a global leader in the postharvest business segment with operations in the US, Mexico, and South America. "The Pace assets bring VBC the unique opportunity to leverage our extensive product portfolio and pipeline further downstream into new and exciting areas that will redefine the postharvest business segment," said VBC president and CEO Michael Donaldson. "Along with our \$150 million investment in a new biorational product manufacturing facility in Osage, US, our acquisition of Pace will help us to meet the growing demand for high quality produce."

Headquartered in Seattle, Pace specialises in the development and commercialisation of coatings, sanitisers, and postharvest disease management products for use in many crops including citrus, stone fruit, pome fruit, potatoes and others. Postharvest products improve fruit quality and maintain nutritional value while allowing for longer storage, providing global access to many types of high value crops. Postharvest losses can range up to 40-50% of all produce that is grown, depending on the crop and country.

Mr Donaldson, also an executive officer with VBC's parent Sumitomo Chemical Company (SCC), said the acquisition supports SCC's strategic vision to diversify its participation in the total food production value chain using both novel and conventional technologies while leveraging Sumitomo's global market access. "Over the course of the last decade, SCC has been investing heavily in technologies that will position it as a fully integrated supplier of agricultural products."

Pace employs over 100 people worldwide. Roberto Carpentier, VP of Sales and Marketing, will become the new executive vice president and chief operating officer of Pace, reporting directly to Michael Donaldson. The acquisition is expected to close before the end of the year.

BAYER AND AG GROWTH DEVELOP NEW SEED TREATMENT TECHNOLOGY

Bayer's *SeedGrowth* proprietary technology for precision application of seed treatments in cereal and speciality crops has been combined with Ag Growth International's (AGI) expertise in grain handling equipment to provide innovative on farm seed treatment equipment for the growing North American market. The new seed treater offers electronic controls, a metering conveyor and peristaltic metering pumps to ensure that the seed treatment is accurately applied. "We believe that future advances in crop production will come from seed development or from on the seed technologies," explains Brent Collins, director of Cereals Marketing for Bayer CropScience in Canada. "Working with AGI, the industry leader in portable grain handling equipment, will help us bring *SeedGrowth* technologies to growers and will enable them to accurately apply seed treatment and maximise their returns." The launch in Canada through a co-marketing agreement between Ag Growth International and Bayer CropScience is planned for 2013.

SYNGENTA UPGRADES RESEARCH STATION IN BRAZIL

Syngenta plans to invest \$5 million to upgrade its research station located in Aracati, Ceará, Brazil. The company said that the investments will be used for the establishment of infrastructure for the station, such as construction equipment, greenhouses, sheds and cooling chambers and an expansion of the administrative area. The research station which opened seven years ago covers an area of 50 hectares. Its focus is on crops such as soybean, maize, sugarcane and fruit like

watermelon and cantaloupe. The station is considered to be one of the company's most important research centres in Latin America. The location was chosen because of the excellent climate and geographical conditions in the region that allow the company to multiply plants more rapidly.

RESEARCHERS DETERMINE VIABILITY OF SOYBEAN RUST SPORES

Researchers at the University of Illinois have developed a method to determine whether spores from Asian soybean rust (*Phakopsora pachyrhizi*) are viable. "Finding spores is different from finding spores that are living and able to infect plants," said USDA Agricultural Research Service (ARS) scientist and crop sciences professor Glen Hartman. Soybean rust, which first appeared in Japan at the beginning of the 20th century, is a foliar infector that reduces plant photosynthetic activity and causes defoliation, premature death, and high yield loss. An obligate pathogen, it grows only on plants and dies when the plant dies or is harvested. The fungus first appeared in the US in 2004. It is concentrated in the southern states where it is able to overwinter on kudzu. Spraying with fungicides is the only way to control it because resistant soybean cultivars are not yet available to US farmers.

To monitor the spread of the disease, researchers established a network of sentinel plots in 2005. Traps in these plots capture airborne spores and can serve as an early warning system for farmers. However, spores that travel long distances are often not viable. There have been many instances where spores have been found in the traps, but rust has not appeared in the fields. Up to now farmers have had no way to determine if the captured spores are dead or alive. They know that spraying too little or too late can lead to yield loss, so they may decide to spray immediately. This increases costs, damages crop quality, and poses risks to human health and the environment. Spraying can also accelerate the development of fungicide-resistant strains.

Hartman, Ramya Vittal, a postdoctoral researcher in the Laboratory for Soybean Disease Research, and James Haudenshield, a USDA-ARS research plant pathologist, have just developed a method that uses two different staining techniques to determine spore viability. The first technique uses two dyes, carboxyfluorescein diacetate (CFDA) and propidium iodide (PI). Viable spores stain green with CFDA while non-viable spores counterstain red with PI. The second technique uses a two-color fluorescent viability probe that causes cylindrical vacuolar structures to form within living spores, which then fluoresce red. Non-viable spores show only faint fluorescence. Hartman said that these tests are rapid and reliable. Early detection coupled with timely fungicide application can help slow the pathogen's spread and minimise yield losses. The next step is to integrate this method with passive spore sampling to develop a tool to detect and monitor the movement of viable *P. pachyrhizi* spores during the soybean growing season.

OTHER NEWS AND MARKETS

MAKHTESHIM AGAN APPOINTS HEAD OF GLOBAL MARKETING

Makhteshim Agan Industries (MAI) has appointed Jean-Marc Dardier as head of Global Marketing. The appointment was effective as of 1 January 2013. In a newly created position, Mr Dardier will lead MAI's marketing activities, as well as define and implement the company's global marketing and branding strategies. MAI says the appointment supports its strategic vision to enhance its global commercial and marketing orientation through a number of business initiatives.

Mr Dardier is a senior marketing, branding, strategy and business development executive with experience inside and outside the crop protection sector. For the past six years, he has held a number of senior posts at Syngenta, including head of Marketing & Strategy for Europe, Africa and the Middle East. More recently, he was appointed global project manager for the integration of Seeds and Crop Protection and the restructuring of the global seeds R&D footprint. He also served in senior commercial positions in the flavours and fragrances industry in the US, France and Switzerland. Commenting on the appointment, Ignacio Dominguez, chief commercial officer of Makhteshim Agan, said: "We are very happy to welcome Jean-Marc Dardier to MAI in his new capacity as head of Global Marketing. His experience in formulating and implementing growth strategies, combined with his broad and deep skill-set...make him the ideal person to fill this important new position."

DEVGEN MODIFIES BOARD TO ACCOMMODATE SYNGENTA STAKE

Following its public bid on the agro-biotech company Devgen NV, Syngenta has acquired a majority stake of 94.1% in the company. As expected Devgen has now modified its board which consists of nine members: Davor Pisk, COO at Syngenta; Robert Berendes, head of Business Development at Syngenta; Thierry Bogaert, CEO of the company; Tobias Meili, general counsel Corporate Legal Affairs of Syngenta; Lukas Schüpbach, head of Merger Integration at Syngenta; Richard Taylor, head of Finance, Global Crops & Assets at Syngenta; Dirk Stolp, Luc Van Milders and Luc Wygaerts, all independent board members. Davor Pisk, who will take up the role of chairman of the board, said: "My fellow directors and I are fully committed to the task of combining the unique strengths of Syngenta and Devgen. Becoming the majority shareholder in Devgen is an important milestone for Syngenta. Together we will be able to provide leading innovations that will benefit millions of growers."

FMC TO ACCESS GAT MICROENCAPSULATION PRODUCTS

MC has announced that its Agricultural Products Group has signed a global licensing agreement, along with distribution and services agreements, with GAT Microencapsulation AG covering a range of advanced crop protection products and proprietary formulation technologies. Under the agreement, FMC will access GAT's complete library of intellectual property, which includes a portfolio of registered products, proprietary formulation technologies and new products in development. FMC will be the main distributor of GAT Microencapsulation's current product portfolio in virtually all global markets. GAT will supply the products to be sold, as well as new materials for products that FMC commercialises in the future.

GAT has developed innovative and cost-effective technologies for the formulation of agrochemicals, most notably microencapsulation. The company's intellectual property in these technologies is based upon a complex combination of international patents.

BAYER HOLDS FIRST VEGETABLE FUTURES FORUM

At Bayer CropScience's first Vegetable Future Forum held on 13 December some 200 representatives of the international vegetable food value chain and industry experts met to discuss key trends and challenges. The one day event was aimed at stimulating fresh perspectives on topics ranging from the development of fast-growth markets in Latin America and Asia Pacific to overall market trends and dynamics. Speakers represented companies such as METRO Group, Nestlé, Koppert Biological Systems, Rabobank and SAP. "Our aim is to become the partner of choice in fruit and vegetables by working together with partners to drive innovation forward," said Dr Rüdiger Scheitza, member of the board of management of Bayer CropScience.

Frank Terhorst, head of Strategic Business Management for Fruit & Vegetables and Insecticides, said: "Enhancing nutrition through healthy vegetables is one of the company's key commitments, underlined by long-term investments to ensure sustainable vegetable production. We are able to offer

integrated solutions based on high quality vegetable seeds marketed under our brand name Nunhems, innovative chemical and biological crop protection solutions, extensive service backup that includes expertise in environmental protection, efficiency and safety to help vegetable growers get the very best from their fields." Bayer CropScience's Food Chain Partnership business initiative brings together growers, processors, exporters and importers, and retailers. There are currently 240 projects in 30 countries that are ongoing and these span 40 fruit and vegetable crops.

BAYER TO OFFER INTEGRATED CROP SOLUTIONS

Bayer CropScience completed the purchase of AgraQuest in Q3 2012 (*CPM June 2012*) for \$425 million and now says it is well-placed to offer its customers a comprehensive range of integrated and sustainable crop solutions which will in future be crop focused. Marcus Meadows-Smith, former AgraQuest CEO and now head of Bayer Biologics, told *Crop Protection Monthly* that the solutions will be based on seeds, traits and combined chemical and biological crop protection including seed treatment. "We will act as a one stop shop for growers and will create a range of differentiated crop packages." Biologics will, he said, play a significant role particularly in the strategically important fruit and vegetable segment where residue management is a key issue. We will also be reviewing our contractual arrangements with national distributors such as BASF.

"We are pleased to be part of Bayer CropScience and will continue to design new green technologies to meet the needs of the various crop segments," Mr Meadows-Smith continued. "Syngenta and BASF have both shown interest in biologicals but Bayer was lucky enough, in my opinion, to get the company with the strongest R&D platform, and the strongest R&D pipeline." Development products include a miticide, a nematocide, broad spectrum fungicide, growth promoter and a product that deals with abiotic stress. We will continue to collaborate with universities around modes of action and will be expanding the number of scientists at our R&D facilities in Davis, California so that it becomes a world class centre of expertise in green products. Bayer CropScience has not only committed to invest in the R&D site in Davis but also plans to expand existing manufacturing operations of biologics at the Tlaxcala site in Mexico.

AgraQuest's current portfolio of products includes the fungicides *Serenade* and *Rhapsody* (*Bacillus subtilis* strain QST 713), *Sonata* and *Ballad Plus* (*Bacillus pumilus* strain QST 2808) and the insecticide *Requiem* (an extract of *Chenopodium ambrosioides* near *ambrosioides*) and these will be coupled with Bayer's insecticide/nematocide seed treatment *Poncho/Votivo* (clothianidin/*Bacillus firmus* strain I-1582). These products will now have the support of 7000 sales and marketing people operating in 120 countries. "The combined talents and capabilities of Bayer CropScience and AgraQuest will allow us to accelerate the market introduction of highly innovative customised solutions including biologics worldwide," said Mr Meadows-Smith.

GLYPHOSATE RESISTANCE CONFIRMED IN NEW ZEALAND

The first case of glyphosate resistance in New Zealand has been confirmed in annual ryegrass on a Marlborough vineyard. The discovery was made as part of a project led by the Foundation of Arable Research (FAR) and funded by the Ministry for Primary Industries' Sustainable Farming Fund (SFF). Mike Parker, project manager for the *Avoiding Glyphosate Resistance* team, says glyphosate is the most frequently used herbicide in New Zealand agriculture and although there have been some anecdotal reports of resistance, this is the first confirmed occurrence. He says the resistance finding should provide a wake-up call for all users of the broad spectrum herbicide.

FAR CEO Nick Pyke says at present it is an isolated case, but it is a warning to users of glyphosate that they need to be aware of the danger of resistance developing and be careful how they use it. He says glyphosate is one of the most environmentally friendly herbicides on the market, and the repercussions of losing the use of it would be serious. "On farm the impacts would include reduced income due to increased chemical costs and reduced crop yields. Removing glyphosate from the suite of available chemicals would also increase the resistance pressure on other herbicides."

Research and testing within the *Avoiding Glyphosate Resistance* project is being led by Dr Trevor James from AgResearch, and Dr Kerry Harrington of Massey University. Dr James explains that the Marlborough case was identified following a report from a chemical company. He says the best way of avoiding glyphosate resistance is to ensure it is not the only chemical used on the same paddock year after year. Instead, he recommends mixing it with a herbicide from a different mode-of-action group every three or four years. This will kill any weeds that may be building up resistance. Sector-specific

strategies on avoiding resistance will be developed as part of the *Avoiding Glyphosate Resistance* project.

Since the 1970s there has been a steady increase in the numbers of weeds developing herbicide resistance worldwide. There are now 393 confirmed resistant weed biotypes in 61 countries with an average of nine new cases being identified each year. The first case of weed resistance to a herbicide in New Zealand was recorded in 1982, when populations of fat hen (*Chenopodium album*) were found to be resistant to the chemical atrazine. The list of herbicide resistant weeds in the country now comprises 10 confirmed cases, four of which are associated to perennial pastures.

CONFERENCES AND FEATURES

THE FUTURE OF CEREAL DISEASE CONTROL

New disease control tactics using novel and robust multi-site chemistry will not only help protect wheat crops, but also other key fungicides on which profitable output depends. That was the main message to emerge from a recent conference The Future of Cereal Disease Control hosted by Makhteshim Agan UK (MAUK) at Huntingdon, Cambridgeshire.

Bill Clark, commercial technical director of NIAB TAG (www.niab.com), made reference to the poor UK wheat yields in 2012 which averaged 6.7 tonnes, down 14.1% on the five year mean. Mr Clark suggested that the early dry weather and focus on yellow rust which was replaced overnight by continuous rain and a rapid increase in Septoria inoculum may have caught many growers out. He reminded delegates how important leaf 3 is in terms of Septoria inoculum. Delayed or poor fungicide choice at T1 (growth stage 31-32) means the tip of the leaf can become infected. Leaf 3 then spreads Septoria to leaf 2 and the flag leaf. The timing of the flag leaf T2 (growth stage 37-39) fungicide application is then critical for control of Septoria on leaf 2. Delays can be extremely costly. Mr Clark suggested that in 2012 a pre T2 spray might have been necessary. He pointed out that some crops received as many as six or even seven sprays including two applications on the ear.

Mr Clark also laid some of the blame for low yields on poor light radiation. He said: "Low light levels can impact on the build-up of stem carbohydrates, the number of grain sites and grain filling. Light radiation only reached 60-70% of normal levels in June and July 2012 so grain filling was always going to be compromised as even green healthy crops struggled to fill grain sites."

"While the triazole fungicides still form the basis of disease control there is an ongoing decline in their performance," said Mr Clark. "Triazole performance was shocking in 2012 in some situations." He explained how Septoria populations are becoming increasingly complex and are no longer predictable. The new succinate dehydrogenase inhibitor (SDHI) fungicides are highly effective against the disease but need protection. Triazoles alone are not good enough to do this, and other chemistry is needed to help.

Mr Clark pointed out that every time a farmer uses a fungicide he applies a selection pressure, the higher the dose the greater the selection. The lower the dose, however, the greater risk of yield loss due to disease. Prophylactic applications reduce selection pressure on subsequent treatments. He warned that because UK wheat varieties are inherently responsive to fungicides this encourages higher fungicide use and leads to more resistance development. In summary he said there is an increasing need for more complex mixtures and more spray applications as eradicant activity declines. Multi-site fungicides could, therefore, play an increasingly important role in the farmer's armoury.

Dr Tom McCabe, University College, Dublin, agreed that the triazoles were under sustained pressure resulting in disappointing field performance in Ireland. He said the strobilurins were nearly obsolete except on rusts. However, the SDHIs used preventatively in 2011/12 were excellent. However, they have single site activity so will have their own problems in time. Multi-site fungicides such as chlorothalonil and folpet have a key role to play.

Stuart Hill, MAUK's technical and development manager, said the time had come to think about disease management rather than disease control. As well as risking yield by letting disease take hold in crops early on, chasing disease increased the risk of Septoria resistance to vulnerable single-site SDHI fungicides and triazoles. Protection rather than cure was vital and a key part of this strategy was the positioning of MAUK's multi-site protectant fungicide *Phoenix* (folpet) at the important early timings. This would build flexibility into the programme and reduce pressure later in the season. The need for both was increasing, said Mr Hill.

The trend to bigger farms meant spray timings and efficacy were more likely to be compromised and often necessitated earlier drilling, which led to higher disease pressure. In addition, almost 80% of the wheat area was sown with varieties with a Septoria resistance rating of 5 or less, and little better for rusts. That, coupled with very uncertain weather at the T1/T2 timings, meant disease could easily get a foothold in crops. "Only 50% of the UK wheat area receives a GS30 (T0) spray on average - we

believe it should be regarded as the foundation spray, as it is vital in limiting inoculum levels," Mr Hill told the conference. He advised applying *Phoenix* at GS30 at 1 litre/ha plus a triazole at half rate, followed at GS32 with a further 1.5 litres/ha of *Phoenix* plus triazole. Similar programmes in trials had lifted yields by almost 30% compared with untreated plots.

Multi-site chemistry had a low risk of breakdown, but was sprayed on average just under once per crop per season. "We think this has to change. *Folpet* has no recorded resistance problems, despite being used intensively on vines in France for more than 40 years. It remains stable and is the ideal product to offer support for single-site chemistry."

Neil Paveley, head of plant disease management at the advisory organisation ADAS, agreed that multi-site fungicides had a valuable role in protecting key chemistry. When used as eradicants, the efficacy of prothioconazole and epoxiconazole had fallen to just 20-40% of 1994 levels. Each mutation step in the pathogen only had a small effect, so the reduction in performance had been gradual. However, with no new products in the immediate pipeline, this decline in performance presents a real threat. SDHI chemistry needs even more protection he stressed. Data suggested this group was more like strobilurins when it came to resistance. "Strobilurins went from achieving 80-100% control to 20-30% in just a couple of years. There is plenty of good evidence that SDHIs are likely to follow this pattern."

Mixtures with multi-site inhibitors were the most effective way of prolonging the single-site component's life, said Dr Paveley. Backing Mr Hill's advice to use *Phoenix* at robust levels, he said chasing disease with high doses of single-site ingredients increased selection for resistance. In addition, the mixture component at the lowest risk of resistance - the multi-site fungicide - should take most of the load, he advised

SUSTAINABLE INTENSIFICATION

SCI BioResources Group's 2012 conference in the series of Syngenta Symposia was held at Jealott's Hill International Research Centre on 30 October 2012 (www.soci.org/News/BioResources-Sustainable-Intensification-Past-Conference-Papers.aspx). The topic of the conference was Sustainable Intensification. Growth from Research and Technology. Dr Alan Baylis reports for Crop Protection Monthly.

Dr David Lawrence, non-executive director of Syngenta and a Biotechnology and Biological Sciences Research Council (BBSRC) member, opened the programme by considering what is meant by 'sustainable intensification' and why it is vital. Pressures on global food security are now well recognised, but agriculture accounts for more than 10% of greenhouse gas emissions. The main issues are methane from livestock and paddy rice, and the denitrification of fertiliser to nitrous oxide – both gases having far more potent effects on global warming than carbon dioxide. In addition, the manufacturing of nitrogen fertilisers accounts for 1% of all global energy consumption and 4% of natural gas. However, a recent US survey has shown that, correcting for yield, organic crop production has around a 25% larger carbon footprint than conventional systems.

Yield is key, for without substantial increases in yield there would be no option but to increase the area of land farmed; with the need to preserve forests and other ecosystems and continued urban growth, this is not an option. Further intensification in a sustainable manner will require particular focus on reducing waste, optimising inputs and caring for the soil to improve or preserve structure and fertility. With global reserves of phosphate starting to decline sharply, a better understanding of soil chemistry and microbiological effects on its availability to plants is one area meriting more intensive research effort. Others are aspects of irrigation and reducing the energy cost of nitrogen fixation.

Rainer von Mielecki, BASF's head of Global, Public/Government Affairs Crop Protection, described his company's *AgBalance* concept and how it is being used to measure progress in sustainable agriculture. Achieving a balance and therefore a high degree of sustainability, means paying attention to the 'triple bottom-line' of profitability, environmental care and meeting the needs of individuals and society. When *AgBalance* is applied to a system, 69 indicators within 16 categories of economic, ecological and social aspects are evaluated. To illustrate the application of *AgBalance*, oilseed rape cropping in Northern Germany was analysed over the period 1998-2008. The sustainability index improved by 40% over the decade, principally down to factors including a yield increase from 2.7 to 4.1 tonnes/ha, a reduction in fixed and variable costs per tonne, less labour input per tonne, increased biodiversity, reduced ecotoxicology of agrochemicals and more efficient use of nitrogen fertiliser.

Simon Turner, a consultant at Canopus Management, reviewed the problem of accessing funding for taking R&D inventions through to commercial products. Total annual investment of venture capital in all life sciences has fallen dramatically over the past five years. Early stage funding is a particular issue and start-ups need to look to sources such as the Technology Strategy Board, Research Councils and European Commission, or collaborations with major players. Although consolidation in the industry has reduced the number of potential partners or buyers for small young companies, those remaining are actively seeking innovations and embracing the concept of 'Open Innovation' (www.syngentathoughtseeders.com). Acquisitions made so far in 2012 include Bayer CropScience of AgraQuest, Monsanto of Precision Planting, and Syngenta of Pasteuria Biosciences.

Optimising and integrating inputs

Dr Mike Bushell, Syngenta's principal scientific advisor, focused on the use of chemical technologies. Without crop protection products 40% of global food production would be lost. However, very few companies now have significant R&D programmes. The pandemic of Asian soybean rust (*Phakopsora pachyrhizi*), which would have devastated soybean production in North and South America in the past decade without effective fungicides, was a reminder of how unexpectedly and swiftly new diseases can establish. Resistance is now a major driver for innovation in the crop protection industry. It can develop slowly as with triazole fungicides or suddenly, resulting in almost total failure, as in the case of some strobilurins. No herbicide with a new mode of action has been introduced since the first HPPD inhibitors in the 1980s. Although fewer new active ingredients are being introduced, there have been significant advances in other areas, such as formulation technology. Controlled release and more sophisticated seed treatments are more precise ways to apply crop protection products. Integrating chemicals with other means of protecting crops is

increasingly seen as the way forward - new varietal traits, biocontrol agents and agronomy. Biological control agents, although often not so effective alone, in combination with chemicals can reduce the overall number of applications needed for disease control and ensure acceptable residue levels. Sometimes the indirect benefits of products need to be recognised. For instance, using the insecticide lambda-cyhalothrin has been shown to markedly reduce mycotoxin contamination in maize. This is because the fungal infection is facilitated by entry through areas of the cobs damaged by insects.

Simon Bright of the BioSciences Knowledge Transfer Network (<https://connect.innovateuk.org/web/biosciencesktn>) described how the BBSRC Crop Improvement Research Club is facilitating collaboration between universities and industry to apply advances in basic science to the breeding of improved varieties of cereals and oilseed rape. DNA sequencing technology now allows the identification of markers that describe the available genetic diversity and the tracking and combining of traits throughout a breeding programme. This is concurrent with advances in the understanding of signalling and control pathways in plants, such that step-changes seem possible to increase biomass productivity. The Bill and Melinda Gates Foundation has invested \$10 million in research into nitrogen-fixing cereals. The first challenge is to engineer the signalling and recognition systems from legumes into cereals. Although this has generally been considered to be of no advantage in intensive cereal production because of the yield penalty associated with the energy cost of nitrogen fixation, in cropping systems where little fertiliser is used, or in nitrate sensitive zones, nitrogen-fixing cereals could be valuable.

Kevin Moran, director at Kemnovation, addressed the need to optimise fertiliser use efficiency directed at both higher crop yields and reducing greenhouse gas emissions. At low rates of nitrogen fertiliser use, depending on soil availability, the crop yield response tends to be steep, ie nitrogen use efficiency (NUE) is high. However, as fertiliser rates increase, the yield response becomes less until no more yield can be obtained, although protein content may still respond. NUE is measured by the ratio of nitrogen removed by the crop to that applied. An optimum NUE is necessary because if it is below about 70% there is a risk of leaching but above 100% the soil reserves are being mined unsustainably. At sub-optimal rates of nitrogen fertiliser, the lower yields obtained ultimately mean that greenhouse gas emissions are much higher because of the increased land that needs to be brought into crop production. To improve the sustainability of intensive nitrogen use, efforts need to be directed not only at the crop but downstream to fertiliser production and transport and upstream to consumption and capture of emissions. Reductions in energy consumption in manufacturing have been made by the use of better catalysts. Controlled release fertilisers and the use of nitrification and urease inhibitors, together with more intensive crop monitoring and precision application offer good prospects for the future.

More precision

Paul Hendley, a senior fellow at Syngenta, showed how modern imaging and modelling technology can help farmers reduce the impact of intensive agriculture on water quality. Forming part of stewardship activities, the objective is to determine where features that will reduce run-off can best be placed within individual fields for maximum effect and minimum investment. Remote sensing approaches are being used to examine cropped landscapes at high spatial resolutions. So, for a particular watershed, potentially vulnerable areas can be ranked and the most appropriate measures such as buffer zones placed with precision. Similar approaches are planned to address the mitigation of leaching and to identify the most effective ways of protecting endangered habitats. In the US, Syngenta is working with environmental organisations to use this technology to help them position land improvement features, such as tree plantings, most effectively. In Europe, it is being used to position ground water monitoring wells to validate the safe use of some herbicides.

Finally, it was appropriate that a farmer rounded-off the conference. Jim Wilson, a director at Soil Essentials (www.soilessentials.com) farms in Scotland and is an avid user of precision agriculture technologies. The underlying reason for using precision techniques is that fields are not uniform in soil, topography and yield potential, yet, traditionally, inputs are applied evenly. Much spatial variability in fields has been caused by farming activities such as joining smaller fields with distinct soil types and cropping histories. This has accentuated areas of high and low nutrient availability, pH, drainage and compaction. Field maps form the basis for future applications of lime and basal fertiliser. In a growing crop, real-time sensing is used, for example using leaf canopy cover to adjust application rates of nitrogen top-dressings.

Over time, areas can be identified where responses in yield can be achieved and where they cannot. Improvements in gross margin range from £5(8\$)/ha from variable rate seeding to £25/ha from variable rate nitrogen application. Currently, machinery can be controlled to work within 25mm of a target area to achieve steering, canopy sensing, variable rate application and yield monitoring. The accuracy is classed as 'static' to determine a given spot year after year; or 'pass-to-pass' where GPS data are collected over a short time frame to determine the correct positioning on a return pass across a field. Radio, Internet and mobile phone technologies are integrated into control systems. This allow tractors and following implements to be steered automatically and sections of drills, planters, spreaders and spray booms to be switched on or off as required, such as when crossing headlands. By reducing overlaps, gross margin improvements of £30/ha can be made. Mobile phone apps are also playing an increasing role. The Internet has meant that the monitoring and data management of precision farming can be fully integrated. Operations and vehicle performance can now be monitored from the farm office.

BIOPESTICIDE CONFERENCE BERLIN

Over 100 delegates were present at the *Biopesticide Conference* that was hosted by Informa Life Sciences on 5-6 December 2012 in Berlin. Peter Chapman of JSC (www.jsc.co.uk) reports.

Pam Marrone, CEO of Marrone Bio Innovations, opened the conference, providing an upbeat summary of the latest developments in the biopesticide market. She reported that biopesticides are now 'mainstream' particularly since the purchase of AgraQuest by Bayer and BASF's acquisition of the Becker Underwood seed treatment business. Further evidence of the importance of biopesticides, she said, was the fact that they were increasingly being included in pest management programmes to meet customer needs. They also provide added benefits where chemical pesticide solutions are limited or do not exist and meet consumer demands and needs with regard to eliminating residues. Compatibility with tightening regulatory regimes is also important.

The biopesticide market is one of the fastest growing agricultural input segments. The global market was valued at \$1.3 billion in 2011 and is expected to grow to \$3.2 billion by 2017. North America dominated the market accounting for over 40% of demand in 2011. Europe is expected to be the fastest growing market in the near future owing to the stringent regulatory regime and the demand for organic produce. Overall the biopesticide market was estimated to be growing at greater than 10% per annum. Ms Marrone, however, acknowledged that biopesticides were still a small part of the crop protection market and that apart from seed treatments had not really broken into the 'row crop' market. There were still misconceptions about efficacy and cost. From a regulatory point of view biopesticides were still not tested properly based on their modes of action, and meeting regulatory demands was becoming more costly and complicated in some regions. However, she said there are developments that could lead to greater adoption of biopesticides and these include formulation innovation, and the development of pre-mixes of chemicals with biopesticides.

Regulatory issues

Jeroen Meeussen from the EU Directorate General for Health and Consumer Affairs (DG SANCO) pointed out that the EU's definition for biopesticides includes microbial pesticides, semiochemicals and botanicals/plant extracts. Macro-organisms are excluded. The main regulatory regimes directly affecting biopesticides come under Regulation 1107/2009, concerning the marketing of plant protection products, and the Sustainable Use Directive. Mr Meeussen explained that there was the possibility of approving low risk substances under 1107/2009, and that some biopesticides would qualify. An expert group on low risk substances had been established in October 2012 and comprised EU member state representatives, the European Commission, grower organisations, NGOs and industry. This group had the responsibility for ensuring consistency of definitions across the EU. There were no plans for the Commission to review already approved substances to determine if they qualified as low risk. This would have to be done at the next renewal.

Mr Meeussen reported that there had been a number of developments in relation to the introduction of biopesticide solutions, including an OECD seminar held in 2011 on the characterisation and analysis of botanicals. A publication on this is currently in preparation. He said there is to be an OECD/EU workshop to be held June 2013 in Stockholm. Attendance has yet to be decided, but will include EU member states and industry representatives. A guidance document will also be developed on the registration requirements for *Trichoderma* spp and guidance on equivalence checks is to be developed for different sources of micro-organisms. A new EU expert working group on botanicals had been formed with a view to preparing a new guidance document to replace SANCO 10472/2003. This new guidance will address all areas of the risk assessment. A first draft is expected in March/April 2013.

Representatives from Austria (Dr Rebecca Reboul), Denmark (Dr Birte Fonnesbech Vogel) and France (Dr Karine Angeli) explained how the EU regulatory regimes impact on the authorisation of biopesticides in their respective countries. There was general agreement that there was insufficient scientific and technical guidance both for the preparation of dossiers and for the safety evaluation of biopesticides. One outcome of this is that the European Food Safety Authority (EFSA) conclusions often identify outstanding data requirements which are not relevant to the substances in question because assessments are based on criteria set for chemical pesticides.

Industry view

Philip Kessler from the Swiss company, Andermatt Biocontrol, set out the main hurdles facing the biocontrol industry as:

- unknown or inappropriate data requirements
- high and unpredictable costs for data packages
- lack of experience in the regulatory authorities
- lack of knowhow within the biocontrol industry
- unreasonable delays in the evaluation procedure
- high registration fees.

He explained that the need for biopesticides was generally accepted, and the political intention to promote non or less toxic solutions in agriculture is embedded in the Sustainable Use Directive. However, Regulation 1107/2009 is not helping to bring biopesticides to the market any quicker. This is only possible if low risk status could be granted. The financial investment for data packages and fees are still too high for products that are to be used in niche markets.

In the future it will be necessary to improve transparency. There is also a requirement for better communication between regulators and industry and the evaluation periods for biopesticides need to be shorter. Resources in member states and the EFSA for biopesticides must be increased, ideally with specialised units for biopesticides as in the US. Lower fees for registration of biopesticides and for mutual recognition should be introduced.

Imme Gerke from IDRG (International Development of Regulatory Globalisation) put forward the view that global evaluation and registration is the way forward in order to reduce costs and get products to the market quicker. She urged biopesticide companies to seek pre-submission meetings with a suitable OECD rapporteur in order to provide a mandate for a global evaluation. She believes strongly that this would force OECD member states into sharing the task of evaluation and would lead to better outcomes for the industry.

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Publisher: Market Scope Europe Ltd ISSN 1366-5634

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