INTERNATIONAL
PEST CONTROL

May/June 2013
Volume 55 Number 3

Public Health ◆ Agriculture ◆ Horticulture ◆ Amenity ◆ Forestry

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Virus to control houseflies

Carpenter ants and building insulation

EU biocide & pesticide legislation

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Irish potato famine latest

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Tel + 33 (0)1 30 10 02 84 - Fax + 33 (0)1 30 10 02 85 - www.parasitec.org - eparasitec@aol.com
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Editor: **David Loughlin** M.Sc. DIC
editor@international-pest-control.com

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Grenville Court, Britwell Road,
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Fax: +44 (0)1628 600488
info@researchinformation.co.uk
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INTERNATIONAL PEST CONTROL

The official publication for

Confederation of European Pest Control Associations

Federation of Asian & Oceania Pest Managers Associations

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Cover – ARS entomologist Chris Geden and student assistant Rachel Dillard sort stable flies before injecting them with SGHV virus to determine its effects on fly mortality and reproduction.

David Loughlin, Editor International Pest Control Magazine

Gradually over the last few weeks, announcers on radio and television have shown considerable improvement in their ability to pronounce the word 'neonicotinoid'. Sadly it appears to be yet another occasion when our industry gets into the public consciousness with negative connotations. It takes little more to raise the general populace's emotions, than concerns over wildlife or nature, especially with bees, and the broadcast media are quick to pounce. The rights and wrongs of the situation have been widely debated on TV and radio, within social websites, in print and at various private and public meetings. Many strong views have been put forward. In making the decision, the European Commission members have themselves been divided on the matter. Yes, the ban is a controversial decision but it is important that the effect of the ban is closely monitored so the impact can be quickly determined as either successful or unnecessary. Getting good data will be key.

This month we have an eclectic mix of pest control issues for you to review. We include, a review of two Industrial Pest Control events on opposite sides of the globe – PestEx UK and the CPCA event in China; a discussion on the minefield that is the EU regulatory environment; how carpenter ants can be destructive in Norway; the origins of pesticide smoke generators in Spain; and the trials of a new A&K fruit fly system. We feature two ongoing Forestry stories that although based in the UK, have a resonance across Europe: the ongoing march of the Oak Processionary Moth and spread of the Chalara fungus.

We continue to develop the IPC magazine content and should you feel you have a contribution to make in the form of a technical paper, a press release, news story or just want to respond to something you have read in this month's issue, please do get in touch.

Email David on editor@international-pest-control.com

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Technical Consultants

Clive Boase runs the Pest Management Consultancy, probably the UK's longest-running urban pest consultancy. "I continue to be amazed by the diversity of urban pest issues. We now work with a broader range of projects and clients than ever before, including pests and construction materials, poultry pest strategies, development of experimental pesticides, bed bugs and the Olympics, strategies for urban housing, invasive species risk assessments, not forgetting training and legal work. This is a very dynamic sector." **www.pest-management.com**

Rob Fryatt B.Sc. held senior positions within ICI, Zeneca and Sorex and now leads Xenex Associates who provide advice to agrochemical suppliers, pest management companies and other organisations around the globe. Rob has been a Director of the BPCA, Director General of CEPA and chairs the CEN European Committee developing a common pest management service standard. Rob is a frequent invited speaker at industry events and has written regular opinion columns for a number of international industry publications.
www.xenexassociates.com

Dr Terry Mabbett is a pest, disease and weed control specialist with forty years of international experience covering research, consultancy and journalism in agriculture, horticulture, forestry, amenity, livestock and public health. His current areas of particular interest are the protection of tropical tree crops and exotic insect pests and plant pathogens of Britain's native, naturalised and forest plantation trees.
Drterrymabbett@btinternet.com

Graham Matthews DSc., FSB., FRES. began his career in Africa working on cotton pest management before joining Imperial College. Research and teaching pesticide application at Imperial and overseas has been interspersed with consultancies for international organisations, such as the World Bank. Author of several books, he was formerly an editor of Crop Protection. Retired in 2001 and now Emeritus Professor of Pest Management.
www.dropdata.net

Martin Redbond B.Sc. has spent nearly forty years working in the crop protection industry where he has held various sales, marketing, technical and regulatory management positions with multinational companies and in contract research. He is the author of a number of important crop protection reports and has been editor of Crop Protection Monthly for the past eight years.
www.crop-protection-monthly.co.uk

FAOPMA 2013 heads for Seoul, South Korea

The 25th annual FAOPMA conference and exhibition heads back this year to South Korea for the third time. First held in Korea in 1995 and then again ten years later in 2005, the event this year will take place at the prestigious COEX Convention Centre in the business district of the capital Seoul from November 26th to 28th.

As this event continues to grow, it has become not just the annual meeting place for the Asian industry, but one of the leading international events for the global industry. This year's hosts the Korea Pest Control Association (KPCA) expect up to 3000 delegates from Korea from within its 16 regional chapters, along with many international delegates and up to 160 exhibitors. For anyone within the global industry with interest in business in Korea, this is a must attend event, an unparalleled opportunity for exposure in one of the most develop markets in the world.

Mr. Park Myeon Ha, president of the KPCA and President elect of FAOPMA, who takes up his two year term during the event sends this message to prospective delegates: "I and my organising team will do our utmost to present you the best FAOPMA event where you will gain cutting edge knowledge, information, techniques and meet professionals in the pest management industry from all over the world. At the same time, you will enjoy Seoul city and Korean Culture with Korean people's warmest hospitality I look forward to welcoming you to Seoul, Korea."

Park Myeon Ha and his team, especially event coordinator Nari Kim, have been constant ambassadors for the event, travelling to many parts of the region to promote the conference.

The theme of the event is "Beyond PES+ech" – looking to the future use of IPM systems as the industry combats climate change. The popular concept, originated in Australia, of a "Pest Manager's Day" is included so that every delegate can take something of use from the event, straight back to their own business.

■ The full programme is not yet published, but detailed information can be found on the dedicated event website: www.faopma2013Korea.com or by contacting Nari Kim direct on 82 (0) 70 7863 6199 or nari.kim@mci-group.com

KPCA promote the 2013 event in Adelaide at FAOPMA 2012.

New on-line forum for pest controllers

Ana Francesco presents Pest Control Forum

PestEx 2013 saw the launch of a new website dedicated to international pest control. The concept, to create a virtual pest control service meeting point for the international pest control community.

The site is divided in two categories, general and professional. General users can visit the website to find information about the industry, read general articles, add blog entries and use the forum rooms. Only registered professional users will have full access to all parts of the website. In addition to the sections that general users have access too, professional's users can read blog entries and scientific articles.

The most important resources are considered to be a listing of pest control companies and also retail market products. Users can look for pest control companies near their location and see a rating and comments on those same companies. Also they can rate and comment on pest control service companies that they have hired or products they bought.

In the Forum rooms, professionals can discuss topics between themselves and share experiences. Within the profile section, users can list their company according to activity: Consultancy, Research & Development, Pest Control Operators, Manufacturers & Distributors, Retail Manufacturers & Distributors.

■ For more information visit www.pestcontrol-forum .com.

UN conference takes historic strides to strengthen chemical safety globally

The three conventions that govern chemicals and hazardous waste safety at the global level, the Basel, Rotterdam and Stockholm conventions, concluded their first ever jointly held meetings of the parties late Friday 10th May 2013, in Geneva.

The historic meeting, attended by nearly two thousand participants from 170 countries, as well as 80 Ministers, adopted 50 separate decisions aimed at strengthening protection against hazardous chemicals and waste.

The meeting had been convened to strengthen cooperation and collaboration between the conventions, with a view to enhancing the effectiveness of their activities on the ground. Each convention then continued individually over a two-week period to deal with its own specific topics of the global chemicals and waste agenda before returning in a joint session at the end of the week to finalize their outcomes.

The meeting culminated in a ministerial segment on 9 and 10 May 2013 dedicated to the theme of strengthening synergies between the conventions at national, regional and global level.

In a press conference following the ministerial segment, United Nations Environment Programme (UNEP) Executive Director Achim Steiner, called the conferences of the parties "a unique historic event coming at a time of unprecedented change and progress in the arena of global environmental governance. The strengthening of UNEP and the synergies process of chemicals and waste multilateral environmental agreements are complementary parts of the ongoing reform to fortify the environmental dimension of sustainable development."

Global Environment Facility (GEF) CEO and Chairperson Naoko Ishii spoke of the challenges countries face protecting the planet's critical ecosystems from contamination by hazardous chemicals and waste and of GEF support for strategies to overcome them. "At this critical juncture, the Global Environment Facility is committed to its financial support to help countries address these important challenges in three ways," said Ms. Ishii. "Assisting them in their efforts to mainstream sound chemicals management in national agendas, creating an integrated GEF chemicals and wastes focal area, and expanding engagement with the private sector."

FAO Director-General José Graziano da Silva said that in many countries intensive crop production has depleted agriculture's natural resource base, jeopardizing future productivity. "To fight hunger and eradicate poverty, we will need to find more sustainable ways to produce 60% more food by 2050," he said.

However, he recognized that chemical pesticides would continue to be part of farming in many parts of the world in future.

"The challenge is to enable countries to manage pesticides safely, to use the right quantity, at the right time and in the right way and also to apply alternatives to hazardous pesticides. Because when we don't, pesticides continue to pose a serious risk to human health and the environment and will eventually end up as waste. Today, half a million tons of obsolete pesticides are scattered around the developing world," he said.

"Around 70 percent of the chemicals addressed by the Basel, Rotterdam and Stockholm conventions are pesticides, and many are used in agriculture. It is in the best interest of all countries to ensure that the three conventions can work together, effectively and efficiently, to address various aspects of the chemical life cycle."

"Much of the success of this synergies meeting is owed to the outstanding cooperation and inspired leadership of the three presidents of the conferences, Franz Perrez of Switzerland, Magdalena Balicka of Poland and Osvaldo Álvarez-Pérez of Chile," added Mr. Willis.

■ Source: FAO Media Centre

One of the challenges discussed in Geneva was how to enable countries to manage pesticides safely, to use the right quantity, at the right time and in the right way.

Eat insects? Two billion people can't be wrong

Insects are often considered a nuisance to human beings and mere pests for crops and animals. Yet this is far from the truth. It is estimated that insects form part of the traditional diets of at least 2 billion people. More than 1,900 species have reportedly been used as food. Insects deliver a host of ecological services that are fundamental to the survival of humankind.

They also play an important role as pollinators in plant reproduction, in improving soil fertility through waste bioconversion, and in natural biocontrol for harmful pest species, and they provide a variety of valuable products for humans such as honey and silk and medical applications such as maggot therapy. Insects provide food at low environmental cost, contribute positively to livelihoods, and play a fundamental role in nature. However, these benefits are largely unknown to the public. Contrary to popular belief, insects are not merely "famine foods" eaten in times of food scarcity or when purchasing and harvesting "conventional foods" becomes difficult; many people around the world eat insects out of choice, largely because of the palatability of the insects and their established place in local food cultures.

Entomophagy is heavily influenced by cultural and religious practices, and insects are commonly consumed as a food source in many regions of the world. In most Western countries, however, people view entomophagy with disgust and associate eating insects with primitive behaviour or a entertainment feature on reality TV. This attitude has resulted in the neglect of insects in agricultural research. Despite historical references to the use of insects for food, the topic of entomophagy has only very recently started to capture public attention worldwide. In 2008, within the framework of the Wageningen University–FAO partnership, a few researchers came together and began reviewing an extensive array of published and unpublished research and information on insect rearing and consumption. Their intention was to break down the aforementioned misconceptions and contribute positively to the development of the edible insects sector. The subject of edible insects inherently covers a wide range of thematic areas, from the conservation of habitats where insects are harvested to insect ecology, the artificial rearing of insect species, the processing of insects into food and feed products, and the labelling and marketing of insect-based food and feed products.

It's all in the presentation. Appetizers prepared with insects (T. Calame)

This new publication, therefore, draws from a wide range of disciplines and areas of expertise. It is a multidisciplinary effort involving technical experts specializing in forestry, animal farming, nutrition, the feed industry, legislation and food security policies. This publication marks the first attempt by FAO to document all aspects of the insect food and feed value chain, with the aim of enabling a comprehensive assessment of the contribution of insects to food and feed security.

■ For the full report see http://www.fao.org/docrep/018/i3253e/i3253e00.htm

CEPA launch project to understand better the key indicators of the pest control industry

CEPA has launched this project in order to get a better picture of the key indicators of the pest control industry at European level and to be in a position to regularly update this database. For the needs of this project CEPA has enlisted the services of the market research specialist InfraLive (a fully-owned subsidiary of TNS Infratest). A pilot test was carried out last year in Spain, in collaboration with ANECPLA our Spanish association.

In cooperation with a panel of the market's key stakeholders, InfraLive has drawn up a questionnaire with an emphasis on the indicators that allow a qualitative analysis of the market studied. InfraLive has also negotiated the desired level of confidentiality for each indicator with the panel involved in the development of the questionnaire. The lower the level of confidentiality, the greater the amount of information available for exchange between all the participants.

The questionnaire developed by this restricted panel of stakeholders must then be sent to around twenty other stakeholders. The information collected is compiled and analysed by InfraLive, which then provides an executive summary. The individual sources are however kept by InfraLive, protected by the research consultancy's code of ethics and the confidentiality agreement negotiated with the participants at the outset.

CEPA hopes to be able to conduct this study in as many European countries as possible. To promote this initiative CEPA is organising information meetings for individual associations, most recently with British pest management companies and the BPCA. The next meeting will be held in Warschau after the summer, in collaboration with the Polish Pest Control Association. CEPA believes that this tool is essential to effectively communicate with the European institutions and all other stakeholders that shape the future of our industry.

Experts debate bee health at EFSA Colloquium

More than 100 bee experts gathered in Parma, Italy, in May to debate the latest scientific developments on the risk assessment of multiple stressors in bees. EFSA's 18th Scientific Colloquium entitled 'Towards holistic approaches to the risk assessment of multiple stressors in bees' was convened in response to the growing consensus among scientists about the multifactorial origins of bee colony losses and mounting evidence that stressors in bees – such as parasites, diseases, malnutrition and the effects of products such as pesticides – may act in combination as well as independently.

Professor Tony Hardy, Chair of EFSA's Scientific Committee, opened the meeting by welcoming delegates from Europe, United States and Canada – including representatives of national environmental bodies; industrial and producer groups such as beekeeper associations; civil organisations; and the European Commission. Prof. Hardy emphasised that the object of the colloquium was to have a frank and open discussion rather than reach a consensus on what is a difficult and sometimes controversial issue.

Invited experts then introduced the four themes of the meeting which were later developed in smaller discussion groups. Koos Biesmeijer, from the Naturalis Biodiversity Centre in the Netherlands, set the scene for the discussion on "Protection of Bees and Pollination Services: Tools and Changes" by outlining the results of a study comparing the decline of bee species in Europe over four 20-year periods.

Pascal Hendrikx, from the French food safety agency ANSES, then described the progress that has been made in setting up a standardised, Europe-wide bee surveillance programme through the EU Reference Laboratory for Honeybee Health. He told the audience that a standard protocol has already been established in 17 Member States, with common sampling methods, visit questionnaires and training of bee inspectors.

Fabio Sgolastra, from the University of Bologna, Italy, gave a taste of the discussion to come on "Testing and Assessing Stressors in Bees: From Laboratory to Field Conditions" by pinpointing difficult issues such as how to address the chronic effects of sub-lethal doses of pesticides under field conditions.

Jeff Pettis, from the US Department of Agriculture, summed up the intricacies of the fourth theme, "Risk Assessment of Multiple Stressors in Bees: From Mechanistic to Holistic Approaches". He raised a number of issues that were taken up in the discussion group, such as: the use of models as a tool in risk assessment; and the validity of extrapolating individual results to the "superorganism".

This latest scientific colloquia meeting will provide valuable material for EFSA's internal task force on bees, which is currently identifying cross-cutting issues, data and knowledge gaps, research needs and recommendations based on the most recent developments in the area of risk assessment and monitoring of bees. The task force is due to report in September 2013.

■ Source: For more information see http://bit.ly/119CflW

ECPA 'deeply disappointed' by neonicotinoid ban

Friedhelm Schmider, Director General of European Crop Protection Association (ECPA) commenting after the vote in the Appeal Committee on the neonicotinoid issue: "We are deeply disappointed by this decision. Firstly because independent monitoring studies in a number of EU member states have clearly documented that when used correctly, neonicotinoid insecticides have no impact at all on bee populations. Furthermore the process has been hazard-based ignoring the risk mitigation measures being implemented in Member States. The scientific basis for such a decision is poor, as the EFSA evaluation was inconclusive and needed to address perceived data gaps to better determine the potential risks."

"Recent findings of the European Commission's Reference Laboratory have confirmed that both beekeepers and laboratories see pesticides as a minor cause affecting bee health, far behind diseases and parasites[1]. It is therefore extremely disappointing to see this decision and making people believe that the decline in bee health can be reversed by mainly restricting or banning this key technology." – he continued.

ECPA is also concerned with the procedural consequences. Friedhelm Schmider added: "This decision is based on a misuse of the precautionary principle setting a very negative precedence in the application of the legal framework set out in Regulation 1107/2009, and contravenes the principles of predictability, consistency, proportionality and legal certainty. It puts at risk the competitiveness, productivity and sustainability of European agriculture and sends an extremely discouraging signal to the whole agri-food sector, including agri-R&D companies in Europe".

Nevertheless, the industry remains committed to the issue of bee health and will continue to invest in stewardship measures and solutions to protect pollinators.

"The crop protection industry believes that neonicotinoids are not the cause of the mortality of bee colonies and we are committed to work with all relevant parties to build a common understanding and develop solutions to the main threats to bee health" – Friedhelm Schmider concluded.

[1] DG SANCO presentation: http://www.ebcd.org/pdf/presentation/304-Laddomada.pdf

■ For more information see the crop protection industry website about pesticides and pollinators at http://www.pollination-station.eu and the Humboldt Forum for Food and Agriculture report supported by Copa-Cogeca, ESA and ECPA and financed by Bayer CropScience and Syngenta at http://www.neonicreport.com

Asian fly threat to fruit industry

It is just two millimetres long but scientists fear the suzukii fly has the potential to damage the UK's multimillion-pound soft fruit industry. *Drosophila suzukii* has been advancing out of its native south-east Asia for the past five years and is now known to be in England and Scandinavia. The pest has the capacity to destroy up to 80% in fruit yield, and could ruin the fruit-farming industry, already beset with problems caused by poor spring weather. The fly lays eggs in fruit such as strawberries, grapes, and pears. Fruits are made inedible as the larvae grow and feed off the fruit flesh, accelerating decay.

However, Edinburgh University based researchers have worked to unravel the genes, in a move that could help them create a targeted pesticide. By understanding its make-up, scientists hope to find out why the fly only eats fresh fruit. They think it may help to create an artificial fragrance that smells similar to fruit to confuse, trap and kill the flies.

The study was carried out by Edinburgh University and Fondazione Edmund Mach in Italy. Professor Mark Blaxter, of Edinburgh University's GenePool Genomics Facility, said: "It's a matter of time before it comes here. But it is great to be able to use our state-of-the-art equipment and skills to help with such a threatening pest." Dros*phila suzukii* had been known to spend winter in its home climate of south-east Asia, but has become hardy enough to survive northern winters.

The researchers say that, if a crop is infected with the fly, much of the fruit will be lost in the first year, with peaks of up to 80% reduction in yield. Once the fly is established on a farm, getting rid of it is almost impossible.

■ The study was published in the journal Genome Biology and Evolution and was supported by the Medical Research Council and the Natural Environment Research Council.

Larvae of the spotted-wing drosophila (Drosophila suzukii) on a strawberry. (photo by Hannah Burrack)

Chestnut Leaf Miner late in 2013

Successful insect plant pests like Horse Chestnut Leaf Miner (*Cameraria ohridella*) show synchrony with their host plant species, in this case the white flowering horse chestnut (*Aesculus hippocastanum*). A normally scheduled spring in southern England sees the white flowering horse chestnut sporting a full leaf canopy by the third week of April with the adult moths emerging from pupae inside dead fallen leaves (leaf litter) from the previous year.

Newly emerged adult moths fly to the tree trunk where they congregate (aggregate) for mating. The egg-laden females then fly to the expanded leaves to oviposit eggs along the veins on the adaxial (upper) surfaces.

In 2007 adult moths were seen on horse chestnut leaves by 20 April. This year (2013) has recorded one of the latest springs on record for the United Kingdom. On 20 April 2013 there was no horse chestnut leaf miner moths in sight, the adult insect stage not yet emerged from pupae inside the leaf litter.

This was just as well because winter buds on white flowering horse chestnut trees were only just beginning to open. We had to wait almost three weeks until 9th May to see the tiny moths with their brown barred wings aggregating in number on the trunks of white flowering horse chestnut trees with leaves now substantially expanded to provide a suitable template for oviposition.

■ Source: Dr Terry Mabbett

Adult horse chestnut leaf miner moths aggregating to mate on the tree trunk. Picture Dr Terry Mabbett.

Nylar 4 EW approved for bed bugs

PelGar International based in Hampshire, UK has received approval for Nylar 4 EW for use on bed bugs. Up until recently the pyriproxifen based product was only licensed for the control of fleas and cockroaches. The addition of bed bugs to the label is great news to anyone who has experienced problems in treating the growing number of resistant strains of bed bugs and needs to be able to add some extra potency to their pest control programme. The product has this use approval in the UK and France.

Pyriproxyfen is a third generation IGR with a unique mode of action, functioning as an analogue of an insect juvenile hormone. Juvenile growth hormones control the development of many parts of the insect's physiology during its lifecycle. These can interrupt the development of eggs; render pest populations infertile by either damaging the production and vigour of sperm; inhibit moulting or cause nymphal stages to moult into sexually sterile 'adults'. Nylar 4 EW is an oil-in-water emulsion (EW) formulation that is particularly effective in treating populations that are showing resistance to conventional insecticidal treatments. The EW formulation offers excellent residual control on non-absorbent surfaces such as vinyl surfaced wall-papers, most plywood, plastics, laminates, metal and (ceramic) tiles. Nylar 4 EW has a very low odour and is non-flammable. Nylar 4 EW can be tank-mixed with the following other commonly available insecticides: Cytrol Forte (PelGar International Ltd HSE 6424); Ficam W (Bayer Environmental Science HSE 5390) and K-Othrine SC10 (Bayer Environmental Science, HSE 5097).

■ For further information contact: Nic Blaszkowicz, UK Sales and Marketing Manager, Email: Nicholas@pelgar.co.uk

Chalara fraxinea undercover in Wales

The latest announcement on Chalara ash dieback from the newly formed 'National Resources Wales' (NRW) suggests Chalara fraxinea was imported into the United Kingdom from Europe at least 7 years ago. The presence of Chalara fraxinea has been confirmed in the wider Welsh environment at Ferryside, Carmarthenshire on 13 May 2013, the spores having spread from an adjacent diseased site planted between December 2006 and March 2007 using infected ash trees sourced from Europe. Chalara ash dieback has been identified at 19 recently planted sites in Wales but this is the first case of the disease being found in the wider wayside and woodland environment.

This announcement begs the question as to how Chalara ash dieback could have been in the United Kingdom for such a long period of time without the plant health authorities knowing. It also questions NRW plans to keep Wales chalara free. The NRW announcement was also like an arrow from a Welsh archer's bow piercing the heart of Defra's recently released Chalara Management Plan for England. A cornerstone of that plan was creation of a disease-free swathe of counties up the western edge of England, by paying landowners to dig up and destroy recently planted ash and to replant with other tree species.

Chalara fraxinea is now in the wider Welsh environment and behind the English 'lines' with a clear and easy ride into the 'Heart of England' from ascospores carried on prevailing south westerly winds. These winds blow far more frequently and fiercely than do easterly winds from the European Continent as Britain well knows from its perennially wet and windy summers.

■ Source Dr Terry Mabbett

Linde invests in crop science

Linde Gases announced in May, the launch of a newly formed Crop Science business, previously referred to as its "fumigants" business and at the same time announced the opening of a new plant in the Czech Republic, which will manufacture the group's latest environmentally friendly fumigant, to be marketed as EDN®.

Linde's Crop Science business will offer innovative fumigant products to protect both food produce itself and the producer's investment, while allowing for genuine sustainable agriculture. The products are highly effective substitutes for the universal – and now mainly banned component – methyl bromide (MeBr), which has for some time been the global standard for fumigation. Linde's fumigant product range is considerably more environmentally friendly and comprises of naturally occurring active ingredients that degrade to earth-friendly metabolites. The fumigant range also fully complies with UN Directives, such as the Montreal Protocol, and has no known global warming potential.

Linde's Crop Science product range includes VAPORMATE™ and EDN™. Linde also has a dedicated team to ensure farmers and producers select the most appropriate fumigant product to meet their needs and to comply with local regulatory requirements.

In recognition of Linde's dedication to sustainability performance, in September 2012 the Group was added to the Dow Jones Sustainability Indexes (DJSI World). Analysts at the Sustainable Asset Management Group (SAM) recognised in particular the Group's activities in the areas of climate change, environmental management systems and risk and crisis management.

■ For more information, see http://cropscience.linde-gas.com/en/index.html, www.linde.com or contact Susan Brownlow, Public Relations Manager, Linde Gases Division, susan.brownlow@linde.com.

96% suppression of the dengue mosquito in Brazilian trials

Scientists from Oxitec, together with Moscamed and the University of Sao Paulo, Oxitec's partners in Brazil, are collaborating to carry out field demonstrations of Oxitec's technology against the dengue mosquito, *Aedes aegypti*. In Mandacaru, a village near the city of Juazeiro, releases of the genetically engineered 'sterile' OX513A mosquitoes resulted in a 96% reduction of the wild mosquito population in the target area after only 6 months. This level of suppression was maintained for a further 7 months using continued releases, at reduced rates, to avoid re-infestation. Almost 3,000 people were protected from the dengue mosquito during this period.

These results follow a previous trial which demonstrated an 80% reduction of a mosquito population in Itaberaba, part of the city of Juazeiro, Brazil. Similar results were also achieved in the Cayman Islands in 2011. The latest evaluation in Mandacaru achieved even greater reduction because it was conducted in a more isolated area and therefore had less immigration of wild mosquitoes from un-treated areas.

"Today's result shows that sustained releases of our OX513A mosquitos can be a highly effective tool in reducing populations of the dengue mosquito" said Oxitec's Dr Luke Alphey. "In this trial we've seen that when releases are carried out in a relatively isolated area, our approach results in even greater population reduction than that which we have reported previously, as immigration from immediate neighbouring areas is reduced. This also indicates that in the right conditions, local elimination of a target pest species should be possible".

Dr Alphey explained that the study was also able to show maintenance of control into the peak mosquito season through sustained low level releases. "It's particularly pleasing that Moscamed demonstrated they were able to maintain control after the initial suppression period through smaller scale releases of our mosquitoes. The wet summer months are when we would normally expect mosquito populations to peak, but even with reduced releases in the treated areas we were barely seeing any wild mosquitoes. This indicates that the approach is not only effective at combating the threat posed by dengue mosquitoes through the peak wet season but also that this approach is sustainable over time".

Moscamed director Dr Aldo Malavasi said that the Oxitec approach offered an important new tool in the fight against the dengue mosquito. "Brazil has one of the highest incidences of dengue fever in the world" he said. "We are pioneering the development of this innovative approach because we desperately need new weapons to target the dengue mosquito, which is growing in number despite conventional efforts to control it. This evaluation was carried out following an extensive programme of community engagement, and local people are highly supportive of what we're doing. They understand better than anyone the threat posed by dengue fever, so it's tremendously exciting to see that this approach may offer real hope to them and to others living in the shadow of this disease".

■ Further information is available at www.oxitec.com, or by email info@oxitec.com

Navy Entomology Center of Excellence hold pesticide application equipment workshop

Lt. Jen Wright and Lt. Marcus McDonough*

The Navy Entomology Center of Excellence (NECE) based in Jacksonville, Florida, hosted the 2013 Department of Defense (DoD) Pesticide Application Equipment Workshop on 19-21 March. The workshop provided an opportunity for military evaluation of insecticide application products and technology produced by a variety of manufacturers. Six vendors with 10 pieces of equipment attended the event exhibiting the newest technologies available on the market.

"For almost 70 years, NECE has served as the Navy's center of innovation for vector control techniques, equipment and pesticides, producing products that reduce the risk of insect-borne disease from negatively impacting our deployed personnel," Cmdr. Eric Hoffman, NECE Officer-in-Charge. "Based on this tradition of sustained extraordinary performance and combined with exceptional facilities and staff, we are proud to have earned recognition as the Department of Defense's center for testing and evaluating all insecticide dispersal equipment to be used by the services. No other organization or command performs this critically important mission."

Jason Trumbetta, Dr. Clint Hoffman, Dr Muhammed Farooq and Lt. Noel Cote use a USDA APP to determine calibration factors.

According to Lt. Noel Cote, NECE Testing and Evaluation Department Head, this workshop identifies novel or updated equipment for testing that can fill a gap or shortfall in current or future contingency operations.

"As the only DoD certified equipment testing center, we are always on the lookout for new technology and equipment that will allow us to better support the deployed

Lt. Noel Cote' records the surface temperature of the Grizzly nozzle during the equipment evaluation.

war-fighter protecting them from vector born diseases," said Cote.

NECE had several subject matter experts on hand to assist with and observe the evaluations. Dr. Graham Matthews, Professor Emeritus, International Pesticide Application Research Center, Imperial College London; brought with him a wealth of knowledge on testing equipment for the World Health Organization (WHO) and presented a lecture to the attendees. Additionally Dr. Clint Hoffmann, U.S. Department of Agriculture, Agriculture Research Station, College Station, Texas, assisted in defining the droplet size for each piece of equipment using a Sympatec Helios laser droplet analyzer system.

"Mr. Vince Smith and Dr. Muhammad Farooq [NECE personnel] were instrumental in the selection of gear to be tested and the operation, planning, and efficiency of the workshop," said Cote. "These men are world experts in Ultra Low Volume (ULV) and Fogging technology providing valuable expertise and skills here at the center."

Each piece of equipment was evaluated according to size range/proportions, flow rates achievable, fuel consumption and the length of operation on a single tank of pesticide. In addition, the Guardian ULV produced by ADAPCO is being tested in accordance with the World Health Organization Pesticide Evaluation Scheme (WHOPES) standards. The objective of WHOPES is to facilitate the search for alternative pesticides and application methods that are safe and cost-effective, and to develop and promote policies, strategies and guidelines for the selective and judicious application of pesticides for public health use, and assist and monitor their implementation by member states.

Bruce Dorendorf and Vince Smith test the Hot Spot atomizer using laser technology at NECE.


Dr. Graham Mathews and Jason Trumbetta, ADAPCO, calibrate the Guardian ULV sprayer at the Department of Defense (DoD) Pesticide Application Equipment Workshop.

"NECE utilized their facilities to evaluate the Guardian (sprayer) to WHO specifications. This is the first time tests of this nature have been performed at NECE, once again establishing the centre as a leader in equipment evaluation," said Matthews.

"The workshop is the initial step in discovering the best possible technology that meets or exceeds military requirements resulting in tools that will protect our deployed personnel from human disease transmitted by blood feeding insects and other arthropods," said Hoffman. "Having the appropriate tools is critically important to mission success as our military members are consistently exposed to elevated disease risk while conducting humanitarian assistance, disaster relief and contingency operations world-wide. "

The results of the testing will be published in the Journal of The American Mosquito Control Association. The Deployed Warfighter Protection Program, a joint venture with DoD and USDA, provided all funding for the study and testing.

■ For more information on how to get equipment evaluated by NECE please contact: NECE-T&E@med.navy.mil.

* LT Jen Wright MSC, USN. Navy Entomology Center of Excellence, PO Box 43, Bldg 937, Naval Air Station, Jacksonville, Florida, USA

PestEx powers on!

This year's PestEx, held 10-11 April in London smashed all records, and proved to be a huge draw – the perfect combination of exhibitors and seminars to bring in a whopping 24% more people over the two days. The show saw 2,369 people (including exhibitors) attend, who were attracted by the many innovative products on display, plus the range and depth of technical and business seminars.

Organised by the British Pest Control Association, PestEx extended the strong international flavour of previous events, with 26% of the visitors being from outside the UK. But quality was not sacrificed for the sake of quantity; the majority of visitors were from roles where they have the final decision over or major influence on the purchase of pest control products and services. BPCA Technical Manager Richard Moseley said "it is clear the majority of our exhibitors now sell products across international boundaries, and PestEx provides them with a perfect platform to reach pest management professionals from across the globe."

BPCA President Henry Mott confirmed the success of the event. He commented "I didn't hear a single moan from any visitors or exhibitors and indeed when I went and had a chat with a few of the exhibitors they all commented how well managed and attended it was."

Wednesday smashed all records, with a 25% increase in visitors over the 2011 event. The Thursday, though traditionally quieter, is a chance (as one exhibitor put it) to have 'more in-depth conversations'. This was backed up by 561 delegates who came for both days of the show, as the 30% increase in stand numbers and range of back-to-back seminars made seeing everything in a single day a planning challenge.

Visitors commented on the range of interesting new technologies, especially in the area of remote monitoring of bait stations and software systems – perhaps an indication that in the recession, our industry is seeking less labour-intensive methods of control.

On the seminar front, PestEx provided a wide range of presentations on business, technical and practical topics. While space does not allow a true reflection of the full programme, some highlights were:

Bait Station Efficacy research by Professor Gai Murphy of the University of Salford. Her research showed that because the rodenticides currently available are not species-specific the risks of non-target poisoning must always be considered. In an urban setting these risks may be amplified where treatments to control house mice (Mus domesticus) are undertaken, as this species tends to be an indoor pest and therefore occupies the same space as people and pets. It is important to strike a balance between safety and efficacy in these situations. To explore the efficacy of bait boxes in an urban setting, the research team from Salford University worked closely with the pest control services unit at Manchester City Council. Feeding trials were run in infested blocks, using the experimental design outlined by Buckle and Prescott (2010). The results found that the formulation and bait boxes did impact on mouse feeding.

The Chartered Institute of Environmental Health launched a consultation document on sewer baiting best practice. The UK waste water industry has recently been through significant changes due to legislation and privatisation. Implementation of rodent control programmes has been patchy and so CIEH's National Pest Advisory Panel has further developed existing operational guidance on sewer baiting treatments, to include training and qualifications of pest control technicians; health & safety aspects; treatment methodology; all necessary for a safe and efficient treatment programme. This revised protocol and guidance document addresses the identified deficiencies and ensures the continuity of treatments nationally, irrespective of whether treatments are undertaken in-house or by third parties. The document consultation process was completed at the end of April, and the new document will be launched soon.

Dr Richard Naylor, a UK bed bug expert gave a presentation answering the question 'Why do bed bugs disperse?' Using custom-built arenas and artificial hosts, Dr Naylor was able to recreate bed bug infestations under laboratory conditions, making it possible to unravel the factors affecting their aggregation and dispersal behaviour. It seems

1


2

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illogical that a bed bug should abandon a reliable source of food and the security of its harbourage and head out into the unknown, with no guarantees of ever finding a new host. Yet active dispersal between rooms within an infested building is an important factor in their spread. Thus improved understanding why they abandon one host in search of another has important implications for their control.

The long-held belief that females disperse to avoid unwanted male attention seems not to be supported by the laboratory studies. However, competition for suitable crevices in the vicinity of the host may be much more important than previously thought. Dr Naylor finished his presentation with an update on the work of The Bed Bug Foundation, including an overview of what's new in the latest version of the European Code of Practice for Bedbug Management as well as the Foundation's direction for 2013 and beyond.

Simon Forrester from BPCA gave a talk on research carried out with the British Retail Consortium on why food premises fail audits. Specification non-compliance is an expensive and potentially damaging process. His talk outlined the key areas for failure against version 6 of the standard, and set out some potential ways forward for clients, auditors and pest management professionals to minimise future non-conformity.

David Cary from the International Biocontrol Manufacturers' Association spoke about the place of biocontrol in public health pest management. The cost of development of traditional pest control products combined with a sceptical consumer market and regulatory policy focused on reducing risk to both human health and the environment means we have to do things differently in pest control. While not a new concept (our industry has accepted for some time that monitoring forms the basis of a robust pest management programme), pest control has adapted well to becoming even more of a service based industry. However we have seen the number of available tools decrease and waited even longer for new ones to arrive.

Increasingly these will come not from chemistry but from nature, creating a market with 10 to 15% growth. Examples

include pheromones for monitoring and mating disruption, Bti in mosquito infestations, and other microbial pathogens such as Beauvaria bassiana for control of food storage insects. Biocontrol programmes are often knowledge and labour intensive, and tailored to local needs. This can be seen as an advantage and not a barrier in a service industry such as Pest Management.

Delegates were invited to consider whether the concept of releasing an insect deliberately into a food factory is an alien thought, or one possible future for our industry. His presentation outlined some food substances and novel techniques that could potentially be relied upon to gain control, and ways to improve the results from existing technologies. His summary stated that by understanding fully the interactions between insects we can use nature to give more reliable control whilst reducing the risk of resistance and damage to human health and the environment.

Other presentations included:

- Feral bees: the UK pest management industry has worked together to produce a code of best practice on dealing with bees to minimise harm to this essential insect.
- Rodent Control: behavioural aspects to improve results
- Waste Management: the UK industry is facing a significant increase in cost if the regulator insists on hazardous waste classification for spent bait
- Gull roof net design: effective installation advice
- Ship cargo and container fumigation: a recent incident with a vented cargo left 18 people hospitalised in Northern Ireland. The seminar discussed how industry can prevent further incidents and ensure the safety of those opening containers at their destination.

The last word must go to BPCA Chief Executive Simon Forrester, who said "we were really pleased to see the volume and quality of people attending the show. I've been organising trade exhibitions for almost 20 years, and this is the best response I've ever had. I want to expresss my personal thanks to the BPCA staff and the team from Dewberry Redpoint, who made the event shine. I'd also like to thank the visitors and exhibitors who travelled so far to make the event so successful."

PestEx 2015 dates have been provisionally set at late March 2015; BPCA are talking to the organisers of another show with the possibility of co-locating. More on this soon. In the mean time, the industry should give itself a pat on the back for coming together and strengthening PestEx's place as the premier pest management event.

■ www.bpca.org.uk/pestex

Image captions

1) Examining possible futures for the pest control industry were Jonathan Peck (Killgerm), David Lodge (Beaver Pest Control), Steve Miller (London Borough Newham), Frances McKim (PEST magazine), Martin Harvey (BPCA) and Stephen Jacob (BASIS Prompt).

2) Among the overseas exhibitors were Magdalena Urbanowicz and Damian Bobrowicz of Euroimpex, Poland.
3) Richard Moseley of the BPCA looked at the management of hazardous waste which now includes spent rodenticide and the issue of traceability.

4) Watch the birdie: Simon Forrester, Chief Executive of BPCA meets his German counterpart, Andreas Beckmann CEO of DSV

5) Discussing CEPA's development of a European Standard for the provison of pest management services were, left to Right: Rob Fryatt (Xenex Associates), Emmanuel Audon (Bureau Veritas), Peter Whittall (Rentokil-Initial) who look on as Bertrand Montmoreau (Chair CEPA) makes a response to the audience. Also on the panel was Dr Chris Suter (Royal Society for Public Health)

6) Paul Butt of Natural England, looked at the future for SGARS and summarised how the implementation of the proposed environmental risk mitigation measures will influence and change current operations.

7) Our own Kumar Patel was happy to welcome new readers on the International Pest Control stand

8) IPC Editor David Loughlin with Jean-Luc Scalabre representing Trece on the Sentomol stand

9) Paul Hoyes and Ray Harrop, give a hands demonstration on the Killgerm stand

10) Professor Gai Murphy of the University of Salford revealed research in conjunction with the Manchester City Council pest control unit investigating how rodenticide formulation and bait boxes impacted on mouse feeding.

11) Mark Astley talked about how detection dogs can be a benefit in pest control, ably assisted by Lola, a 2 year old Parsons Jack Russell, the original Trust K9 Bed Bug Dog.

12) Sharon Hughes of BASF examined how rodent baits can be use to exploit rodent behaviour to taste/odour, bait boxes and a rodent's reaction in environments

13) Andy McLachlan of Business Shield considered why accidents happen in the workplace and provided advice on how to ensure they can be reduced.

14) The Servicepro.net team from Columbus, Ohio know the right reading material.

■ *Editors note: We would like to thank the BPCA for their assistance in compiling this review and for the supply of much of the photography.*

Chinese Pest Control Association celebrates its first 20 years

Rob Fryatt*

The CPCA is a young industry association, but has made big leaps forward in its 20 years of existence. No one who visits China regularly would be surprised by this, especially those involved with the pest management industry. The resultant Chinese Pest Control Association Annual Conference and the celebration of its 20th anniversary were held in the provincial capital city of Changsha, Hunan Province, from March 27th to March 29th 2013. The festivities in Changsha were joined by public health and Centre for Disease Control in China (CDC) officials, transportation authorities, industry experts, both Chinese and International representatives from National Pest Control Association (NPMA), Confederation of European Pest Control Associations (CEPA), Australian Environmental Pest Managers Association (AEPMA), Korea Pest Control Association (KPCA), CPCA's board members, consultants, association members, and other industry colleagues.

More than 600 hundred delegates and 60 exhibitors attended this year's conference. The distinguished guest list included from China, the president of CPCA, Xiaoqiu Qi, Deputy Director of Public Health Bureau, Andi Lin and Deputy Secretary of City Government of Changsha, Qiucheng Liu. Uniquely the CPCA were able to bring together in the same location, the President of NMPA – Laura Simpson, the President of CEPA- Bertrand Montmoreau and the President of FAOPMA and AEPMA – David Gay. Indeed to have the President Elect of FAOPMA and current President of KPCA – Myeon Ha Park added to the uniqueness.

The celebrations kicked off with a video tribute during the opening ceremony, containing photos and commentary of the recollections of the founding members of CPCA, who laid a strong foundation for the association's success. During the session, video greetings were broadcast from both the NPMA in the US and the BPCA from the UK. Both were well received. The opening session closed with the first public performance of a specially commissioned "Song for the CPCA". An innovation led by Ms. Huang who could be described as the single factor that runs through the last 20 years and continues to lead the Chinese industry into the future.

From its humble start in 1993, to an internationally recognized organization in twenty years, the CPCA currently boasts more than 600 members, along with 22 regional affiliates all across China. CPCA has taken on the task of training technicians, the certification of pest management companies and facilitating dialogue between regulatory bodies and the industry. CPCA is an active participant in FAOPMA and also attends numerous international conferences and has an international column in its magazine to bring the latest industry news to its members.

During the CEO forum Laura Simpson, David Gay, Bertrand Montmoreau and Rob Fryatt, along with leaders from the Chinese industry led lively discussion with the CEO's from leading invited Chinese PCO companies. This covered the challenges and opportunities within the pest management industry from a global perspective. Their input and viewpoints were well-received by the Chinese audience.

The opening ceremony

As a regular contributor to the CPCA magazine, and a regular visitor and commentator on the Chinese industry, the conference demonstrated to me once again, the speed of development of the pest management industry in China. Not just the speed of growth, but the continual drive to learn from industry colleagues around the world with the goal of continuing to raise the level of professionalism and market understanding.

Discussions in the Exhibition Hall

*Rob Fryatt is Senior Associate at Xenex Associates. rob@xenexassocites.com. www.xenexassociates.com

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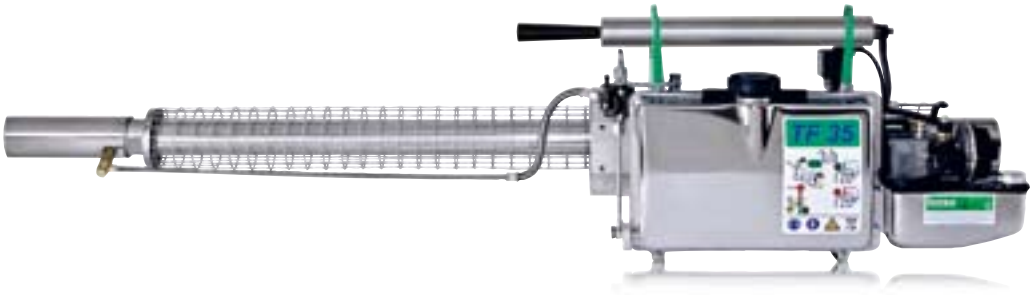

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Pyrotechnic smoke generators as pesticide application tools

Carlos Cintora & Daniele Barni*

Antonio Cintora the inventor of smoke pesticide technology lectures in the early 1960's.

China is recognized for many inventions and especially for being the birthplace of pyrotechnics, during the Sung Dynasty, about 1000 years ago. Through adventurous explorers, the knowledge of how to make fireworks spread west, through Arabia in the seventh century. The Mongols are credited with taking Chinese gunpowder to Europe in the 13th Century with the first record of their use in Europe around 1258.

Hundreds of years later, in the 1950´s Fumi-Hogar's founder, a young Spanish agronomist called Antonio Cintora, took out the first patents on the use of pyrotechnic and smoke technology to deliver pesticidal effects. This was the basis of the development of his novel company in 1967, becoming the first in the industry to develop such products, which after almost 50 years, continue to be one of the few specialist companies worldwide manufacturing and marketing specialist smoke delivery products. The work over many years by Antonio Cintora and his successors at Fumi-Hogar and the sister international company Fumi-Tech have extended the use from insecticides to a range of biocides, that include fungicides and disinfectants, all using this novel delivery system.

Smoke generators have the ability to quickly and efficiently treat an indoor space for pests without the need for additional equipment.

The characteristics of smoke delivery

Fumigants are a unique and particularly valuable group of chemical pesticides that can successfully act over a wide range of pests, often where no other form of control is feasible. It is important to draw the distinction from aerosols, which are particulate suspensions of liquids or solids dispersed in air and which are often referred to as smokes, fogs or mists. Smoke delivery consists of tiny solid particles, smaller than any aerosol drop, which provide a much more effective treatment. Smokes permit the active ingredient to penetrate inside commodities and into cracks and crevices where other insecticides have difficulty to reach, if at all.

Studies performed on many different formulations show the benefits of smoke generators compared to other traditional delivery systems such as compression sprayers that often involve the handling and application of hazardous substances and their potentially harmful or corrosive effect on equipment and premises. Through the special features of smoke generators, where no additional equipment is required, it is possible to reduce handling costs and at the same time improve efficiency, ensuring better working conditions and enhanced product effect.

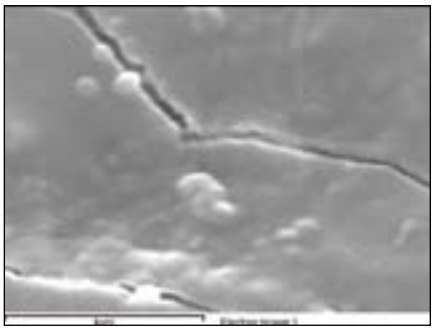
The two most important characteristics of good smoke delivery are particle size distribution and smoke pressure. 97% of the particles within the smoke are usually less than 5 microns. This explains how the smoke is able to penetrate into difficult or inaccessible areas, such as roof voids and nooks and crannies and ensures that the active substance is homogeneously deposited on all surfaces; vertical, horizontal and even the underside of horizontal surfaces.

A combination of smoke pressure and the low particle weight permits a homogeneous dispersion of active ingredient throughout the space to be treated. This has been confirmed using tests with florescent tracers, to demonstrate that all treated surfaces are equally exposed to the impact of the particles during fumigation. On the next page a picture displays the result of a fluorescent tracer dissolved into the fumigant mixture together with the active ingredient, with subsequent crystallization by evaporation. Using ultra violet light the tracer can be seen to be evenly distributed over the treated area.

Benefits of using smoke genrators

- Lower quantities of active substance are required to treat the same area than traditional spraying

Electronic microscopy studies showing particles of around 1 micron distributed evenly across the treated surface.



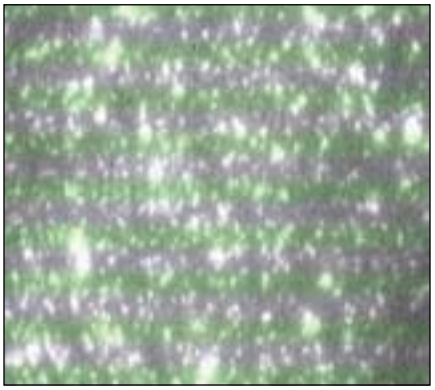
- Optimum effective use of small quantities of pesticide helps minimize the impact on the environment
- Simple and easy to use – no special training required
- No special equipment required – cost saving
- Low operator exposure – health benefits to staff
- Low groundwater contamination – low environmental impact
- Smokes do not increase humidity – fungal growth is not encouraged
- Effective treatment in any enclosed area
- Pesticide is deposited on vertical, horizontal and underside of horizontal surfaces ensuring a thorough treatment
- Treatment of inaccessible areas – roofs, nooks and crannies can be successfully treated.

New frontiers

Though smoke technology has been regularly used during many decades for insect control, it is only since the beginning of the 21st Century that the use of fumigants as disinfectants have been increasingly used throughout the world.

Dry smoking techniques are now well used in market sectors where humidity levels must be kept to a minimum in order to avoid fungal growth and many other dangerous diseases, such as in food production plants, fruit storage and many other areas.

The control of microorganisms can be considered essential in residential homes, within many industry processes as well as in public health. There is an increasing



Even smoke distribution displayed by use of a fluorescent tracer

demand for such products as both modern industry and society expect total control of common microorganisms such as bacteria, fungi, yeast and viruses.

Disinfectant smoke generators can be used in a wide range of application areas where a system for controlling the total microbial contamination level is required, such as with animal feed and grain industry, food production plants, fruit storage and packaging units, bakeries, air conditioning systems, hatcheries, dairy product factories and livestock farms. This is the new frontier for the use of smoke delivery technology

Delivery system

Traditionally smoke control products have been delivered through a combustible mixture within an expensive tin or a cheaper paper and cardboard cone. Even today the majority of applications are made using these traditional methods. Fumi-Tech pioneered the development and marketing of compressed tablets that perform the same function. The tablet is presented in a cellophane sleeve which acts as the wick. The advantage of the compressed tablet is that the cost of production is greatly reduced as they are produced by machine, lowering costs of filling and measuring every device and then assembling the tin and wick. The cost of the tin and wick is also eliminated. This presents a very cost effective treatment for markets where price competitiveness drives purchase. Fumi Tabs are now marketing around the world with increasing uptake.

With over 46 years of experience as a specialized company working with biocidal products, Fumi Hogar and its international division Fumi Tech understand, formulate and market a wide range of solid organic and chemical materials. The company has invested at its production site in Malaga, Spain in modern production machinery, with the environment and waste elimination at the fore. This is substantiated by their ISO 9001 and 14001 certifications. So from farm gate to dinner plate, these products have a wide range of uses in fruit production, horticulture, grain storage, veterinary and public health. A much overlooked technology "pyrotechnics" has an increasing value and use in today's market.

■ For more information contact ccintora@fumi-tech.com or visit www.fumi-tech.com.

*Fumi-Tech, Avd. Ortega y Gasset, 268', Pol. Ind El Viso. 29006 Malaga, España

Table 1: Microorganisms controlled by Disinfectant smoke generators

Virus	Bacteria	Fungi and Moulds
Influenza Hong Kong Virus	*Bacillus subtilis*	*Aspergillus*
Herpes Simplex	*Enterobacter cloacae*	*Trichophyton mentagrophytes niger*
Type 1 Virus	*Escherichia coli 0157:H7*	*Candida albicans*
Vaccinia Virus	*Legionella pneumophila*	*Rhodotorula rubra S*
Rotavirus	*Listeria monocytogenes*	*Sccharomyces cerevisiae*
Avian Infectious	*Proteus vulgaris*	*Candida krusei*
Laryngotracheitis Virus	*Pseudomonas aeruginosa*	*Rhodotorula mucilaginosa*
Avian Herpes Virus	*Pseudomonas putida*	*Saccharomyces bailii*
Fowl pox Virus	*Salmonella choleraesius*	*Torula utilis*
Swine Transmissible Gastroenteritis Virus	*Salmonella typhimurium*	*Alternaria tenuis*
Foot & Mouth Disease Virus	*Staphylococcus aureus*	*Aspergillus Flavus*
Feline Coronavirus	*Streptococcus faecalis*	*Aspergillus Ustus*
Feline Calicivirus	*Streptococcus lactis*	*Chaetomium Globosum*
(Norovirus surrogate)	*Aeromonas Punctada*	*Microsporium canis* CBS38564
Canine Parvovirus	*Bacillus mycoides*	*Mucur racemosus*
Pathogenic Avian Influenza	*Desulfovibrio desulfuricans*	*Pennicillium brvicaule*
Virus (H7N1)	*Enterobacter Aerogenes*	*Rhizopus stolonifer* CBS 26379
	Escherichia coli spp	*Trichophyton rubrum* DSM 4167
	Mycobacterium terrae	
	Pseudomonas fluorescens	

Rob Fryatt interviews: Simon Forrester, Chief Executive of the British Pest Control Association


Rob Fryatt

In this edition of International Pest Control there is an review of the recent PestEx exhibition held at the ExCel Centre, London. This event is put on every two years by the British Pest Control Association, known throughout the global pest management industry as the BPCA (not to be confused with either the Belgian or Bulgarian national associations, also shortened to BPCA).

The British BPCA is without doubt one of the leading national industry associations worldwide. Its standards are high, membership means meeting many criteria above just paying the subscription fee; it offers an increasing number of added value services to its members; and it reaches out on behalf of members to generate additional business. Simon Forrester, Chief Executive, is a rare breed within the industry. First he is one of the few, full time executive directors within the industry and second, a professionally qualified association manager, with his core skills in running trade associations and not pest management.

At the Italian Industry Association conference during March, Simon and I shared a coffee, as one does in Italy and discussed his role and his thoughts on the industry he has recently joined.

Simon, you are a relatively new face to the industry but one increasingly recognised especially within Europe. Can you share with IPC subscribers and readers your background prior to joining BPCA and what was it that attracted you to say yes when offered the position?

After studying environmental science at University in the late eighties, I took a range of roles in the British National Health Service. I found out from a friend in the hospital that there was a job available in his professional association and it sounded interesting. Once in the job, it was a role I really enjoyed. For small organisations, associations are extremely complex and the challenges of dealing with a volunteer board and a varied membership, keeps any association manager on their toes. I then moved on to run bodies representing business tourism and construction before spotting the opportunity with BPCA. What attracted me to the role was a chance to make a real difference. My research showed that pest control was quite inward-looking – the industry didn't shout about the difference it was making, and I thought I could help turn that around. I'd done some client-focused work, including a magazine at a previous role and so I thought the model would work again.

Across the world there are many committed people in our industry leading national trade associations, but few have the specific management experience that you bring. How do you think this benefits members of BPCA and through your strong involvement with CEPA, the European industry?

Any association faces a dilemma in selecting its CEO. Do you go for someone who knows the sector, but may be seen to be 'partisan', or an outsider who brings no 'baggage' but will take time to understand how the sector operates. Association management professionals bring their strong knowledge of how associations can improve, along with strategic planning experience. I have particularly enjoyed supporting the development of the BPCA board in terms of governance issues, and developing an extensive benefits package for the members which includes a new website and database. Earlier this year, I was proud to be selected to join the Board of CEPA. The BPCA Board are very keen to further professionalise BPCA member companies and their employees and can see the clear benefit in our being closely involved with CEPA, particularly around the CEPA/CEN Standard, which we hope our members will all meet.

You and I have discussed and debated the CEPA/CEN Pest Management Service Standard a lot. At the recent PestEx event you opened time in the programme for a debate on the Standard. In what ways do you think the European industry will gain from the standard and have you experience from other industries that can assist us in promoting the value of the Standard?

I think one of the main benefits will be to show key stakeholders that pest control is a professional sector which takes its responsibilities seriously. Standards have a role in both improving companies and individuals in a sector but also in generating positive publicity. In my last association, we launched a private standard for the integration of three ISO standards (9001, 14001 and 18001) because many member companies were being asked to me*et al*l three. By targeting our members' customers to ask for the standard, we significantly increased uptake. I think this is a key success factor for our CEPA/CEN standard – whether clients like BRC or the supermarket groups look for it.

I want to be sure that we get the best value from your outside industry viewpoint. What is the one area that you think pest management could improve, to raise the public perception of its value to society and the perception of its level of professionalism?

I think one area we are lacking is useful evidence-based data on what benefits pest control actually delivers. We have no real way of justifying the benefit of what we do in hard cash terms. Until we do, our sector will always be seen as an overhead rather than an essential. Much of what we do or recommend is anecdotal and has little scientific backing, or certainly that is the impression given.

I was speaking with a senior Facilities Manager recently, who said pest control is glorified cleaning. If that's the impression our industry gives out, what hope is there for our establishment as a profession? We need to counter these stereotypes with economic and scientific arguments, and I would like to see not just Europe but our colleagues across the globe working together on this issue.

One initiative that you have developed in the UK for the BPCA is the new magazine Alexo, as a way to promote the BPCA members and their services to the major client groups of the industry. Can you share with us what you see as the value to your members and how could they make the most of the magazine. Indeed how could other trade associations in other countries develop such a good idea for their local industry?

Pest controllers are busy people, and marketing is not always a core skill – let's face it, they would rather be dealing with pest problems. Alexo offers them the chance to have a professionally produced magazine bearing their contact details at no cost to them. They can even include quotes in the articles we have written by experts. Only a relatively small number have taken part in Alexo, but with the reader and member feedback, we have changed the structure of the magazine to produce twelve issues a year rather than two, each with a specific focus on one industry sector for example retail, healthcare, packaging and hospitality. I think the model will probably work anywhere, and we would be happy to help trade associations in other countries to set up their own versions.

You have recently held yet another successful PestEx event in London. Was the attendance good and were the exhibitors pleased with the outcome?

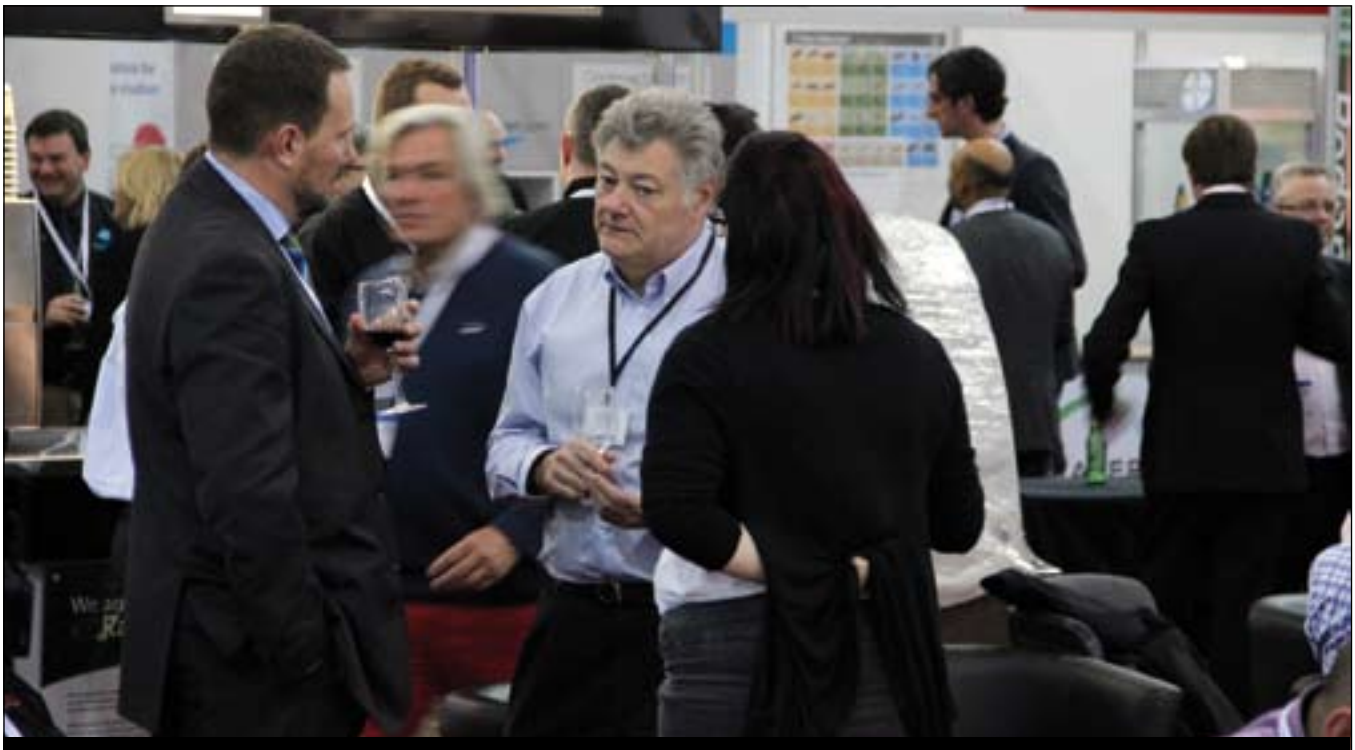
We have been slightly unnerved by how well the show was received. It depends how you measure the success but we had a 30% increase in stand numbers, and a very healthy growth in visitors – vital to demonstrate value to our exhibitors. We aren't resting – there is a lot to do to improve the show for next time, but we are rapidly establishing PestEx as a key part of the international pest control calendar and a show that stretches far beyond the shores of the UK.

Since joining the BPCA, you have been engaged with CEPA, ensuring that the UK industry plays its full part within the increasingly unified European Pest Management Industry. What do you see the value of CEPA to the industry and how can we share more across borders. Indeed, is there

Simon Forrester, Chief Executive of the British Pest Control Association

scope for wider collaboration with NPMA in North America and FAOPMA in Asia and Oceania?

CEPA is vitally important to the success of our sector. We all face the same problems like loss of biocides, invasive species, demonstration of professionalism, and showing clients our worth. Pest controllers in the UK have no conflict with, say, those in Manhattan, Melbourne or Mumbai. We all want to raise the standard of our industry and working together is the best way to achieve it. I hope to attend FAOPMA in Korea this November, to learn from other associations in our sector. After all, we're not in competition and we all have broadly the same end goals.



Simon Forrester and Rob Fryatt wrap up the interview over a glass at PestEx.

In the UK, the BPCA is not the only active trade association. As members ourselves, we have always seen it as the organisation for businesses rather than technicians or sole traders. How do you view this and is the value of the BPCA to the company or the individual? How do systems of continuous professional development (CPD) fit within this balance?

BPCA has historically looked after companies from sole traders upwards. The BPCA Board took a strategic decision last year to offer support to every individual in the sector because a trained and competent workforce is vital to BPCA's success and that of our member companies. We now have an Affiliate scheme for an individual, which provides advice, support and training to enable every pest controller to keep up to date and demonstrate professionalism. The Board offer this scheme at no cost to individuals.

For the final couple of questions I want to look to the future. I know you are an avid "Tweeter". What do you see as the value of social media to the industry and how do we create long term added value from a phenomenon that is here to stay in whatever evolving format it takes?

Twitter and Facebook allow you the opportunity to contact and communicate with people all over the world. My random thoughts on twitter (@assoc_ceo) are very much more about me than BPCA – we have our own association feed (@britpestcontrol). Pest control tends to be a regional (or even local) business but being seen as an expert is always a good thing. By sharing your knowledge, you can influence tomorrow's customer and create conversations with them – vital if you are to maintain influence over their purchasing decision. Social media can't be done in a half-hearted manner – you need to work at it and I'm still learning what works for BPCA.

Finally Simon, if a genie granted you three wishes to improve the UK pest control sector, what would they be?

Where do I start? I think one of the first things to address is the public's perception of pest control – banishing the phrase 'ratcatcher' would be a personal plus, as I cringe every time the media portray our industry in this way. Secondly, I would want to remove the political agendas that exist in the UK market that are clearly preventing progress. If we as a sector could act with one voice, we would accomplish a lot more. Finally, I would have the genie invent a range of biocides that are harmless to non-target species, break down in the environment to nothing but water and oxygen and contain ingredients safe for use on food premises. That should keep my membership in business for a bit longer!

Some thought provoking comments, from someone who no longer think of himself as new to the industry! Indeed in a short time, Simon has built a strong personal credibility within not just the UK industry but wherever he travels within Europe. It is encouraging to see the increasing integration across the European industry and Simon has played an important role in this. The BPCA is highly regarded worldwide and this regard will no doubt continue to grow under Simon's leadership.

Biopesticide Market Opportunities – strategic knowledge sharing and networking event

Dr Julian Entwistle*

A strategic knowledge sharing and networking event on Biopesticide Market Opportunities was held at the University of Greenwich in London on 11th April 2013, organised jointly with the Enterprise Europe Network (EEN) South East, the Natural Resources Institute (NRI) and the Society of Chemical Industries (SCI) BioResources Group. The event was fully subscribed with around 100 representatives of bio-pesticide companies and related organisations, mainly from the UK with a few attendees from companies based in France, Holland, Belgium and Kenya.

The objectives of the event were primarily to foster networking and future collaboration to accelerate the development, introduction and uptake of biopesticides. Professor Andrew Westby, Director of the NRI at the University of Greenwich, welcomed the participants and explained the role of the NRI in supporting Integrated Pest Management (IPM) through MSc and PhD programmes and in setting up the European Centre for IPM (EUCIPM).

Dr Len Copping, vice-chairman of the SCI's BioResources Group, chaired the morning presentation sessions and the afternoon was devoted to structured networking aimed to encourage new collaborations between participants.

Dr Jeff Pedley, EEN Project Manager at the University of Greenwich, explained about this organisation, which is the world's largest business network, currently covering 54 countries including several outside Europe. The Network offers free support to companies and universities particularly in terms of finding research collaborators, business partners and investors and in technology transfer and help with EU legislation.

Len Copping vice-chairman of the SCI's BioResources Group (right) with David Cary, Executive Director of the International Biocontrol Manufacturers' Association (IBMA), answering questions.

Dr Rory Hillocks of the EUCIPM explained that European Regulation (EC) No 1107/2009 and the Sustainable Use Directive 2009/128/EC require member countries to implement IPM and to give priority wherever possible

*Dr Julian Entwistle, Xenex Associates Ltd.
Email: julian@xenexassociates.com

The afternoon session provided delegates with networking and match-making opportunities.

to nonchemical methods of plant protection and pest and crop management. However, in contrast with the USA, where 69% of new pesticide registrations are biopesticides, the introduction of biopesticides in Europe has been heavily constrained by regulation.

David Cary, Executive Director of the International Biocontrol Manufacturers' Association (IBMA), said that the biopesticide market, consisting of microbials, macrobials, semiochemicals and natural products, has been growing rapidly at 10 – 15% per annum, but still remains relatively small at 3% of the total pesticide market. The IBMA, based in Brussels, has over 200 members, and a key focus is to try to ensure proportionate regulation. In responding to a question he said that European Food Safety Authority (EFSA) has recruited more scientific experts and this should lead to a better understanding in their approach to reviewing biopesticides.

Further speakers included regulatory consultant Dr Roma Gwynn who explained the 2-step regulatory process in Europe and commented that regulatory costs are a higher proportion of total development costs than for conventional pesticides. Dr Stephanie Williamson of the Pesticide Action Network (PAN) UK highlighted the global Highly Hazardous Pesticides FAO/WHO initiative and the need to plan for safer and more sustainable alternatives and Dr Jerry Cross presented on the IPM situation in apple orchards in the UK and illustrated the many practical issues in achieving reductions in pesticide use, including the fact that popular varieties of apple are susceptible to diseases and require intensive spraying.

At the end of the morning there were short 'pitches' by 7 organisations that have successfully developed biopesticides: Dr Paul Sopp of Fargro Ltd, Dr Willem Ravensburg of Koppert Biological Systems, Colin Govett of BCP Certis Europe, Dr Eric Patterson of Germains Seed Technology, Dr Neil Morrison of Oxitec, Clive Newitt of Eden Research and Dr Nayem Hussan of Russell IPM.

The informal networking opportunities and afternoon structured networking sessions formed a key part of the event and participants were asked to identify likely future collaborations arising from new contacts and discussions. Attendees strongly appreciated the event and the organisers are planning to repeat it next year.

The Queen Anne Building at the Old Naval College was the venue for the Biopesticide Knowledge Sharing and networking Event.

Dr Owen Jones of Lisk & Jones Consultants, Suterra and past president of IBMA, said "I found the Biopesticides Opportunities meeting both stimulating and informative. Clearly the interest in biopesticides is gathering momentum on a global basis. I thought the format was just right with presentations in the morning and one-to-one meetings in the afternoon and I look forward to the next one."

■ For more information visit www.eucipm.org and the Events page at www.enterprise-europe-network.ec.europa.eu.

Dave Hall (University of Greenwich, NRI) and Nayem Hassan (Russell IPM) exchange ideas over lunch.

Jeff Pedley, Project Manager for the Enterprise Europe Network at the Unversity of Greenwich talks to Jonathan Harmer of Farmura Ltd.

Excavation of building insulation by carpenter ants (*Camponotus ligniperda*, Hymenoptera; Formicidae)

Anders Aak[1]*, Tone Birkemoe[2], Heidi Lindstedt Heggen[1] & Kristin Skarsfjord Edgar[1]

A total of 2250 *Camponotus ligniperda* workers and 120 ant larvae were used in 3 experiments investigating the ability of the insulation materials expanded polystyrene (EPS), extruded polystyrene (XPS) and Foamglas to withstand excavation and nest construction.

The three experiments investigated time until initiation of excavation, level of damage after 5 days of excavation and the effect of elevated temperatures on level of excavation. EPS and XPS was excavated by ants and showed similar properties in terms of ability to withstand initiation and establishment of nests. Foamglas did not experience any nest construction and was significantly less influenced by the ants in terms of weight removed, relative loss of insulation material, area excavated and category nest score.

Ants showed a general preference for heated insulation, and heated EPS and XPS blocks experienced significantly higher levels of ant damage compared to cold blocks. As there was no nesting activity in Foamglas, no difference between hot and cold insulation could be detected.

Introduction

Ant societies are important elements in most terrestrial habitats. They aid in nutritional recycling and play a regulatory role in the community through its interactions with plants, animals, fungi and microorganisms (Hölldobler & Wilson, 1990; Douwes *et al*., 2012). Under natural conditions they establish and construct advanced nests which give them the opportunity to perform efficient foraging at the same time as it provides protection against environmental factors and predators. Ant colonies are long lasting, grow relatively slowly and may become large (Mallis & Hedges, 1997; Douwes *et al*., 2012). Colonies of common ant pest species often contain several thousand to more than 10 000 individuals (Akre *et al*., 1994; Hansen & Klotz, 2005). They utilize concealed spaces and most species manipulate their nesting site by excavation or construction of well-defined areas for specific tasks. The location of a nest is determined by the structure of the habitat, suitability and availability of nest substrate in combination with abiotic factors such as temperature and moisture levels (Hölldobler & Wilson, 1990; Klotz *et al*., 1998; Chen *et al*., 2002; Buczkowski, 2011; Mankowski & Morrell, 2011).

Carpenter ants (*Camponotus* spp., Picture 1) have strong jaws and construct nests in wooden materials such as partially broken down tree-trunks or stumps, living trees and hard dried wood (Hansen & Klotz, 2005). This habit of nest construction leaves them in skirmish with humans when the ants move into buildings (Akre & Hansen, 1990; Fowler, 1990) to utilize the wide array of nesting materials available (Picture 2). Living inside a building also excludes natural vertebrate predators and competitors at the same time as it offers elevated temperatures and favorable microclimatic conditions.

The two most common carpenter ants found in northern Europe and north Scandinavia, *Camponotus herculeanus* Linnaeus, 1758 and *Camponotus ligniperda* Latreille, 1802 both inhabit buildings (Collingwood, 1979; Birkemoe, 2002; Hansen & Klotz, 2005). Carpenter ants are of concern as pests in forested areas, and of great economic importance (Rust & Su, 2012).

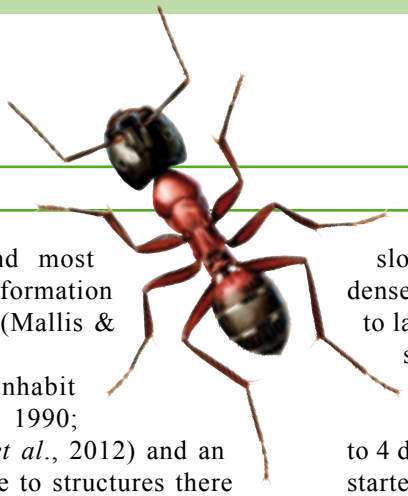
People gets stressed by having ants in their buildings, ants may weaken carrying structures or reduce insulation (Fowler, 1990; Akre & Hansen, 1990; Mallis & Hedges, 1997). In Norway the direct cost of professional carpenter ant control was estimated to $1.5 million in 2007 (Ottesen *et al*., 2009), but taking into account the private control efforts and the material and labor needed to repair the buildings, this problem constitutes a major cost for the Norwegian society.

In other parts of the world, similar figures are higher and the estimated cost of carpenter ant control in Washington and New Jersey State in USA was $25 million and $12.6 million in 1980, respectively (Hansen & Klotz, 2005).

This clearly should provide a base for detailed studies regarding material preference, nest site location and nest expansion. However, only a few scientific studies have described nests in buildings, tried to pinpoint potential solutions or find ways to minimize the impact from this pest (Butovitsch, 1976; Klotz *et al*., 1995; Birkemoe,

1) Norwegian Institute of Public Health – Department of Pest Control. Lovisenberggata 8, Postboks 4404 Nydalen, NO-0456 Oslo, Norway.
2) Norwegian University of Life Sciences – Ecology and Natural Resource Management. Høyskoleveien 12, Postboks 5003, NO-1432 Ås, Norway

Visualization of nest excavation. Chambers and corridors were found in EPS and XPS but not in foamglas. Excavated insulation is seen on the right.



2002; Ottesen *et al*., 2009), and most registered damage is based on information from professional pest controllers (Mallis & Hedges, 1997).

Relatively few ant species inhabit buildings (Hölldobler & Wilson, 1990; Mallis & Hedges, 1997; Douwes *et al*., 2012) and an even smaller number cause damage to structures there (Akre & Hansen, 1990; Fowler, 1990). Many of the damage causing species also depends on prior damage to successfully get a foothold inside, but some are fully capable of establishing themselves in buildings in prime condition. Carpenter ants are among the most ferocious structure excavators known (Hansen & Klotz, 2005), and we therefore selected *C. ligniperda* as our study insect, believing that it represent the outermost limit of damage inflicting capability among the ants.

This study aims to investigate the ability of Foamglas to withstand nest excavation activity from carpenter ants by comparing it to two of the most widely used insulation materials in Norwegian buildings. By allowing a controlled number of carpenter ants to establish themselves in standardized cubes of insulation the damage was quantified to provide a measure of ability to withstand attack. The combined effect of elevated temperatures and insulation type was also explored to simulate a situation often encountered by carpenter ants establishing in buildings in cool climate areas.

Materials and methods

Collection and handling of ants

Ants were collected in collaboration with pest controllers in May and the beginning of June. Nests in buildings were located, and infested structures were opened to gain access to the ants. Ant workers were collected using a slow running vacuum cleaner and by transfer of densely populated insulation or building materials to large collection boxes. We used ants from three separate locations in Tønsberg municipality, Norway, and ants from different colonies were never mixed. Ants were stored for up to 4 days in darkness at 10 °C until the experiments started.

Feather tip forceps and small glass vials were used to handle the ants during transfer from collection boxes to the experimental ant containers. Ants had constant access to honey-water (approximately 25% honey diluted in tap water) during both storing and experimentation. The honey-water was made accessible for the ants through glass tubes closed with a cotton wick. The honey-water soaked cotton allow the ants to feed when needed. At the end of each experiment the numbers of living and dead ants were counted to ensure no bias in the measured ability to withstand excavation due to variation in ant mortality.

Experimental units and test facilities

Ant boxes: Tests were performed in 10.8 L white plastic buckets or in transparent rectangular 21.0 L boxes (Picture 3). The lids sealing off these ant boxes had two small openings (ø=3.0 cm) allowing transfer of ants and visual inspection of activity. These openings were closed by dense rubber corks during the experiment. To allow replacement of air, the center of the bucket lid had a larger opening (ø=8.4 cm) which was permanently closed by a fine mesh cover. The squared boxes had a narrow gap between the box and the lid to allow ventilation.

Insulation blocks: Three different types of insulation were used in the experiments. Foamglas (T4+, Foamglas, Tessenderlo, Belgium), polystyren insulation with normal density (Jackopor 80 – EPS , JACKON Insulation GmbH, Steinhagen, Deutchland) and polystyren insula-

Damage in expanded polystyrene caused by Carpenter ants (Camponotus ligniperda).

Picture 3: Boxes used for testing of insulations ability to withstand carpenter ant (Camponotus ligniperda) nest excavation

tion with high density (Jackofoam 200 – XPS, JACKON Insulation GmbH, Steinhagen, Deutchland) were tested for their ability to withstand ant excavation. Jackopor and Jackofoam are hereafter denoted as EPS (Expanded PolyStyrene) and XPS (eXtruded PolyStyrene), respectively. Standardized insulation test units, measuring 10×10×10cm, were cut from larger blocks of insulation.

Test facilities: All experiments were performed in the facilities at the Norwegian Institute of Public Health. The three experiments were performed under different temperature and light conditions. The extensive test for nest establishment was conducted at a temperature average of 25.5±0.1 °C and a lightcycle of 12:12 hour, light: dark. The temperature during the nest construction initiation experiment was 21.9±0.1 °C and ants experienced a natural light cycle (approximately 17:7 hour, light: dark) obtained through daylight windows. The same light regimen was used for the heat preference experiment, but temperatures were then adjusted to accommodate temperature differences inside the boxes.

Measurement of damage

The damage caused by the carpenter ants was quantified in four different ways:

1) The blocks were weighed before and after the experiments and the difference between the two measurements were used to calculate the weight loss.
2) The relative damage in terms of weight removed divided by initial weight, expressed in percentage.
3) The excavated area of the insulation test cube surface was measured with 1 cm^2 accuracy.
4) Nests were categorized according to complexity of the excavation, using a score of 0 for no damage, 1 for initiated excavation with attack of the edges only, 2 for distinctly excavated nest structure with horizontal chambers and corridors and 3 for complex nest structures having both horizontal chambers and horizontally and vertically excavated corridors.

Experiment 1 – initiation of nest construction

Ten test units (10×10×10cm) of each of the three insulation types were individually assigned to 30 separate buckets (3x10). The insulation blocks were all positioned in the center of the buckets with one side of the test cube horizontally aligned with the bucket bottom (Picture 4). 25 carpenter ants were then added to each bucket and initiation of attack was measured by registration of presence or absence of excavated insulation pieces. The insulation blocks were inspected after 3, 6, 9, 22 and 31 hours. After 31 hours the numbers of living and dead ants were counted and excavation was quantified using visual inspection and category nest score (for category description see "measurement of damage" above).

Experiment 2 – ability to withstand nest construction

Eight test units (10×10×10cm) of each of the three insulation types were individually assigned to 24 separate buckets (8x3). The insulation blocks were positioned in the center of the buckets with one side of the test cube horizontally aligned with the bucket bottom (Picture 4). 50 carpenter ants were then added to each bucket and the ants were allowed to try to establish themselves in the insulation blocks for 5 days. After these five days the numbers of living and dead ants were counted, and the damage inflicted was quantified according to the four methods described above.

Experiment 3 – effect of temperature on establishment

Sixteen test units (10×10×10cm) of each of the three insulation types were assigned to 24 squared plastic boxes (16/2x3). Two and two test units of the same type

Picture 4: Positioning of insulation blocks in test buckets.

Picture 5: Positioning of insulation blocks in test boxes.

were positioned 13 cm apart in the same box (Picture 5). The boxes were then placed on top of electric heating cables and positioned to ensure elevated temperature in only one of the two insulation blocks. The general temperature in the room was kept low by air-condition allowing an approximate temperature gradient of 5°C between the two insulation blocks. 25 carpenter ant workers were then added to each bucket together with five ant larvae. The ants were allowed to try to establish themselves in the insulation blocks for three days.

Three times a day the ants resting on or within 1 cm of the cold and warm insulation blocks were counted. Eventual movement of larvae from the exposed outside to the safety within the insulation block was also scored. After the three days of nest establishment the numbers of living and dead ants were counted, and the damage inflicted on the insulation blocks quantified according area excavated.

Statistical analysis: The data was analyzed in SigmaPlot 12 (Systat Software Inc. San Jose, California, USA). Data were checked for normality and multiple comparisons were done by ANOVA, while pairwise comparisons were done by t-tests. If tests for normality failed, we used Mann-Whitney rank sum test and Kruskal-Wallis analyses of variance. Significance level was set to 0.05, and differences between multiple comparisons were identified using tukey- or tukey type post-hoc tests.

Additional testing: The Norwegian Institute of Public Health wants to prevent excessive use of pesticides in residential- or public buildings, and novel toxic free pest control solutions are of general interest for the Department of Pest Control. Building materials capable of withstanding ant attack may contribute to reduced establishment, reduced structural damage and limit the pesticide exposure for people using the buildings. In parallel with the ordered comparison between EPS, XPS and Foamglas we also tested other commonly used insulation materials (GLAVA and ROCKWOOL) and two different mixtures of EPS-pellets and concrete (EPS pellets mixed with 12.5% concrete and EPS pellets mixed with 25% concrete). Details of these experiments are not described, but they were performed as experiment 1 and 2. Figures comparable to figure 1, 2 and 3A-D showing the full test range, are given in the appendix at the end of this report.

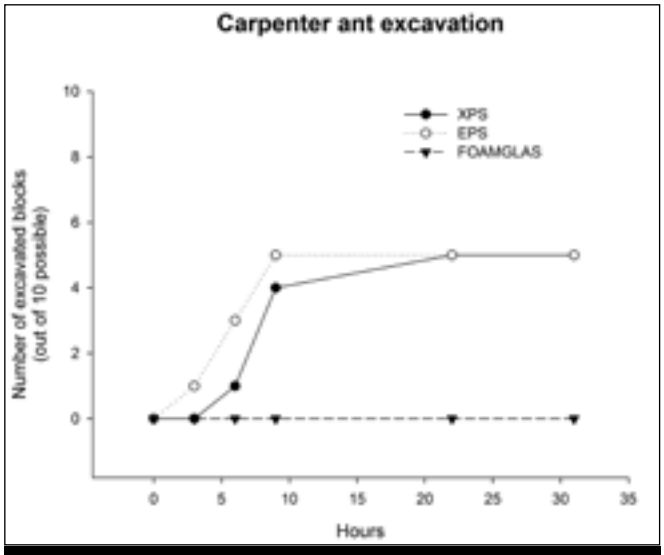


Figure 1: Carpenter ant excavation in EPS, XPS and Foamglas insulation. The x-axis represent time in hours from release of ants and the y-axis represents the number of blocks (out of 10 possible) showing sign of excavation.

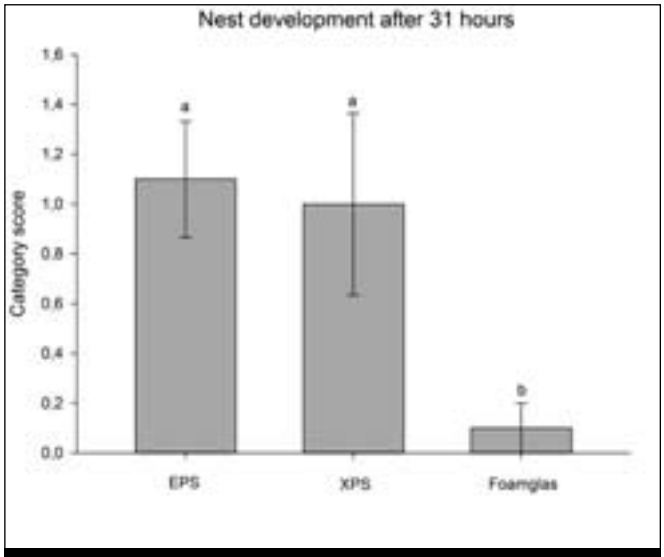


Figure 2: Carpenter ant excavation in EPS, XPS and Foamglas insulation blocks. The average category score ± SE is based on a value of 0 for no damage, 1 for initiated excavation with attack of the edges only, 2 for distinctly excavated nest structure with horizontal chambers and corridors and 3 for complex nest structures having both horizontal chambers and horizontally and vertically excavated corridors. 10 blocks of each insulation type was used and damage was scored after 31 hours. Treatments significantly different from each other are denoted by different small letter (a and b).

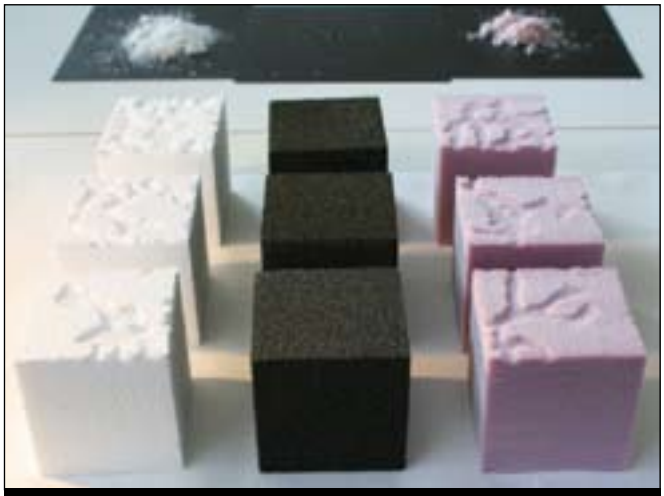
Results

The collected ants all belonged to the species *C. ligniperda*. A total of 2550 worker ants and 120 larvae were used in the experiment. The overall mortality in the different test boxes was 27.6±2.3%. No difference in mortality was observed between the three insulation treatments in either of the three experiments (Experiment 1 – Kruskal-Wallis ANOVA: H=1.285, p=0,526; Experiment 2 – ANOVA: F=0.049, p=0.952; Experiment 3 – ANOVA: F=0.812, p=0,458).

Experiment 1 – initiation of nest construction

The first sign of excavation appeared after 3 hours in EPS and 6 hours in XPS (Figure 1). Polystyren insulation showed an increase in the number of insulation cubes being excavated by carpenter ants until the 22 hour check. At this time 50 % of both EPS and XPS insulation blocks showed signs of nesting activity, while Foamglas appeared undamaged.

Visual inspection and categorical score of nest structures after 31 hours revealed a significant difference between the three insulation types (ANOVA on ranks:



Picture 6: Visualization of nest excavation. Chambers and corridors were found in EPS and XPS but not in foamglas. Excavated insulation is seen in the background.

H=13.24, p<0.001) and the following tukey type comparison identified Foamglas to be significantly less excavated compared to EPS and XPS (Figure 2). Both EPS and XPS had nests belonging to the advanced type including chambers and corridors (Picture 6), while Foamglas only had one identifiable bite mark in the insulation block.

Experiment 2 – ability to withstand nest construction

After 5 days of access to the three insulation types, advanced ant nests (Picture 6) were found in 7 out of 8 EPS insulation blocks, in 8 out of 8 XPS insulation blocks and in 0 out of 8 Foamglas insulation blocks. Large amounts of small pieces of excavated EPS and XPS were found in connection with the nesting activity, whereas the buckets with the Foamglas blocks only showed small amounts of fine dust originating from ant activity and movement on the outer surface of the insulation.

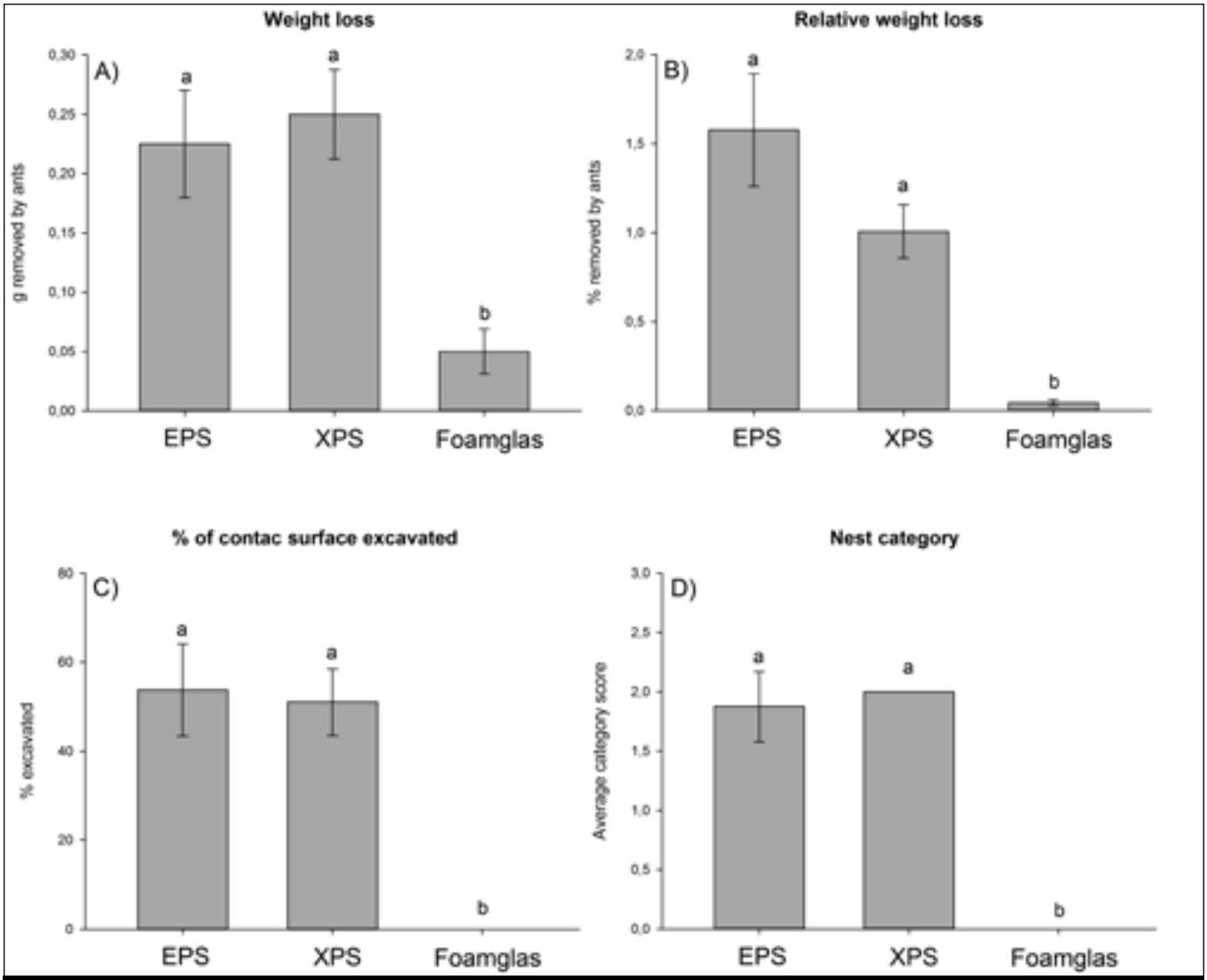


Figure 3: Average damage ± SE from carpenter ant (Camponotus ligniperda) excavation in EPS, XPS and Foamglas insulation blocks. A) Weight loss in grams, B) Relative weight loss in %, C) Area of contact surface excavated and D) Category score based on a value of 0 for no damage, 1 for initiated excavation with attack of the edges only, 2 for distinctly excavated nest structure with horizontal chambers and corridors and 3 for complex nest structures having both horizontal chambers and horizontally and vertically excavated corridors. 8 blocks of each insulation type was used and damage was quantified after 5 days. Treatments significantly different from each other are denoted by different small letter (a and b).

The comparison of the weight loss showed a significant difference between the three insulation types both in terms of absolute and relative values (absolute values – ANOVA: F=9.279, p<0,001; relative values – ANOVA on ranks: H=13.242, p<0,001).

The following tests identified Foamglas to be less suceptible to ant excavation compared to EPS and XPS (Figure 3A and 3B). Foamglas showed no sign of excavation while EPS and XPS had an average of 53.7±10.4 cm^2 and 51.0±7.5 cm^2 of the down facing contact surface (100 cm^2) excavated.

Ants never attacked the other 5 sides of the cube. This difference between EPS, XPS and Foamglas was significant (ANOVA on ranks: H=14.304, p<0,001) with equal and higher level of damage on the two polystyrene products (Figure 3C). The nest category score also showed significant differences between the three insulation products (ANOVA on ranks: H=18.027, p<0,001) with Foamglas being significantly more able to withstand excavation compared to the two polystyrene products (Figure 3 D).

EPS had one advanced category 3 nest showing nest structures in both the horizontal and the vertical plane. The remaining 6 nests were horizontal in its arrangement. XPS had 8 category 2 nests with horizontally arranged chambers and corridors only. Foamglas had no nests. The average category score was 1.9±0.3, 2.0±0.0 and 0.0±0.0 for EPS, XPS and Foamglas, respectively.

Experiment 3 – effect of temperature on establishment

A distinct temperature gradient was established between heated and cool insulation blocks. The cold blocks had an average temperature of 19.8±0.3°C compared to hot blocks which had an average of 24.8±0.6°C.

The ants showed an overall preference for higher temperatures (Mann-Whitney rank sum test: T=29612.3, p<0,001) with an average number of 9.0±0.3 resting near the heated insulation blocks compared to 1.4±0.2 near the cold blocks. This heat preference was observed regardless of insulation type in the test boxes (Figure 4A).

The general heat preference also resulted in an increased nesting activity in varm blocks compared to cold blocks for both EPS and XPS, but not for Foamglas (t-test EPS: t=26.750, p<0.001; t-test XPS: t=6.080, p<0.001; Mann-Whitney rank sum test Foamglas: T=72.000, p=0.72, Figure 4B).

Larvae were moved from the outside of the blocks to the newly constructed nest within two days of excavation and 15 out of the 16 nests with larvae were located in the hot insulation blocks. Some nesting activity also took place in cold insulation blocks of the EPS and XPS (Figure 4B).

Discussion

In all tests performed, Foamglass T4+ proved to be more capable of withstanding carpenter ant establishment when compared to both of the polystyrene products. Nests were never found in Foamglas, while the majority of the polystyrene blocks were occupied and guarded by ants.

The minor signs of ant activity on Foamglas are likely to represent failure to excavate or a result of aggressive behavior, i.e. soldier ants attacking everything from forceps, glass vials or the insulation blocks when handled in the experiments.

Some variation was also observed between EPS and XPS, but in all excavation cases the distinct nest structures typical for an ant society could be observed (Tschinkel, 2005). The variation between the two polystyrene products was not large enough to prove any dif-

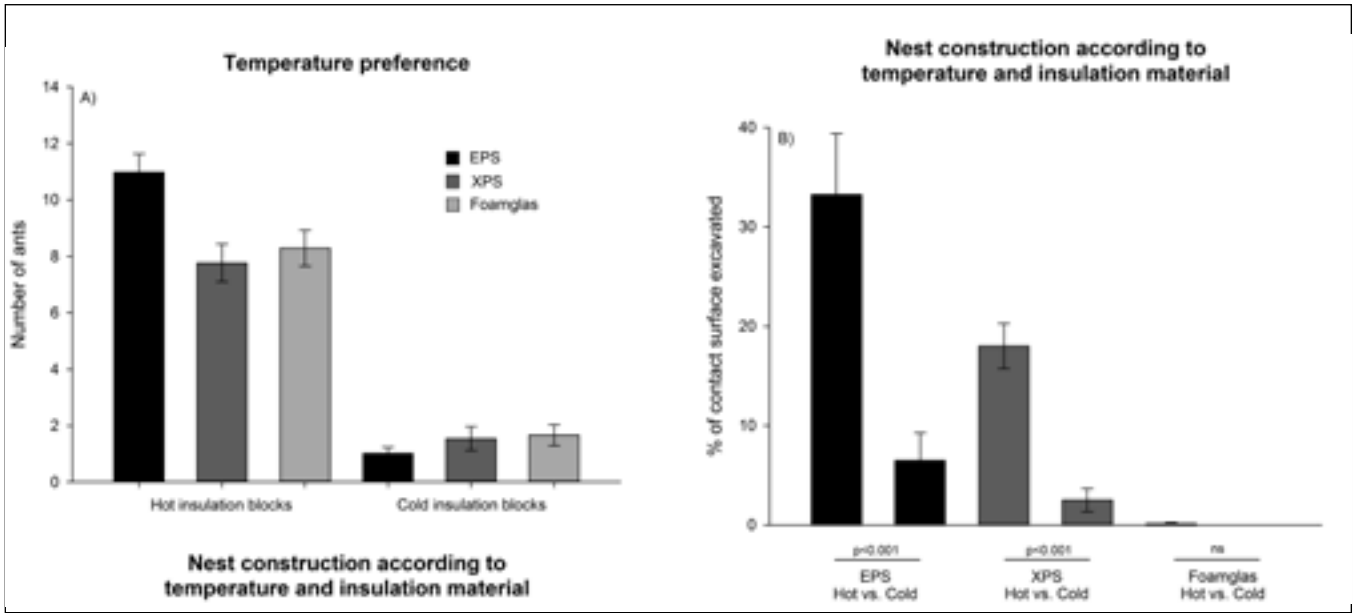


Figure 4: Average ± SE A) aggregation and B) damage from carpenter ant (Camponotus ligniperda) excavation in EPS, XPS and Foamglas insulation blocks. Damage is quantified according to area of contact surface excavated. 16 blocks of each insulation type was used in a pair vise choise situation with cold (19.8±0.3 °C) and varm (24.8±0.6 °C) blocks as options. Damage was quantified after 3 days. Black bars represent EPS, dark grey represent XPS and light grey represent foamglas.

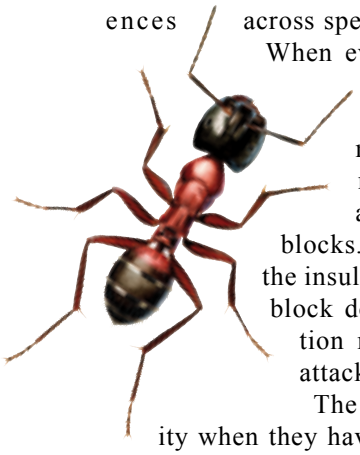
ference between them. These findings coincide well with observations from the field where ant nests are often found in polystyren (Birkemoe, 2002).

The ants purpose of the excavation was to construct shelter and protection for the individuals present in the test boxes. During the experiments more and more ants moved from the outside to the inside of the insulation blocks resulting in a near natural situation with the majority of workers staying hidden in the nest.

On some occasions we also observed that the ants carefully positioned the pieces of excavated material around the glass vial with honey water as if trying to protect or hide their food source. This is likely a result of the unnatural situations without vegetation, soil and detritus in the test boxes, but it shows that the excavated insulation may be used by the ants. We tested *C. ligniperda* in this study and found distinct differences in their behavior when facing different types of insulation.

Other insulation excavating species such as *Camponotus herculeanus* Latreille, 1802, *Lasius niger* Linnaeus, 1758 or *Formica fusca* Linnaeus, 1758 may show similar nest building variation according to material properties. However, as we selected one of the strongest excavators for our experiments it is likely that the insulations ability to withstand attack may be higher when other species are trying to establish themselves.

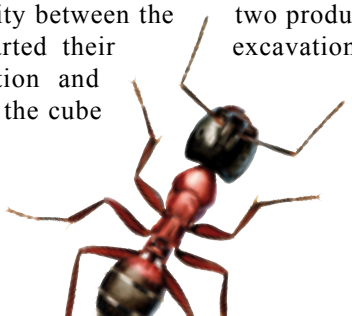
Small differences in habitat preferences across closely related species are known to occur (Klotz *et al*., 1998) and it is likely that there are interactions between species specific traits and the insulation encountered. Further studies are needed to reveal any similarities or differences across species and insulation types.

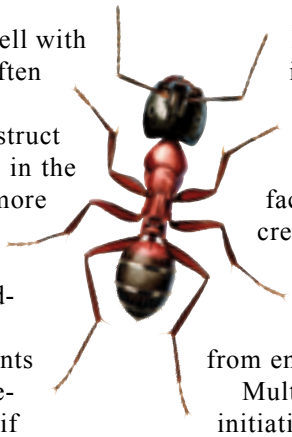


When evaluating the damage inflicted by the carpenter ants we used 4 different types of damage assessment. A certain number of ants needs a specific area to move about and rest inside the insulation blocks. If ants are capable of excavating the insulation, the weight removed from the block does not by itself provide information regarding ability to withstand ant attack.

The ants may simply stop their activity when they have enough room. In a similar manner is the relative weight loss influenced by the initial weight of the insulation block and thus does not provide information regarding the insulations ability to withstand the ants nesting activity. These numbers are however important in terms of lost insulation or damage in buildings. If we had included time as a factor it could have indicated how easily the insulation is excavated. In the initiation experiment EPS and XPS showed slightly different progress in terms of timing of the attack. This may be explained by small variations in excavation susceptibility between the two products.

Ants started their excavation on the edge of the insulation and typically on the side of the cube facing down.



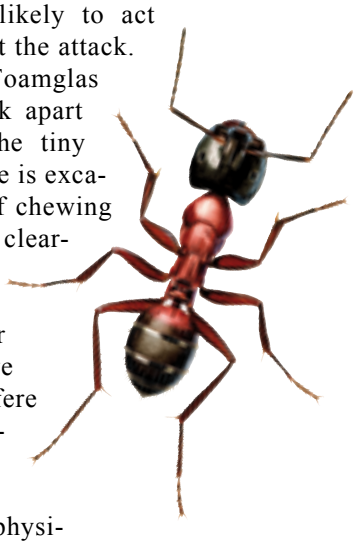


By doing this they established the nest in the transition between the hard plastic bottom and the insulation. In both polystyrene materials the ants excavated a large proportion of this down facing surface. Normally they left the edges intact to create closed off chambers and they kept the entrance to these chambers narrow. This indicates that they produce protective areas which efficiently prevent enemies from entering and is easily defended.

Multi-chambered nests may also indicate the initiation of complex nest structures with different society tasks (Tschinkel, 2005). A few of the insulation blocks also showed signs of 3-dimentional structuring of the nest, potentially allowing even more protection, greater chamber differentiation and subsequently more damage to the insulation. Including both the measure of area excavated and nest category produce a valuable quantification of damage as it directly relates to the number of ants present and it provides biologically relevant information about the use of the insulation.

The density, consistency and hardness of the material are regulating factors for the nest construction. Clearly there is a limit to what kind of material the ants are able to bite through, and hard materials may efficiently prevent ants from attacking. However, most insulation materials used today are less dense and softer than dried wood which carpenter ants are known to excavate (Fowler, 1990; Akre & Hansen, 1990; Birkemoe, 2002; Hansen & Klotz, 2005; Ottesen *et al*., 2009), and neither of the tested materials was dense or hard enough to create such a preventive effect.

Foamglas has the highest density of the three insulation types, but the clear cut difference between polystyrene and Foamglas is unlikely to be explained by this parameter alone because the density and hardness is within the range of what carpenter ants are capable of excavating. The consistency, chemical properties or mechanical properties are more likely to act together with the density to prevent the attack.

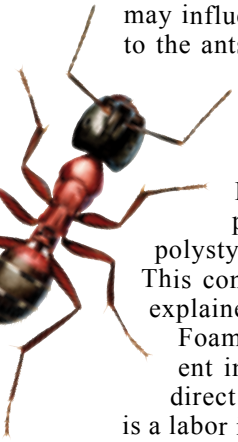


Compared to polystyrene the Foamglas insulation has a tendency to break apart into a fine powder instead of the tiny pieces that appear when polystyrene is excavated. This may cause problems of chewing in Foamglas, but also problems of clearing the chambers or corridors.

A sulfurous odour is also released when Foamglas is cut or handled and this chemical may have a repellent effect or it may interfere with the intricate chemical communication found among all ant species (Gullan & Cranston, 2010). A third potential factor is related to physical damage to the ants. The fine Foamglas powder may attach to the cuticula of the ants and thus cause damage to the protective wax layer

or otherwise interfere with necessary physiological processes. We did not observe any difference in mortality between the insulation treatments, but ants may have been pacified by such effects. Further studies are needed to identify the main factor or the potential synergisms between two or more of these elements.

All our tests were performed in a laboratory setting with relatively few ants, and the results cannot automatically be extrapolated directly into a field situation because biotic elements such as moisture or temperature may influence the properties of the insulation according to the ants' biology. However, our study offers a strong indication of Foamglas being much more able to withstand excavation than the commonly used insulation types.



Based on these investigations it is likely that Foamglas offer a solution to several ant pest problems. Ant nesting is commonly observed in polystyrene insulation but not in Foamglas insulation. This concurs with our study, but may equally well be explained by the less frequent use, or a different use of Foamglas in buildings. Field studies testing different insulation types could be performed to allow a direct comparisons between insulation types, but this is a labor intensive task and probably too costly and time consuming to be worthwhile. However, more elaborate choice experiments in a simulated natural setting would be of general interest to close the present gap between laboratory- and field studies.

Our heat and insulation choice-experiment does to some extent probe into a more field near situation. Under natural conditions ants will often prefer warm over cold micro climatic conditions (Chen *et al*., 2002) and many of the ant infestations found in cool climate areas may be a result of the elevated temperatures inside buildings (Birkemoe, 2002; Ottesen *et al*., 2009).

Ants are also known to establish their nests in close proximity to external heat sources and highly concealed nest structures are believed to be located in insulated and heated floors (Birkemoe, 2002). Although all the ants in our experiments aggregated near to the heat source they did not establish themselves in the warm Foamglas insulation. This strengthens the argument for a potential preventive solution by using the less ant susceptible insulation type.

In this study we investigated three insulation types. The choice of Jackopor 80 and Jackofoam 200 was based on availability in local stores, while the Foamglas T4+ was delivered by Foamglas. Most insulation types come with a wide variety of properties and ideally all of them should have been tested for their ability to withstand ant excavation. However, as several properties of the insulation are likely to interact and influence the nest activity, it is from a research point of view more important to identify the mechanisms underlying nest substrate refusal or acceptance.

This study contributes to an increased knowledge regarding carpenter ant nesting activity by pointing out potential mechanisms behind the ability to withstand ant attack. Based on the results of this study it is also made clear that there are distinct differences between the products tested and that Foamglas is significantly less susceptible to ant excavation in the laboratory. Foamglas seems like a product that should be preferred to avoid ant excavation in areas with high risk of carpenter ant infestation. By its specific properties it may contribute to reduced ant establishment, smaller damage and consequently less pesticide use in indoor environments.

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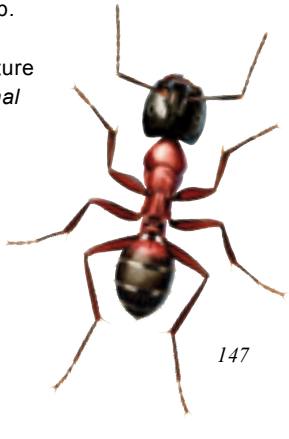
Ant image: Camponotus ligniperda. Illustration: Halvard Elven.



Appendix

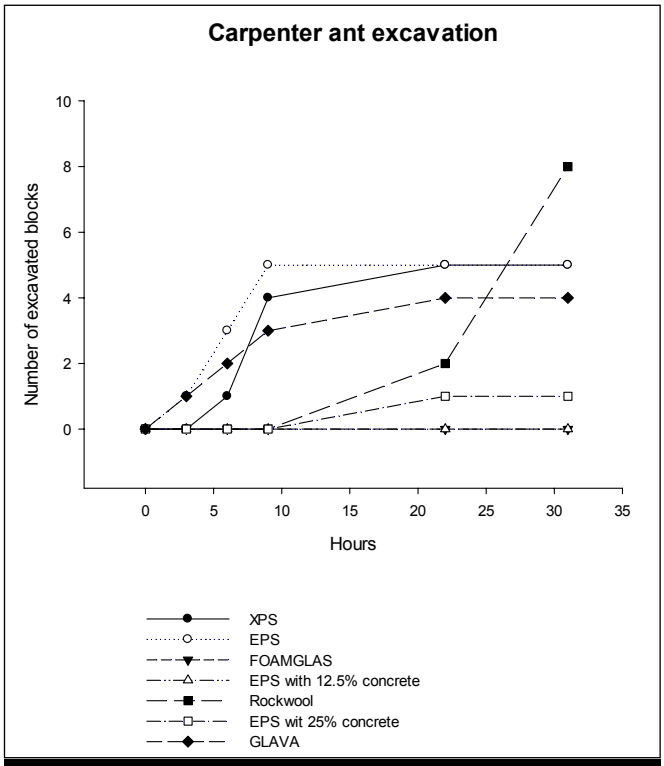


Figure A-1: Comparable to Figure 1 in the report.

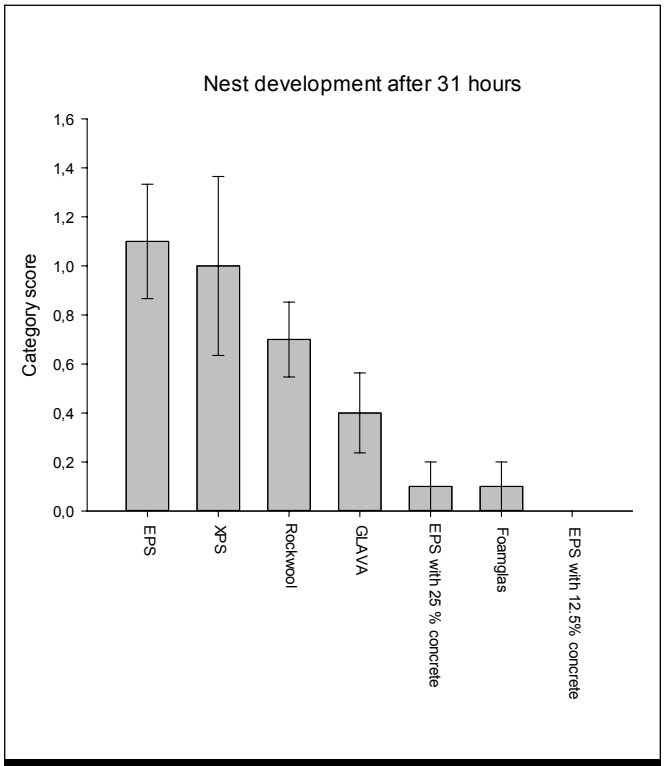


Figure A-2: Comparable to Figure 2 in the report.

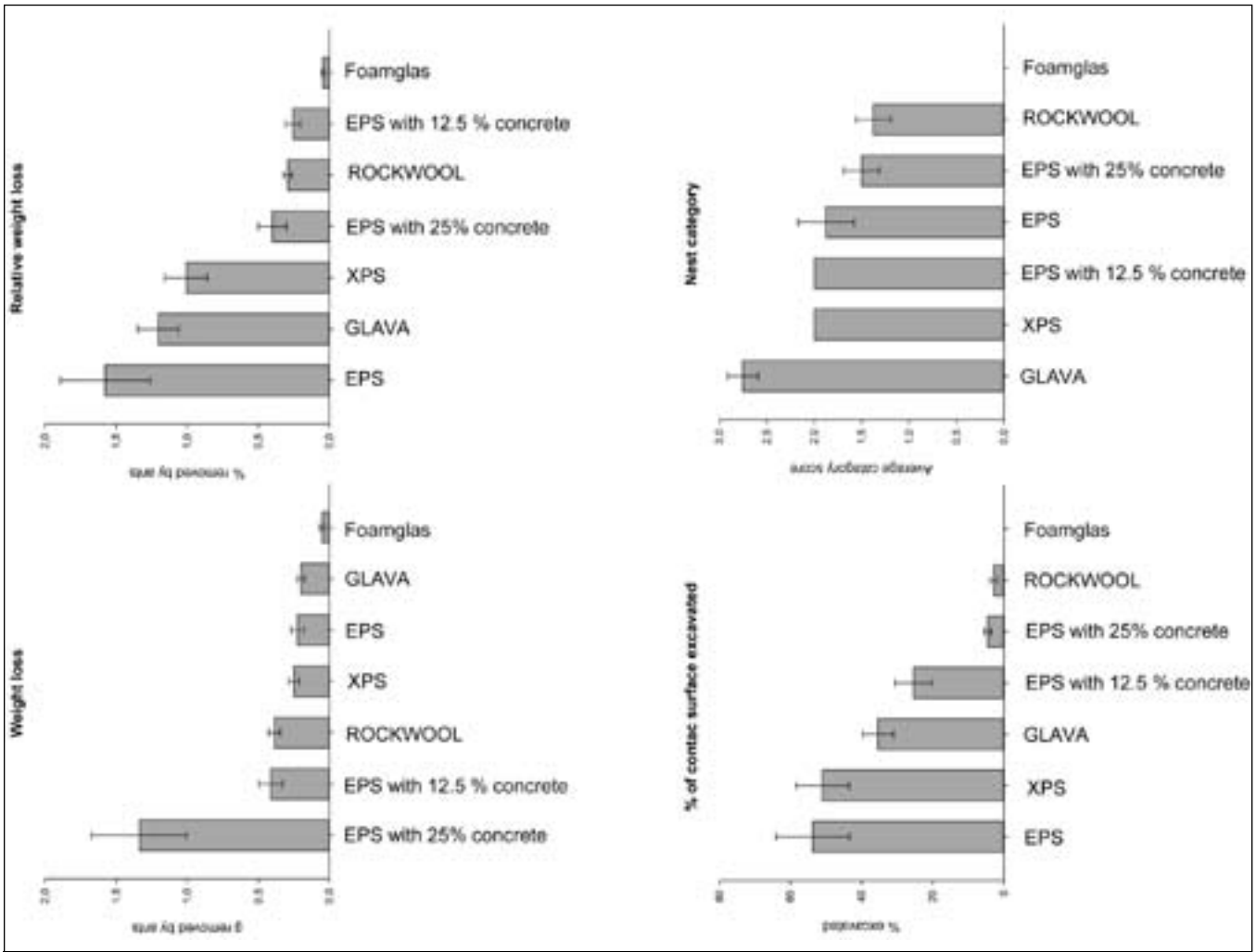


Figure A-3: Comparable to Figure 3 in the report.

Delivering a virus to control houseflies

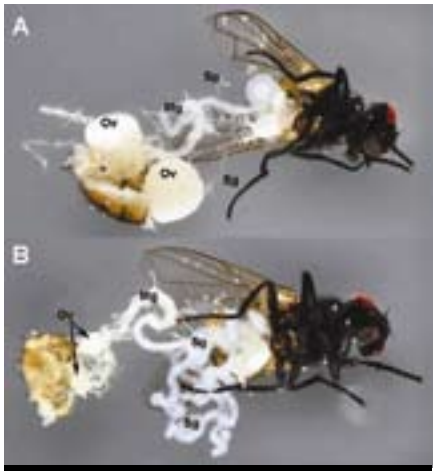
Christopher Geden*

Houseflies can transmit hundreds of animal and human pathogens like Salmonella, Escherichia coli and Shigella bacteria, which cause food borne illnesses. Insecticides are used to help control flies, but the pests can develop resistance to chemicals. Entomologists with the ARS Center for Medical, Agricultural and Veterinary Entomology in Gainesville, Fla., examined salivary gland hypertrophy virus (SGHV), a member of a newly discovered family of viruses called Hytrosaviridae.

Collaborating with scientists at the University of Florida and Denmark's Aarhus University, the investigation looked at SGHV's distribution and host range, and the effectiveness of different application methods on house flies. The virus reproduces in the salivary gland of the infected insects, preventing the females from laying eggs and preventing the males from mating. Scientists examined different approaches to increase the virus infection rate in flies. The best method was a crude mixture of Danish SGHV-infected flies and water. A strain of healthy flies that had been dipped directly into the mixture or that walked on treated surfaces had an infection rate of 56 percent. A Florida strain had a 50 percent infection rate.

Common house fly, Musca domestica.

Liquid baits containing SGHV produced an infection rate of 22 percent (Danish virus) or 26 percent (Florida virus) in flies. When flies were sprayed directly with SGHV, the Danish virus infected 18 percent and the Florida virus infected 22 percent. In other laboratory tests, Florida houseflies were highly susceptible when injected with SGHV. Black dump flies were severely affected, and stable flies died quickly or failed to develop ovaries after injection.



Comparison of a healthy fly (A) and a fly infected with SGHV (B). The fly with SGHV shows underdeveloped ovaries (ov) and overdeveloped salivary glands (sg).

While the virus shows great potential in controlling house and other filth flies, it is not a quick fix. However, SGHV could become part of an integrated management program that involves treating natural fly populations early during peak season to reduce reproduction.

ARS entomologist Chris Geden and student assistant Rachel Dillard sort stable flies before injecting them with SGHV virus to determine its effects on fly mortality and reproduction.

*Christopher Geden, ARS Mosquito and Fly Research Unit, Gainesville, Florida, USA; chris.geden@ars.usda.gov. ARS is the chief intramural scientific research agency of the U.S. Department of Agriculture.

A review of EU biocides and pesticides legislations

Richard Elsmore and Peter Chapman*

The development of both agricultural pesticides legislation and biocides legislation in the European Union has followed a similar course during the past two decades. Pesticides[1] were the first to be subject to EU-wide legislation with the introduction of the Plant Protection Products Directive (PPPD), 91/414/EEC coming into force on 26 July 1993.

Biocides followed with the introduction of the Biocidal Products Directive (BPD), 98/8/EC, coming into force on 14 May 2000. Pesticides principally include products that are used in agriculture and horticulture for the control of pests, diseases and weeds and as plant growth regulators. Biocides are a broad group of products that are used to control unwanted organisms in many differing areas.

They include household products such as disinfectants and insecticides as well as preservatives used to protect a wide range of finished goods and raw materials. Historically the regulation of these products and the active substances that they contain has varied considerably across member states within the EU with some products being regulated and others not; this varied on a country by country basis. Similarly in the case of agricultural pesticides the extent to which they were regulated varied between member states, although the types of product regulated tended to be more uniform, compared with biocides. Inevitably there have been borderline cases that have had be resolved, where it was unclear under which regulations certain uses fell.

Both directives were introduced with the aim of removing barriers to free trade within the EU. The objectives being: to harmonise the regulation of pesticide and biocide products across the EU; to provide a high level of protection for humans, animals and the environment; and to ensure that products are sufficiently effective against target species.

*JSC International Limited, Simpson House, Windsor Court, Clarence Drive, Harrogate, HG1 2PE, United Kingdom.

Both directives set down the basis for 10 year work programmes, in which active substances on the market at the time the directives came into force, would be reviewed with the aim of establishing whether they could continue to be used in formulated products without any unacceptable effects on people, animals or the environment. In the event both these programmes had to be extended on more than one occasion. The programme for these so called 'existing active substances' was completed at the end of 2008 for pesticides but for biocides, the programme may not be fully completed until 2024. In both cases the review programme was implemented by a series of EU Commission Regulations (the Review Regulations) that amongst other things set deadlines by when dossiers had to be submitted to the appointed Competent Authority, in the rapporteur member state. The work involved being divided between the member states on the basis of their capacity to undertake the tasks involved.

Following the evaluation of these active substances (and after decisions were made regarding their acceptability for use in plant protection or biocide products) they were either included in a positive list of active substances as Annex I or IA (microbial substances under the PPPD and active substances suitable for use in low risk biocidal products under the BPD) of the respective Directives. If they were not acceptable, they were non-included.

Once an active substance has been included onto Annex I/IA, member states are required to ensure that any conditions relating to Annex I/IA inclusion are met for all products already on the market within a specified time scale. Failure to do so means that products containing the relevant active substance must be withdrawn from the market.

Following this member states must re-register products containing the active substance in their country (providing any necessary data has been supplied and any conditions placed upon the Annex I/IA inclusion are met). Once products were either authorised (BPD), or re-registered (PPPD), in one member state it was the intention that authorisations could be granted in other member states by the process of mutual recognition.

In the case of plant protection products this procedure only worked in very limited circumstances because member states either did not accept the evaluation done in another member state, or, applied their own data requirements and risk mitigation measure for national product registration. For biocides similar concerns have been seen.

In the case of both the pesticide and biocide directives, decisions were taken during the process of their implementation, to take steps to revise the regulatory regimes in order to address various criticisms and shortcomings. The means by which this was to be achieved was by the introduction of specific regulations. In the case of pesticides this was the Plant Protection Products Regulations, Council Regulation (EU) No 1107/2009 of 21 October 2009 and for biocides this was the Biocidal Products Regulations, Council Regulation (EU) No 528/2012 of 22 May 2012.

Comparison of Plant Protection Products Regulation and Biocidal Products Regulation

The Plant Protection Products Regulation (PPPR) was adopted on 21 October 2009 and entered into force on 14 December 2009. It applied from 14 June 2011. The Biocidal Products Regulation (BPR) was adopted on 22 May 2012 and entered into force on 17 July 2012. It will apply from 1 September 2013.

The objective of both of these regulations is to improve the functioning of the internal market for pesticide and biocide products respectively whilst at the same time ensuring a high level of environmental and human health protection and that products are effective. Both regulations are also intended to remedy a number of weaknesses and to reflect public concerns that were identified during the implementation of the pesticides and biocides directives.

Like the directives that preceded them, both regulations maintain the two-step process of registration; firstly the evaluation and approval of the active substance at the European Union level, and secondly product authorisation at Member State level. In the case of the BPR, some biocidal products may be granted 'union authorisation' giving them direct access to the entire EU market.

Both regulations are intended to simplify and streamline the requirements for approving active substances and authorising products. Compared to directives, the regulations have direct application in the member states, without the need for national regulations to be introduced for implementation.

A common objective was also to achieve a reduction in animal testing by making vertebrate data sharing compulsory and encouraging the use of alternative testing methods and a more flexible and intelligent approach to testing. In the case of the BPR the new Regulation was the first piece of legislation to build in the new Commission definition on nanomaterials.

The procedures for approving active substances are somewhat different for biocides and pesticides. In the case of pesticides, the European Food Safety Authority (EFSA) provides independent scientific and technical advice to the European Commission, including organising the peer review of evaluations done by the competent authorities of the member states. In this role EFSA acts as the risk assessor. For biocides the European Chemicals Agency (ECHA) will provide scientific and technical back-up to the Commission and the Member States, in particular, ECHA will be responsible for the assessment of applications for the Union authorisation of biocidal products. In both cases risk management and decision taking is the responsibility of the European Commission.

Some of the key features of the two sets of regulations are summarised below:

Biocidal Products Regulation

- Applies to any substance or mixture, in the form in which it is supplied to the user, consisting of, containing or generating one or more active substances, with the intention of destroying, deterring, rendering harmless, preventing the action of, or otherwise exerting a controlling effect on, any harmful organism by any means other than mere physical or mechanical action.
- Any substance or mixture, generated from substances or mixtures which do not themselves fall under the first indent, to be used with the intention of destroying, deterring, rendering harmless, preventing the action of, or otherwise exerting a controlling effect on, any harmful organism by any means other than mere physical or mechanical action.
- A treated article that has a primary biocidal function shall be considered a biocidal product.

(BPR) Plant Protection Products Regulation (PPPR)

- Applies to products, in the form in which they are supplied to the user, consisting of or containing active substances, safeners or synergists, and intended for one of the following uses:

(a) protecting plants or plant products against all harmful organisms or preventing the action of such organisms, unless the main purpose of these products is considered to be for reasons of hygiene rather than for the protection of plants or plant products;
(b) influencing the life processes of plants, such as substances influencing their growth, other than as a nutrient;
(c) preserving plant products, in so far as such substances or products are not subject to special Community provisions on preservatives;
(d) destroying undesired plants or parts of plants, except algae unless the products are applied on soil or water to protect plants;
(e) checking or preventing undesired growth of plants, except algae unless the products are applied on soil or water to protect plants.

Under the BPR, the definition of a biocidal product has changed compared to the BPD. The new definition captures in-situ biocides which are generated at point of use (these were not defined under the BPD which caused confusion amongst industry and regulators alike). The definition also captures treated articles that have a primary biocidal function. In the case of pesticides the scope of the regulation has been extended compared with the Directive to include safeners, synergists, co-formulants and adjuvants. A regulation has to be adopted by 14 December 2014 establishing a programme for the review of synergists and safeners already on the market. In the case of co-formulants and adjuvants no specific timeframe has been set for their review.

Active substances

The BPR and PPPR both include exclusion, approval and substitution criteria as new hazard-based cut-off limits.

Exclusion (BPR) and Approval (PPPR) criteria

Under both regulations, active substances meeting the exclusion criteria will not be approved. These criteria include:

- carcinogens, mutagens and reprotoxic substances (CMR) category 1A or 1B according to the CLP Regulation 1272/2008
- endocrine disruptors
- persistent, bioaccumulative and toxic (PBT) substances
- very persistent and very bioaccumulative (vPvB) substances

Under BPR certain derogations are possible, in particular when the active substance might be needed on grounds of public health or of public interest when no alternatives are available. Under PPPR there is a limited derogation in respect carcinogens and reprotoxic substances where approval is possible

if human exposure is negligible; for example in closed systems.

In the case of PBT substances, two out of three of the triggers have to be exceeded for a substance to be categorised in both regulations. In PPPR where the P and B triggers are exceeded and the substance meets the criteria for long range environmental transport, then it would be considered a Persistent Organic Pollutant (POP).

Substitution criteria

For both biocides and plant protection products, active substances meeting the substitution criteria will be designated as candidates for substitution during the approval procedure. The criteria are based on the intrinsic hazardous properties in combination with the use and potential exposure.

Substitution is required if any of the following conditions shown in the table below are met.

Candidates for substitution under both sets of regulations may only be approved for periods of up to seven years, with renewal also allowed for up to seven years.

In the case of pesticide active substances, the Commission is obliged to establish a list of already approved substances that satisfy the above criteria, by 14 December 2013. The list for biocides will be included in implementing regulation, although no time frame is specified.

During the evaluation for national or Union authorisation of a biocidal product and for national authorisation of a plant protection product that contain one or more active substances considered as candidates for substitution, a comparative assessment will be performed to determine if less harmful products are available for the same use.

Product authorisation

Under the BPR, applicants now have the option to seek national authorisation, as under the BPD, or for some products apply for Union authorisation. In addition national authorisations may be extended to other member states via mutual recognition. National authorisation and authorisation via mutual recognition is available for plant protection products; however the system is implemented on a zonal basis comprising three zones, whereby mutual recognition is obligatory within a zone but voluntary between zones. For certain products, namely those for use in greenhouses, post-harvest treatment, empty storage rooms and seed treatments the EU is regarded as a single zone.

National authorisation BPD and BPR

As was the case under the BPD, following the approval of an active substance, companies wishing to place biocidal products on the market in a Member State have to apply for product authorisation. This is done by submitting a dossier to that reference Member State. Once a first authorisation is granted, the applicant can ask for the recognition of that authorisation by other Member States (called concerned member states), either in sequence, or in parallel under mutual recognition. Disagreements regarding mutual recognition will be referred to the Coordination Group, which has 60 days to seek agreement. ECHA will provide the secretariat for this group. If an agreement cannot be reached, the matter is referred to the Commission which may ask ECHA for an opinion on the scientific or technical aspects of the case.

Substitution criteria	BPR	PPPR
PBT substance – 2 out of 3	√	√
CMR (Cat 1A or 1B)	√	√
Endocrine disrupting properties	√	√
Respiratory sensitiser	√	X
Contains a significant proportion of non-active isomers	√	√
Reasons for concern linked to the nature of the critical effects which, in combination with the use patterns, amount to use that could still cause concern, such as high potential of risk to groundwater, even with very restrictive risk management measures	√	√
ADI, ARD or AOEL are significantly lower than other actives in the same group	√	√

National authorisation PPPD

Similar to the BPD, plant protection product authorisation was conditional on the approval of an active substance. Companies had to apply to each country in which they wished to obtain an authorisation. There was the possibility of obtaining authorisation by mutual recognition of an authorisation already granted in another member state. In practice, this procedure was relatively little used and very few authorisations were granted by mutual recognition.

Union authorisation BPR

This is new – under the BPR certain biocidal products can be authorised at Union level. This will allow companies to place these biocidal products on the market in the entire Union. Union Authorisation (UA) will be granted to biocidal products with similar conditions of use across the Union, except those containing active substances meeting the exclusion criteria and certain specific product-types where UA will not be allowed. There is no equivalent procedure in the plant protection product regulations.

Transitional measures

Both the BPR and PPPR have specific transitional measures for active substances that were being evaluated under the previous directives and for products where dossiers have been submitted or where authorisations / registrations have been granted under regulations made under the previous directives.

Conclusion

This article is intended to provide some high level comparisons between the new regulations governing the approval and authorisation of both biocide and pesticide active substances and products. By its very nature a short article of this type cannot provide a detailed comparison of the many procedures involved in the registration of these two groups of chemicals.

In both cases there is uncertainty over how the legal texts should be interpreted and these are and will be

clarified through the publication of new guidance documentation and specific implementing legislation. For biocides, errors will be corrected through the issue of a corrigendum to the regulation, while for pesticides there are no such plans. In both areas there are task groups working on the regulations. In the case of biocides, these are being led by either DG Environment or ECHA and have both member state and industry stakeholder representation. Involvement with these groups represents the best prospect for industry input into how the BPR will be implemented. In the case of pesticides the groups are lead by DG Health and Consumer Affairs with member state representation, but with a more limited industry involvement.

While based on the principles of the previous directives, both the BPR and the PPPR introduce a number of changes to the way products and the active substances on which they are based are regulated within the EU. In particular the move to a more hazard-based criteria for determining whether active substances are acceptable and the full implementation of comparative assessment across both categories of products.

The BPR represents a significant change in the way biocides are regulated within the EU. Due to the stage in the active substance review process, the BPR will see many products such as household disinfectants, fall within a strong regulatory framework where currently in many countries they may be only lightly regulated. It is to be expected that due to the large numbers of products that fall within the scope of the BPR, that this will present significant challenges to both industry and regulators.

In contrast plant protection products have a longer history of regulatory control. The introduction of the PPPD and PPPR resulted in relatively few previously unregulated active substances coming under statutory control. However, overall the EU regulatory regime has significantly reduced the total number of active substance available on the market.

■ For more information please contact enquiries@jsci.co.uk.

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1) In this article the term pesticide is used to describe plant protection products

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Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC, *Official Journal of the European Communities*, 24 November 2009, L309/1.

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Opening a window into vector-borne plant viruses

Michelle Cilia*

Agricultural Research Service (ARS) scientists in Ithaca, N.Y., are collaborating on development of a technology that could lead to new ways of disrupting how insects transmit viruses to crops. Michelle Cilia and Stewart Gray at the ARS Robert W. Holley Center for Agriculture and Health in Ithaca, and colleagues James Bruce and Juan Chavez at the University of Washington, have mapped out the structure of an elusive protein that gives certain plant viruses the ability to travel from plants to insects, through the insects, and back into plants.

To move from plant to plant, some viruses, such as potato leafroll virus, need to stay in the infected plant's phloem tissues so they can be ingested by a feeding aphid. Once inside the aphid, the virus must pass through the insect's gut and salivary tissues before it can be passed into another plant by the aphid. To complete the journey, viruses need to assemble into larger packages known as virions. Each virus species is very particular and can only be transmitted by a few species of aphids. ARS researchers believe the outside shape or topology of the virion plays a major role in that specificity, determining whether a virus will move through the aphid and infect a plant.

A minor structural protein of these viruses that extends from the shell of the virion is instrumental in guiding the virion on its journey through the insect and through the plant.Until now, there has been no information about these structural proteins and such information is crucial to developing new ways of disrupting how they work.

In tests with potato leafroll virus, the researchers used protein interaction reporter (PIR) technology, a tool developed in Bruce's laboratory to study protein interactions. Researchers there developed a unique set of chemical compounds, or PIR cross-linkers, which could interact with the structural proteins, allowing scientists to capture a molecular snapshot of them. Coupled to high-resolution mass spectrometry, the advanced molecular design of the PIR cross-linkers also allowed the scientists to visualize critical topological features of the virion for the first time. The results, described in a paper in the Journal of Proteome Research, represent a new technology that can take measurements of insect and plant-virus protein interactions in living cells.

The researchers have so far focused on luteoviruses spread by aphids, but the technology could one day be used to study other insect-transmitted plant viruses and animal-infecting viruses now difficult to study with traditional methods.

*Michelle Cilia, ARS Robert W. Holley Center for Agriculture and Health, Ithaca, N.Y.; michelle.cilia@ars.usda.gov. ARS is the principal intramural scientific research agency of the U.S. Department of Agriculture (USDA), and this research supports the USDA goal of promoting international food security.

Postdoctoral associate Stacy DeBlasio injects a liquid culture of a plant-infecting bacteria into plant cells.

Michelle Cilia, a molecular biologist in the Biological Integrated Pest Management Research Unit in Ithaca, New York, examines infected potato plants in the greenhouse for symptoms of virus infection.

ARS scientists have found a way to map the structure of an elusive protein that gives certain plant viruses the ability to travel from plants to insects, through the insects, and back into plants.

Unravelling the Irish potato famine

Phytophthora infestans, the cause of potato late blight, is infamous for having triggered the Irish Potato Famine in the 1840s. Until the 1970s, the diversity of P. infestans outside of its Mexican centre of origin was low, and a single strain, US-1, was considered to have dominated the global population for 150 years.

This has been challenged, based on DNA analysis of historical herbarium specimens. This is the first time that scientists have decoded the genome of a plant pathogen and its plant host from dried herbarium samples and this opens up a new area of research to understand how pathogens evolve and how human activity impacts the spread of plant disease.

The DNA reconstruction used material that was 170 to 120 years old. The Herbaria were considered to represent a rich and untapped source from which a tremendous amount could be learned about the historical distribution of plants and their pests – and also about the history of the people who grew these plants. The researchers examined the historical spread of the fungus-like oomycete *Phytophthora infestans*.

The strain US-1 was long thought to have been the cause of the fatal outbreak but the current study concludes that a new strain, HERB-1 was responsible and while more closely related to the US-1 strain than to other modern strains, it is unique. The researchers compared the historic samples with modern strains from Europe, Africa and the Americas as well as two closely related *Phytophthora* species. The scientists were able to estimate with confidence when the various *Phytophthora* strains diverged from each other during evolutionary time.

Assumed channels of distribution of the two examined strains of the potato blight pathogen Phytophthora infestans. Source eLIFE Sciences Journal

The HERB-1 strain of *Phytophthora infestans* probably emerged in the early 1800's and continued its global spread throughout the 19th century. Only in the twentieth century, after new potato varieties were introduced, was HERB-1 replaced by another *Phytophthora infestans* strain, US-1. Researchers found several connections with historic events. The first contact between Europeans and Americans in Mexico in the sixteenth century coincides with a remarkable increase in the genetic diversity of *Phytophthora*. The social upheaval during that time may have led to a spread of the pathogen from its centre of origin in Mexico. This in turn would have accelerated its evolution.

A potato specimen showing the effects of Phytophthora infestans. Source US Agricultural Research Service.

The international team came to these conclusions after deciphering the entire genomes of 11 historical samples of *Phytophthora infestans* from potato leaves collected over more than 50 years. These came from Ireland, the UK, Europe and North America and had been preserved in the herbaria of the Botanical State Collection Munich and the Kew Gardens in London. Because of the remarkable DNA quality and quantity in the herbarium samples, the research team could evaluate the entire genome of *Phytophthora infestans* and its host, the potato, within just a few weeks.

Crop breeding methods may impact on the evolution of pathogens. This study directly documents the effect of plant breeding on the genetic makeup of a pathogen. Perhaps the strain became extinct when the first resistant potato varieties were bred at the beginning of the twentieth century. What is for certain is that these findings will help understand the dynamics of emerging pathogens.

■ For more information: Kentaro Yoshida et al. 'Herbarium metagenomics reveals the rise and fall of the Phytophthora lineage that triggered the Irish potato famine', eLife, in press. http://arxiv.org/abs/1305.4206

Evaluation of Zonatrac™ and Ceranock™ Attract and Kill Systems for the control of *Bactrocera zonata* and *Ceratitis capitata* on peach

Dr. Nayem Hassan*

Fruit flies (*Diptera*: Tephritidae) are one of most serious pests of fresh fruit and vegetable crops worldwide. There are around 5000 fruit fly species recorded of which 70 species are of economic importance. Among these is the Mediterranean fruit fly, which can cause annual fruit losses of over US$365 million if control measures are not applied.

Control strategies mainly rely on the use of conventional organophosphate (OP) chemical insecticides; Malathion, Naled and others. Numerous cases of fruit fly resistance to OP insecticides have been reported including *Bactrocera dorsalis* in Taiwan, *Bactrocera oleae* in Europe and *Ceratitis capitata* in Spain (Hsu and Feng, 2002; Hawkes et al., 2005; Magaña, 2007; Skouras et al., 2007).

Moreover, organophosphate insecticides have received widespread scrutiny for their negative impacts on non-target species and on consumer health. Therefore, an alternative approach is urgently needed for controlling fruit flies. One possible solution is the uses of para-pheromone based attract and kill technique that could be a sustainable, eco-friendly and effective control measure.

Figure 1. Zonatrac applied as on trunk or branches of trees.

Fruit fly eradication has already been achieved in many counties through area-wide application of an attract and kill approach using an attractant incorporated with an (OP) insecticides. Russell IPM has developed innovative attract and kill formulations for controlling male and female fruit populations with enhanced performance and safety relative to the existing organophosphate-based systems.

In the present study the male fly attractant, methyl eugenol and a low dose toxicant based Zonatrac™ system has been tested against peach fruit fly, *Bactrocera zonnata*. Zonatrac™ contains fruit fly attractant methyl eugenol and low dose contact insecticide (0.5%).

At the same time to combat female fruit fly population the Ceranock™ Attract and Kill system has been developed. It contains food attractant hydrolyzed protein and low dose alphacypermethrin. The target insect contacts the source of attractant and is killed or incapacitated upon contact. The Ceranock system remains active over a period of four months and has a range of advantages over other available control systems. Ceranock is an IPM compatible management tool that ensures zero pesticide application directly onto fruit crops. In the present study the Ceranock system has also been tested in order to con-

*Russell IPM Ltd, Deeside Industrial Park, Deeside, Flintshire, UK,

Figure 2. Zonatrac applied on leaf surface.

trol Mediterranean fruit fly, *Ceratitis capitata* in Jordan.

Materials and methods:

1- Zonatrac system

The efficacy of Zonatrac 'attract and kill' has been evaluated against Peach fruit fly, *Bactrocera zonata* in Sidi El-Masri, Tripoli, Libya. An average amount of 2g of Zonatrac applied on a corrugated cardboard surface and placed inside a McPhail trap. The traps were hung from branches of host and non-host trees at a height of 1.5 – 2 meters above the ground level. Zonatrac was also applied on tree trunk and leaf surfaces (See Figures 1 and 2) to evaluate the comparative attraction. Mean (±SEM) daily temperature values in the trial sites were: 18-43ºC from July to September, 2012. The experiment was conducted during the period of 28 June to 29 of September, 2012. The trap catches were recorded every two days.

2- Ceranock system

Ceranock is an innovative Mediterranean fruit fly Attract and Kill system based on target application of fruit fly female attractant and low dose of pesticide presented as a bait station. Ceranock bait stations were hung from tree branches (See Figure. 3). The effectiveness of the Ceranock system was evaluated in Al Mafariq region, Jordan, against *C. capitata* on two peach varieties (Fire time and Rayan sun). Four hundred Ceranock bait stations were hung in every hectare around 1.5 – 2 meters above the ground level. Bait stations were placed 4-6 weeks before fruit colour change on shady part of the tree to avoid scorching sunlight.

McPhail traps baited with Trimedlure and Femilure were used for monitoring the male and female fly population. Experiments were conducted during the period of 1st of July till 30th of September, 2012.

Figure 3. Ceranock bait station in use.

The efficacy of Ceranock was evaluated by recording fruit damage. Twenty trees were selected from the centre of both control and treatment areas. In each tree 40 fruits were marked, 10 from each side. The number of dropped fruits was recorded from the beginning of fruit set. Dropped fruits were dissected and assessed. After harvest, total yield of the selected trees were counted in terms of number of healthy fruits per tree.

Results and discussion:

1- Zonatrac system efficacy in the control of *B. zonata*

In trail fields Zonatrac remain effective over a period of 12 weeks. The highest trap catches were123-130 peach fruit flies per trap per day (FTD) during first two weeks (See Figure 4).

Then trap catches per day gradually reduced and the lowest FTD (12.44) was recorded in week 12. The study revealed consistent attractiveness of Zonatrac system against male *B. zonata* and the results indicate that the Zonatrac can be used as a successful tool for male annihilation in an area-wide integrated pest management (IPM) program.

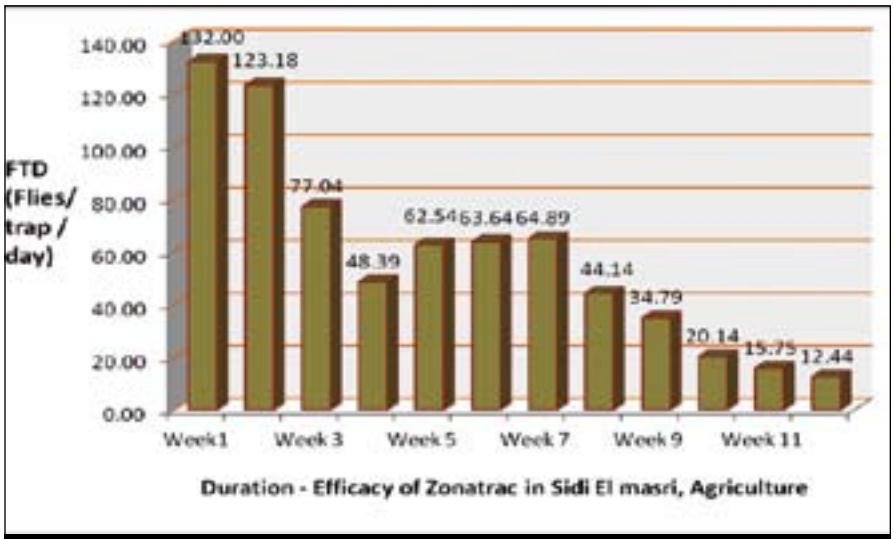


Figure 4. Average trap catches of male B. zonata/trap/day in traps baited with Zonatrac in Sidi EL Masri, Tripoli, Libya from 28 June to 18 September, 2012.

2- Ceranock system efficacy in the control of C. capitata

2-1- Study of the population dynamic in border and center of Ceranock treated areas

The Ceranock Attract and Kill system was placed in a peach orchard from the beginning of July,2012. To evaluate the efficacy of the system in the control of Med-fly, male and female monitoring traps were placed outside, in the border and center area of each experimental plot. Trap catches were collected weekly.

A significant difference was observed among the number of flies captured between the outside, the border and the center areas for both plots A and B. It is found that the pressure of Med-fly outside the orchard was higher and this is due to the normal presence of the insect (See Figure 7).

However, traps near the border trapped 80% and 90% of the total of trapped insect, respectively for plot A and B. In the center, the numbers of trap catches were negligible. The Ceranock system has found to be effective to control of Med-fly by reducing the insect pressure from the border to the center area.

2-2- Monitoring traps catches data

Catch data from monitoring traps baited with Trimedlure were collected weekly in Ceranock treated field and control plots. A significant difference was shown in the number of trap catches between treatment and control field. In fact, for the plot A, a maximum of 226 flies/trap/week (FTD= 37.66) and has been recorded, however in control plots, captures were doubled with 440 flies/trap/week (FTD= 73.33) (See Figure 8).

Similarly for plot B, where it is noted that maximum trap catches were 110 flies/trap/week, (FTD= 18.33), compared to 268 flies/trap/week (FTD= 44.66) in the control plot (See Figure 8).

2-3 Fruit damages assessment

Fruit damage was assessed during the period of treatment for both plots A, B and for control. Significant difference in percent fruit damage was found between the treated plots and the control plot. The Ceranock treatment was found to be effective in reducing Med-fly damage in both peach varieties to 5-6%, whereas in control plots the total damage

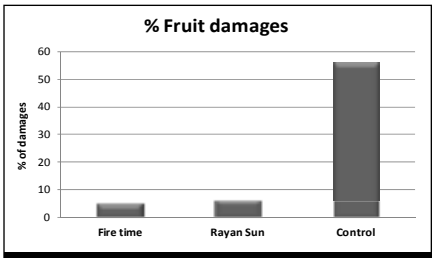


Figure 9. Evaluation of the percentage of fruit damages in plots A, B and Control

Figure 7. Male and female C. capitata *rate of captures using Trimedlure and Femilure outside the orchard, border and center of Ceranock treated*

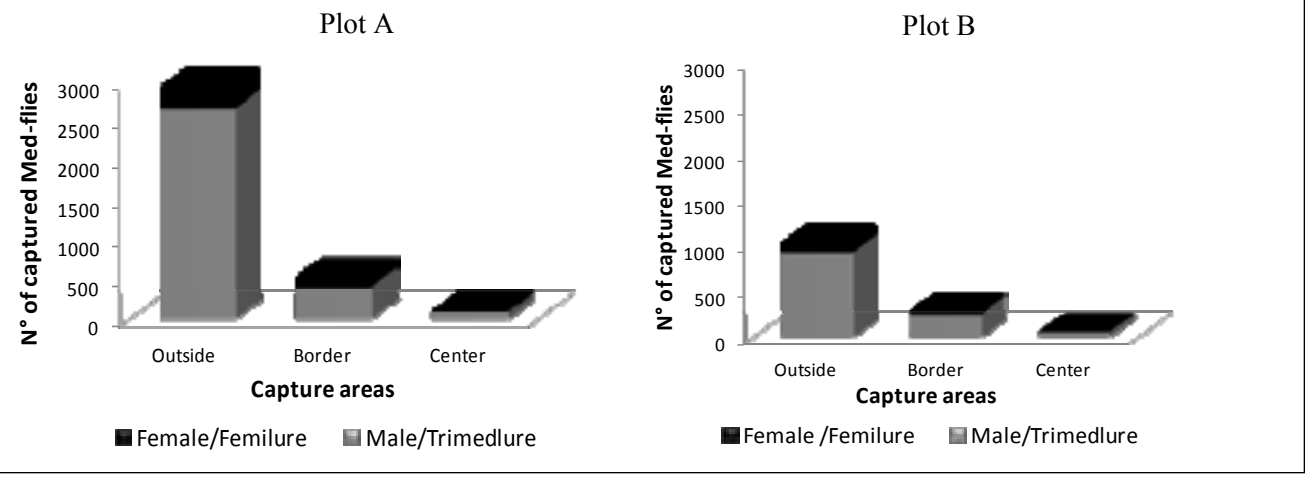
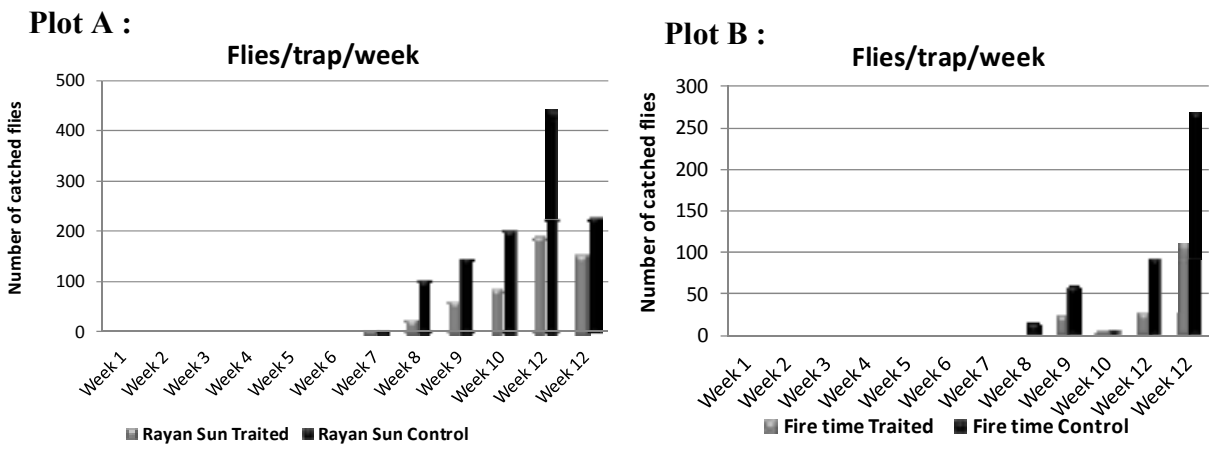


Figure 8. Evaluation of C. capitata *monitoring catches trap in plots A, B and control.*



was observed to be up to 56% (See Figure 9).

Conclusion:

The present study showed the effectiveness of the Zonatrac system over a period of 12 weeks. Zonatrac has proven to be a strong candidate for MAT for *B. zonata*. In addition, this study proved the effectiveness of Ceranock Attract and Kill method in the control of Med-fly populations. Ceranock reduced the level of infestation from the border to the centre of the treated area which restricted fruit damages up to 5-6%.

Moreover, a similar study conducted in Spain, 2008 found that the pressure of Med-fly is higher in the outside area compared to the inner area which ensures fly population pressure reduced as a result of the use of baited station. In addition Ware, 2002 reported that an Attract and Kill bait station approach was found to be an effective tool for the control of fruit fly in citrus, deciduous and subtropical fruits in South Africa. All of these previous attract and kill studies results are consistent with the results of this study.

Therefore the present study confirmed that Zonatrac and Ceranock systems could be an effective alternative to conventional chemical control of B. zonata and Mediterranean fruit fly. There will be no pesticide residues left on fruits, as these systems eliminate the need for a cover spray of insecticide onto fruit directly. Moreover, Ceranock is a ready to use system and can protect fruits over a period of 120 days without skilled labour.

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First time focus on fungicides for an amenity tree

Dr Terry Mabbett*

Native and naturalised trees in the United Kingdom (UK) face unprecedented levels of disease, damage and destruction from exotic (alien) plant pathogens. These mainly fungal pathogens are arriving on infected plant material via intra EU (European Union) trade. The level of plant quarantine exercised between the UK and other EU member states is considerably lower than that which operates between the UK and 'Third Countries' (e.g. United States).

Plant pathogens recently entering and establishing in the UK from other EU countries include *Phytophthora ramorum* (sudden larch death), *Cryphonectria parasitica* (sweet chestnut blight), *Phytophthora lateralis* and *Phytophthora austrocedrae*.

The latest pathogen to hit the headlines is *Chalara fraxinea*, causal fungus of Chalara ash dieback, first intercepted on a consignment of 2000 common ash (*Fraxinea excelsior*) raised in Belgium and imported from the Netherlands last year. Chalara ash dieback has now spread to most EU countries since first appearing in Poland in 1992, with only a handful of Mediterranean and Balkan countries unaffected. Denmark is expected to lose over 90 per cent of its common ash tree population. The UK's island status should have been sufficient to prevent entry of this spore spreading pathogen, providing sufficiently rigid quarantine was in place.

Subsequent surveys, carried out November 2012, showed widespread infection of common ash throughout the UK, strongly suggesting that the introduction of *Chalara fraxinea* on infected planting material from other EU countries, had taken place over a period of at least five years. The latest count (at 13th May 2013) stands at 500 confirmed infections comprising 23, 295 and 182 in, respectively, plant nurseries, recently planted sites and the wider environment (e.g. established woodland).

Despite persistent warnings on the need for quarantine measures, first made by EPPO (European and Mediterranean Plant Protection Organisation) in 2007 and the subsequent petition for a ban on imports of all *Fraxinus* species into the UK (made by HTA [Horticultural Trades Association] in 2009), the UK plant authorities allowed ash imports to continue without even the cursory inspection of trees.

The UK government is now faced with the embarrassment of seeing *Fraxinus excelsior*, the second most important native high forest tree and widely planted in the forestry and amenity sectors, being virtually wiped out. In response UK government is providing a level of funding not afforded to other trees in similar disease predicaments. This includes native *Quercus robur* and *Q. petraea* (English oak), environmentally and economically the UK's most important native trees, and now under serious threat from acute oak decline, caused by the combined activity of a bark boring beetle (*Agrilus biguttatus*) and at least one pathogenic bacterium.

By the same token, the UK plant health authorities (Forestry Commission and FERA) recently announced a chalara management plan involving an unprecedented depth and spectrum of measures which in the past have been summarily dismissed as too costly and unworkable for other trees facing equivalent disease threats.

Apart from trying to deflect constant badgering by the national media and appeasing public anger, Chalara ash dieback seems a strange adversary for the government to choose. The disease is being spread by airborne ascospores amongst and within a huge population (circa 100 million) of common ash. As a pioneering and colonising tree, common ash is found literally anywhere and everywhere in the UK. In addition, thousands of hectares of ash are established in commercial forestry and millions of trees have been planted in the amenity and landscape sectors. What's more chalara ash dieback is a vascular wilt disease, growing and moving internally within the woody tissue, and therefore extremely difficult to manage with fungicides once a tree is infected.

Focus on fungicides

Be that as it may, the UK government's Chalara Management Plan (March 2013) includes laboratory screening of fungicides for activity against the pathogen with follow up use of the best performing fungicides in field trials. This is something which has never been considered in the UK even for other economically important pathogens such as *Dothistroma sp*, the cause of Dothistroma needle blight (red band needle blight) of economically important pines including Corsican Pine (*Pinus nigra* var. *maritima*) and Scot's Pine (*Pinus sylvestris*). The former is no longer planted in UK forestry due to damage by Dothistroma, despite experience from Radiata Pine (*Pinus radiata*) plantations

Chalara fraxinea ascospores borne in apothecia on last year's leaf litter infect current season's ash leaves to cause lesions and necrosis from July to October. Image credit: Forestry Commission.

* Dr Terry Mabbett Consultants, e-mail: DrTerryMabbett@btinternet.com

Chalara fraxinea infection moves along the leaf stalks and new green shoots and into the woody stem to cause highly distinctive bark lesions (Picture: Forestry Commission)

in New Zealand showing Dothistroma as much easier to control with copper fungicides than Chalara ash dieback will ever prove to be.

Fourteen fungicides shortlisted for laboratory screening against *Chalara fraxinea* by FERA were selected from 50 candidate fungicides submitted by Crop Protection Association members and 34 compounds proposed by other companies and individuals (Table 1).

Selection is heavily biased towards systemic, single-site action fungicides belonging to the triazole, strobilurin and SDHI (succinate dehydrogenase inhibitor) chemical groups. Systemic fungicides enter the leaves and are re-distributed in the plant, to a greater or lesser extent, depending on the chemical. Truly systemic fungicides are re-distributed in the water conducting (xylem) and/or food conducting (phloem) tissue. Locally systemic (translaminar) fungicides do not move outside of the leaf through which they gain entry.

FERA says overall selection was made using the following criteria

- Fungicides with established activity against *C. fraxinea*, closely related pathogens and others like *Venturia inaequalis* (apple scab) displaying similar life cycles
- Selection from chemical groups having modes of action most likely to be effective
- Products containing a single active ingredient rather than a mixture of two or more active ingredients, to satisfy the practicalities of laboratory screening
- Fungicides already registered as plant protection products in the UK, elsewhere in Europe, or close to achieving that registration
- With a regard to the risk of the pathogen developing resistance to the action of a specific fungicide, or a group of fungicides with close molecular structures and therefore the same mode of action. Mode of action is the way a fungicide inhibits, suppresses or destroys the fungus at cellular level.

Classic green shoot dieback symptoms of the chalara ash dieback disease (Picture: Forestry Commission)

FERA says fungicides showing most activity in the laboratory screen will be used as protectant treatments on ash saplings in the field, starting in Spring 2013. Field tests will also be carried out on two additional chemicals classed as nutrients. Potassium phosphite will be assessed for stimulation of host plant resistance in ash saplings. Urea will be tested as a treatment of leaf litter for the suppression of apothecia formation and acceleration of leaf litter decomposition. Apothecia are the fungal fruiting bodies containing the leaf infecting ascospores of *C. fraxinea.*

Strange selections

There is some inconsistency in the choice of fungicides for testing in relation to the criteria given by FERA as the basis for selection.

Protectant action occurs on the plant surface. The fungicide acts by contact to stop fungal spore germination and/or prevent the pathogen from penetrating the leaf to establish an infection. Mancozeb and copper oxychloride are examples of purely protectant fungicides. They do not (and cannot) enter the leaf but instead form sparingly soluble deposits on the leaf surface to kill spores or stop leaf penetration and infection by the fungus.

Some systemic fungicides give protectant action while they remain on the leaf surface but this will be limited in amount and duration because systemic fungicides are designed to enter the leaf as rapidly as possible. Systemic fungicides entering the plant, to inhibit or stop infections which have already started, are called curative fungicides. This ability may include antisporulant activity to slow disease development by limiting the reproductive potential of the fungus.

Bark lesions followed by progressive internal infection of the phloem, cambium and xylem vascular tissues as a vascular wilt disease is the cutting edge of the Chalara fraxinea fungal pathogen (Picture: Thomas Kristis)

Triazoles lack protectant action

Triazole fungicides as a group, display true systemic activity with rapid absorption of the fungicide by leaves and upward (acropetal) movement) of fungicide in the plant via water conducting (xylem) tissue. Trizazole fungicides will therefore spend a minimum amount of time on the surface of the leaf for any potential protectant action against alighting Chalara ascospores.

That said, the triazole fungicides as a group have inherently little or even no protectant action against fungal spores on plant surfaces due to their specific mode of action. Triazole fungicides kill fungi by inhibiting the formation of sterols which are essential components of fungal cell membranes. Triazoles have no effect against spore germination because fungal spores already contain enough sterol for the formation of germ tubes. Some spores even have enough sterol to produce infection structures, so in some cases triazoles may not even be effective in preventing fungal penetration. What is the point in testing triazole fungicides for a level of protectant action which they simply do not have?

Two missing triazole fungicides

None of the products listed contain the two triazole fungicides with the most well established track record against closely related chalara pathogens causing similar vascular wilt diseases in other trees. Propiconazole and tebuconazole are applied by tree injection in North America to control vascular wilt of oak trees caused by *Chalara quercina*. As two of the longest established and most widely available triazole fungicides they would almost certainly be amongst the most cost effective to use.

Copper fungicide conundrum

FERA says copper oxychloride was included at the request of stakeholders for a copper based compound. Copper oxychloride is one of the three mainstream particulate

Older trees with extensive vascular wilt disease caused by Chalara fraxinea typically respond with epicormic growth up the main stem (Picture: Forestry Commission)

fixed copper compounds used globally and especially in the tropics to control aggressive fungal and bacterial diseases of tree crops such as coffee, cocoa, tea, citrus, mango and avocado.

The word 'fixed' describes the sparingly soluble (in water) nature of these copper compounds which 'fixes' the active copper fungicide ingredient within the molecule. Sparingly soluble and weatherproof deposits of these purely protectant fungicides, formed on the leaf surface, slowly release the active ingredient (the copper ion

Table 1 Fungicide short-list for activity against Chalara fraxinea*

Active ingredient	Fungicide Group	Commercial Product	Company
Myclobutanil	Triazole	Systhane 20EW	Dow Agrosciences Ltd
Cyproconazole	Triazole	Alto 100 SL	Syngenta Crop Protection Ltd
Prothioconazole	Triazole	Proline	Bayer CropScience AG
Fenbuconazole	Triazole	Indar 5EW	Dow Agrosciences Ltd
Flutriafol	Triazole	Consul	Cheminova
Azoxystrobin	Strobilurin	Amistar	Syngenta Crop Protection Ltd
Fluxapyroxad	SDHI	Imtrex	BASF plc
Bixafen/prothioconazole	SDHI/triazole	Aviator 235 XPro	Bayer CropScience AG
Boscalid/pyraclostrobin	SDHI/strobilurin	Signum	BASF plc
Mancozeb	Dithiocarbamate	Dithane 945	InterFarm (UK) Ltd
Pyrimethanil	Anilinopyrimidine	Scala	BASF plc
Dithianon	Qinone	Dithianon WG	BASF plc
Garlic extract (allicin)	n/a	Organosulfur	To be confirmed
Copper oxychloride	Inorganic copper	Cuprokylt FL	Universal Crop Protection

*Source: FERA

The use of fungicide sprays in mixed ash woodland like that shown here is a logistical non-starter (Picture: Dr Terry Mabbett)

– Cu^{2+}) to protect the plant surface over a long period of time. Copper fungicides do not enter the leaf.

The three mainstream fixed copper compounds used as fungicides are copper oxychloride, copper hydroxide and cuprous oxide. Choice of copper oxychloride would appear strange because on a gram for gram basis cuprous oxide and copper hydroxide contain a greater proportion of active copper. Research in the tropics on cocoa which suffers from aggressive Phytophthora pod rot disease and heavy weathering pressure on fungicide deposits generally shows cuprous oxide to be the most efficacious.

Only drawback when relying on a purely protectant fungicide against systemically infecting vascular wilt fungi such as *Chalara fraxinea* is that once the pathogen is inside the plant, as a developing infection inside the leaves, green shoots and woody tissue, there is nothing more that can be done.

Purely protectant fungicides, and systemic fungicides showing only translaminar movement, cannot protect new leaves produced after the fungicide treatment has been made. Truly systemic fungicides carried to all aerial parts of the plant are able to deal with disease in new leaves produced after fungicide treatment is made.

Injection with truly systemic fungicide of individual old, large and 'valuable' common ash trees like the specimen shown here in ancient woodland is the only realistic use for fungicides against chalara ash dieback disease (Picture: Dr Terry Mabbett)

Running risks of resistance

FERA says it is aware of the risk of fungicide resistance and will select treatments accordingly. Highest risk is posed by single-site action fungicides such as the triazoles, strobilurins and SDHI's. A single site-action fungicide inhibits or destroys the fungus by acting against just one specific enzyme in the fungal metabolism. But this is a 'double edged sword' because it is easier for the fungus to 'overcome' the fungicide by 'throwing up' a strain or biotype which can avoid, bypass or neutralise a specific single-site mode of action. The fungicide will carry on killing the fungus but not the resistant strain that will eventually form the entire pathogen population.

Risk of resistance development is reduced by applying fungicide mixtures containing a purely protectant multi-site action fungicide (such as a copper fungicide or a dithiocarbamate fungicide) alongside a single-site action systemic fungicide. Copper compounds are multi-site action fungicides which can denature and destroy all enzymes in the fungal metabolism. It is virtually impossible for a pathogen to overcome such a broad-ranging and 'broadside' mode of action. Copper fungicides are very low risk and have been used as foliar sprays for over 100 years without any reports of fungicide resistance.

Alternating the application of one fungicide with another with a completely different chemistry and therefore mode of action, is another option. Minimising the number of fungicide applications made in a single season is 'part and parcel' of protecting fungicides against resistance development.

Contradiction in terms

UK plant health authorities are embarking on a wide ranging, long term and costly research programme into the use of chemicals to control chalara ash dieback, but given a statement tucked away in the 'Chalara Management Plan March 2013' you may wonder why. The report says: "Based on our experience of other tree diseases, on scientific advice and other European countries' experience of Chalara, we are advised against expecting to find a treatment which can be widely applied to protect woodland or treat an infected wood or forest. Treatments may have a role, though, in protecting individual trees or groups of trees".

There are strict limitations on controlling a tree disease of this nature with fungicides. Chalara ash dieback is vascular wilt disease of a completely ubiquitous and exceptionally common native tree. Injection of individually large and 'valuable' ash trees using systemic fungicide will almost certainly prove to be the only logistical, practical and economic way forward for fungicides in this instance.

Time and money could be saved by testing and obtaining CRD (Chemicals Regulation Directorate) approval for two widely available triazole fungicides (propiconazole and tebuconazole) which are already used by tree injection in the United States to control *Chalara quercina* the causal agent of vascular wilt disease (oak wilt) in oak trees.

Injection with truly systemic fungicide of individual old, large and 'valuable' common ash trees like the hedgerow common ash shown here is the only realistic use for fungicides against this chalara ash dieback disease (Picture: Dr Terry Mabbett)

Alert over caterpillar pest in London and Berkshire

People in parts of London and South East England are being reminded this Spring by the Forestry Commission, Public Health England and local authorities not to touch caterpillars of the Oak Processionary Moth, which are beginning to emerge in oak trees in these locations. They are also advised to keep children, pets and livestock away from the caterpillars and their nests, and to report any sightings.

Caterpillars of the Oak Processionary Moth, *Thaumetopoea processionea* (OPM), which was accidentally introduced to Britain from mainland Europe in 2006, are a tree pest and pose a threat to human and animal health. The caterpillars damage oak trees by feeding on the leaves, in some cases leaving the trees severely defoliated and vulnerable to other pests, diseases or drought.

A native of southern Europe, OPM has become established as far north as The Netherlands over the past 20 years. It most likely entered Britain as eggs laid on young oak trees before they were imported from mainland Europe for planting here. The caterpillars pupate in their nests in late June and early July and emerge as moths up to four weeks later. The moths lay their eggs in oak trees in July and August, and the caterpillars emerge from the eggs the following spring. The caterpillars feed in groups and at other times congregate in nests of matted, white, silken webbing, which are typically about the size of a tennis ball. OPM will attack other trees such as hornbeam, hazel, beech, sweet chestnut and birch, but usually only where oaks are severely defoliated and its preferred food of oak leaves is limited

Caterpillars of the Oak Processionary Moth, Thaumetopoea processionea (OPM). Image credit: Forestry Commission (Crown copyright)

They pose a risk to human and animal health because they have tiny, toxin-containing hairs which, on contact, can cause itchy skin rashes in people and animals. Eye and throat irritations have also been reported as symptoms. The hairs can be blown on the wind, and left in the silken, web-like nests which the caterpillars build in oak trees. They pose the greatest risk from May to July, although nests should not be approached at any time.

The Forestry Commission is working with local authorities and land managers to tackle the outbreaks with a carefully controlled programme of tree spraying and nest removal. Ian Gambles, Director of Forestry Commission England, said the public could help, but urged caution. "We need, and welcome, reports of the caterpillars or their nests from the public or others, such as gardeners and tree surgeons, who are out and about in areas with oak trees," he said. "However, the public should not try to remove the caterpillars or nests themselves. This task needs to be carefully timed to be most effective, and is best done by specially trained and equipped operators."

Dr Yvonne Doyle, London Regional Director of Public Health England, endorsed this advice, saying: "We strongly advise people not to touch or approach the caterpillars or their nests because of the health risks posed by the toxin-containing hairs. Pets can also be affected and should be kept away as well. "Anyone who experiences an itchy or painful skin rash or a sore throat and irritated eyes after being near oak trees in these areas should consult their doctor or contact the NHS. "We have issued advice to local GPs and health professionals to help them identify when patients have been affected by the caterpillars and to advise them on appropriate treatment." Tree spraying is done by fully qualified operators under strict health, safety and environmental controls to ensure it is safe for humans and animals.

Rash caused by contact with the hairs of OPM caterpillars. Image credit: Henry Kuppen.

- Sighting reports – can be sent to the local council, or to the Forestry Commission, using the Commission's Tree Alert app or on-line form at www.forestry.gov.uk/oakprocessionarymoth.
- Health advice – Anyone who is worried by an intensely itchy or painful skin rash, sore throat or irritated eyes, and who might have been near oak trees infested with OPM, should consult their GP or NHS 111. Health information is also available from the Public Health England website (www.hpa.org.uk) under 'Oak Processionary Moth'. Anyone concerned about their pets should contact a vet.
- Pest control – A list of local operators who can deal with OPM is available from the Forestry Commission at plant.health@forestry.gsi.gov.uk, or the local Council.
- Working on oak trees – Anyone having oak trees pruned or felled in the affected areas must contact the Forestry Commission's Plant Health Service beforehand

■ Further information is available from www.forestry.gov.uk/oakprocessionarymoth.

A Colour Handbook of Tomato Diseases (Second Edition)

Dominique Blancard, 978-1-84076-156-6, £135 hardback, 688pp., 900 colour images. Publication: August 2012. www.mansonpublishing.com/tomato

Since its' original publication in 1992, the Dominique Blancard book 'A Colour Atlas of Tomato Diseases' has become a British tomato industry essential for referencing Tomato diseases and physiological disorders in commercial crops for growers, agronomists and professional pathologists alike.

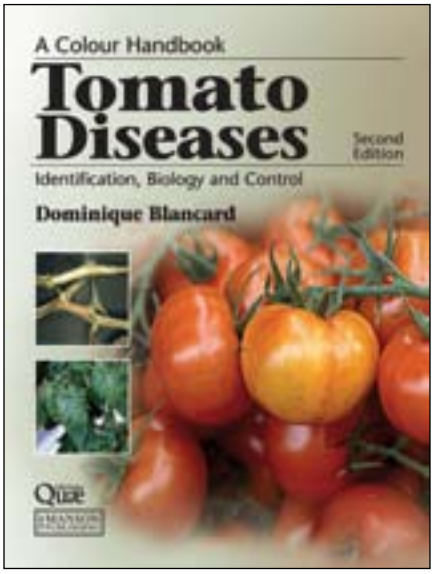
Though growers have sometimes found the indexing system difficult to use it has, nevertheless, enabled self diagnosis of some economically damaging diseases and disorders at an early stage and enabled growers to minimize losses due to such events.

With over 650 pages, (well over 3 times the volume of the first edition) the second edition now entitled 'A Colour Handbook; Tomato Diseases. Identification, Biology and Control' extends the scope of the previous edition through a thorough revision, including the addition of more descriptive prose and a whole new section on the biology of pathogens, helping the reader to understand as well as identify potential, nascent and existing pathology issues within their crops as well as their potential sources.

This is further supported by sections on disease prevention through understanding the nature of and selection of resist cultivars and some guidance in the options relating to prevention and dealing with current issues in the growing crop.

This second edition is now a comprehensive textbook of Tomato plant pathology. A reference resource that will be invaluable to professional growers, agronomists and plant pathologists as well as academics and students, involved in the production or consideration of the cultivation of high quality and value British Tomato crops.

The second edition benefits from an improved referencing system which, though not perfect, is a welcome improvement on the first edition. There are also many new and high quality descriptive pictures and illustrations making this an essential purchase for anyone interested in the diagnosis of Tomato plant pathogens and disorders. Blancard and his



collaborators (including the well known British Pathologist Dr John Fletcher) have worked hard to update and improve on the previous edition, well written and easy to read. The author has created what will fast become the new industry standard guide to understanding diseases and disorders in one of the most important UK, European and indeed global salad food crop, fit for the 21st Century and a superb aid to assist in dealing with the increasing challenges caused by new and existing pathogens.

The second edition of Blancards' 'A Colour Handbook: Tomato Diseases. Identification, Biology and Control' is an essential addition to a Tomato growers' library and comes highly recommended by the British Tomato Growers' Association.

■ Dr Philip S Morley, Technical Officer. British Tomato Growers' Association

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www.britishtomatoes.co.uk

Managing pesticides in the food chain

Campden BRI Guideline No. 19, 3rd edition

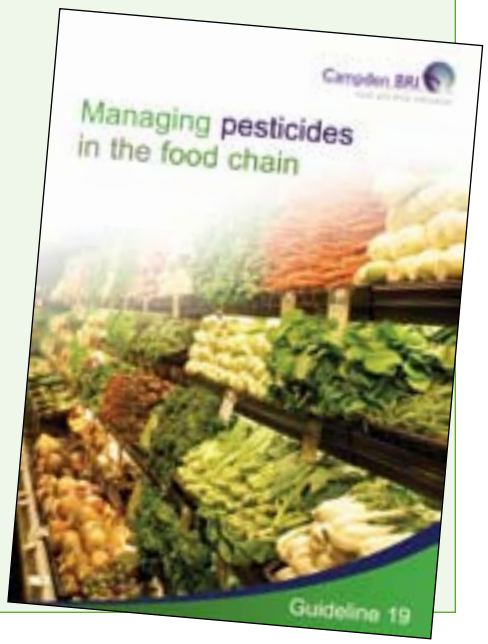
Pesticides are an important part of the food production system – both in improving production efficiency and in minimising post-harvest losses, and ensuring a high quality raw food product.

More stringent legislation has been introduced with respect to the mechanisms controlling the authorisation of pesticides, the level of permitted residues and the practical aspects of pesticide application.

All in the food supply chain face the considerable challenge of needing to comply with restrictions imposed by statutory and customer-led requirements.

This new guide is designed to help farmers, growers, food processors, food manufacturers and retailers understand and respond to the legislative and voluntary controls of pesticides in the food chain. It describes pesticide risk management systems, including record keeping, and explains how to implement these in practice.

■ Contact: pubs@campdenbri.co.uk, www.campdenbri.co.uk.



International Pest Control calendar of events

Please find below a list of key international events in the world of pest management. If you know of a exhibition or conference that is not listed here, please send information to editor@international-pest-control.com. It is sadly not possible to list all the events in the pest control world, however we will aim to publicise as many as possible. If you have attended an event and believe the discussions might be of interest to our readers, we are also interested in receiving reports and photos that you are happy to share with our readership.

Date	Days	Event / Venue / Website
07-May-13	3	**IOBC Working Group on Integrated Control in Citrus Fruit Crops** / Adana, Turkey / http://iobcwprscitruswg.org/
12-May-13	5	**12th European Fusarium Seminar** / Bordeaux, France / https://colloque.inra.fr/efs2013
12-May-13	5	**6th Meeting, IOBC-WPRS Working Group, Integrated Protection of Olive Crops /** Becici, Budva, Montenegro / http://www.montenegrolive-iobc.com/
13-May-13	4	**14th Euroblight Workshop** / Limassol, Cyprus / http://www.euroblight.net/EuroBlight.asp
20-May-13	5	**1st International Whitefly Symposium /** Kolymbari, Crete, Greece / www.ibws6.gr
21-May-13	1	**65th International Symposium on Crop Protection /** Ghent, BELGIUM / www.iscp.ugent.be.
29-May-13	1	**Museum Pest Workshop: Annual Conf of American Inst of Conservation (AIC) /** Indianapolis, USA / http://www.conservation-us.org/index.cfm?fuseaction=page.viewpage&pageid=715
05-Jun-13	3	**International Conference on IPM in Museums, Archives and Historic Homes /** Vienna, Austria / http://www.ipm-conference-vienna2013.at/
10-Jun-13	4	**IOBC-WPRS: Induced resistance in plants against insects and diseases /** Avignon, France / https://colloque.inra.fr/iobc_inducedresistance_avignon
24-Jun-13	4	**16th European Weed Research Society Symposium** / Samsun, Turkey / https://www.ewrs2013.org/
09-Jul-13	1	**CEPA, General Assembly and Management Day** / Belgium / www.cepa-europe.org
03-Aug-13	6	**10th European Congress of Entomology /** York, UK / www.ece2014.com
03-Aug-13	6	**10th International Mycological Congress /** Bangkok, Thailand / http://www.imc10.kasetsart.org
13-Aug-13	3	**New Zealand Plant Protection Society Conference /** Napier, New Zealand / www.nzpps.org/conference.php
19-Aug-13	5	**International Chemical Ecology Conference (ICEC 2013) /** Melbourne, Australia / http://www.icec2013.com.au/
25-Aug-13	6	**International Congress of Plant Pathology** / Beijing, China / http://www.icppbj2013.org/
09-Sep-13	3	**1st Eurasian Pest Management Conference EAPMC-2013 /** Russian Academy of Sciences / http://www.pestmanagement.su/english/invitation/
22-Sep-13	6	**European Vertebrate Pest Management Conference** / Turku, Finland / www.evpmc.org/home
07-Oct-13	5	**European Mosquito Control Association /** Istanbul, Turkey / http://www.emca-online.eu/
21-Oct-13	3	**Annual Biocontrol Industry Meeting /** Basle / www.abim.ch
23-Oct-13	4	**PestWorld /** Phoenix, Arizona, USA / http://www.npmapestworld.org/pestworld2013/
29-Oct-13	2	**CropWorld /** Amsterdam Rai Centre, Netherlands / http://www.cropworld-global.com/
06-Nov-13	1	**PestTech** / Birmingham, UK / http://www.pesttech.org.uk/
13-Nov-13	1	**Barcelona Pest Control International Forum (BPCIF) /** Barcelona, Catalonia, Spain / http://www.adepap.com/es/barcelona-pest-control-international-forum
13-Nov-13	2	**Parasitec Maghreb** / Casablanca, Morocco / www.parasitec.org
15-Nov-13	1	**ISNTD Bites 2013, Vectors: surveillance & control for public health** / Greenwich, London / www.isntdbites2013.com
26-Nov-13	3	**FAOPMA** / Seoul, Korea / www.faopma2013korea.com
19-Feb-14	2	**Eurocido /** Dortmund, Germany / http://eurocido.de/
02-Jun-14	3	**11th Fumigants & Pheromones Conference /** Krakow, Poland / http://www.youtube.com/watch?v=xSeh4L6ut0I&feature=player_detailpage
20-Jul-14	4	**2014 International Conference on Urban Pests (ICUP)** / University of Zurich, Switzerland / www.icup.org.uk

International Pest Control intends to be at the following events, we hope to see you there.

- PestWorld Phoenix USA 23-26 Oct 2013
- Parasitec Casablaca, Morocco 13-14 Nov 2013
- 25th FAOPMA Korea 26-28 Nov 2013
- PestTech Birmingham, UK 06 Nov 2013
- IBMA Basle 21-23 Oct 2013
- CropWorld Amsterdam 29-30 Oct 2013

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Visit www.npmapestworld.org/pestworld2013 for more details.

presented by the National Pest Management Association

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