

# The GROWER

THE TECHNICAL JOURNAL FOR HORTICULTURE

AHDB

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## DISRUPTIVE IDEAS

Controlling moth pests using a mating disruption system

## SEEDS OF CHANGE

Could different coatings hold the key  
to better seed performance?



## ARE YOU IN THE ZONE?

Should you use grid or zone-based soil mapping  
to unearth the secret to success in your soil?



# THE FUTURE IS LEAN

Join the free workshops to find out how to increase labour efficiencies in your business

Lincolnshire – 13 March  
Lancashire – 15 March

A large background image shows a worker in a grey and orange jacket, a brown hat, and blue gloves, bent over in a field of green plants. The worker is holding a small container and appears to be inspecting or working with the plants. In the background, another worker is visible in a similar outfit. The field is vast and green, with a few trees and a utility pole in the distance under a clear blue sky.

“ A good innovative event. Very useful to growers and any horticultural business owner ”

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# COMMENT



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## EVERY ENDING IS A NEW BEGINNING

It is with great sadness that this will be my final Chairman's comment as I will be retiring as Chair of the AHDB Horticulture Board on 31 March, six months earlier than planned, to take on a new role but crucially maintain an active part in the industry.

I have been involved in AHDB Horticulture since 2003, back when it was known as HDC, and I hope that in some small way I have made a positive contribution both to AHDB's work and to the horticulture industry. I have certainly found this part of my life immensely rewarding and enjoyable, and it has been a great pleasure getting to know, and work with, you all.

This edition of the magazine fills me with great hope that fresh new minds and ideas are coming to the forefront. We have nine new panel members all eager to drive the industry forward and you can learn a bit more about them on page 7. We also speak to some young researchers from our AHDB Studentship programme about the significant work they are doing to help the sector on page 10.

I want to assure you that I, the rest of the AHDB Horticulture Board, and Steve Tones, remain totally dedicated to ensuring that AHDB continues to provide what the British horticulture industry needs to survive and thrive, now and in the future. The risks and opportunities for growers have never been greater than they are today. To be competitive in future, the industry must find ways to produce crops with minimal reliance both on human labour and on chemical pesticides.

I know that you will make my successor welcome, as you did me, and I am sure that you will benefit from the fresh energy and perspective that they are sure to bring to our collective mission.

I close by thanking you all, and will most likely meet some of you over the coming months before I embark on the next phase of my own exciting life in horticulture.



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# CONTRIBUTORS

Discover more about the people who have helped to contribute to this issue of The Grower magazine.



## CLAIRE DONKIN

For the last 10 years Claire has worked as a technical and agronomy consultant to growers and retailers specialising in niche crops but especially focused on asparagus, stone fruit and herbs. A BASIS/FACTS agronomist she provides field agronomy guidance direct to growers and works with the whole supply chain on trials and product development, both in the UK and overseas. Claire has an MPhil in Soil Science and works closely with both British Herbs and the Asparagus Growers Association.

**Journey to the Asparagus Conference with Claire on page 30**



## JOE MARTIN

Joe studied BSC (Hons) Applied Biology specialising in crop protection at Nottingham Trent University with training placements at Oxford Agricultural Trials, Syngenta's Horticultural Trial's Team and Brixham Environmental Laboratory. Joe spent 19 years working in regulatory and development trials at Eurofins before joining AHDB in July 2015. As Crop Protection Senior Scientist he has responsibilities within horticulture for a range of different crop protection projects, including the lead on SCEPTREplus, AMBER and the Gap Analysis. Within the Crop Health and Protection team he has responsibilities for weeds across all crops with the strategic aim of creating resilient IPM systems decreasingly reliant on pesticides, helping to boost the competitiveness and sustainability of the industry.

**Joe talks chemicals collaboration on page 17**



## HUGH BAKER

Hugh Baker is the founder of the farm business and land agency consultancy Hub Rural. He provides farmers and agri-food firms with a unique mix of industry knowledge, experience and business acumen. Part consultant, part devil's advocate, often with a seat on the Board, he works with some of the UK's biggest food producers & growers, helping them to grow, sustain and realise their ambitions. Now in its 10th year, Hub Rural continues to grow in the ever changing industry that is British food production. The services it provides is more important today than ever before.

**Hugh helps you to ask the difficult questions of your business on page 28**



## ED HARDY

Since joining FEC Energy in 2016 as an Energy Projects Engineer, Ed has been heavily involved with GrowSave, operated on behalf of AHDB Horticulture. He regularly contributes to articles for publications including GrowSave News and The Grower, while also writing technical updates and speaking at events and workshops. Ed is involved with a range of other technical projects including the Next Generation Growing study groups currently being trialled by GrowSave, and a research project investigating improvements in storage conditions for potato box stores.

Ed has a degree in Aerospace Engineering from the University of Bath and subsequently worked in the industry for four years, before moving across to the Energy sector.

**Ed aims to enlighten you on page 24**

# NEWS & UPDATES

## IN BRIEF

### RESISTANT DIAMONDBACK MOTHS NOW CAPABLE OF SURVIVING WINTER

Diamondback moths that have developed resistance to pyrethroids are as capable as surviving overwinter as non-resistant populations. Resistance development can result in reduced fitness, so pests don't survive colder weather. However, the identification of pyrethroid resistance in 2017's populations suggests they are descendants of 2016's migrating moths and have therefore overwintered in the UK.

### 'DEAD-END HOSTS' TO HELP REDUCE SPOTTED WING DROSOPHILA

Populations of spotted wing drosophila in fruit crops could be reduced by introducing fruiting plants that are attractive to the pest, but which also slow or prevent the development of their eggs.

An AHDB review has identified potential plant species which, if used with netted crops, could be a valuable tool in a grower's IPM. A full report is available at horticulture.ahdb.org.uk/publications.

### HORTICULTURE BUSINESSES JOIN INNOVATIVE FARMERS INITIATIVE

A group of top fruit growers are investigating a variety of soil amendments with the Organic Research Centre, looking at ramial and composted woodchip, biochar, green waste compost, mycorrhizae inoculant and anaerobic digestate.

The group, established in the GREATsoils programme, will join Innovative Farmers and extend their original field lab into a three-year trial.

### RB209 AMENDED

The AHDB Nutrient Management Guide (RB209) has been amended to provide clarity on key changes made during the summer and correct a small number of errors. You can pick up the amendment sheet or download the latest digital version at [www.ahdb.org.uk/rb209](http://www.ahdb.org.uk/rb209). The App, available in the App Store or Google Play, has also been updated.

## GOOD HYGIENE ESSENTIAL TO PREVENT LETTUCE FUSARIUM WILT

Rigorous hygiene practice is critical to prevent the risk of infection from lettuce Fusarium wilt, the potentially devastating disease new to UK lettuce crops.

Growers at a recent workshop organised by AHDB Horticulture were told it was essential to carry out their own risk assessments to identify potential sources of infection. Delegates were also urged to put in place clear hygiene protocols to prevent the disease both getting into nurseries and spreading between them.

Lettuce Fusarium wilt has now been confirmed in the UK on two nurseries in Lancashire since October 2017, although earlier outbreaks may have gone undiagnosed. Effective control measures for lettuce Fusarium wilt are limited and no varieties resistant to race 4 (the strain identified in the UK) are available.

Tim O'Neill, Associate Plant Pathologist at ADAS, told growers, "All Fusarium wilt diseases are difficult to manage, you need to use integrated control rather than individual measures.

"The soil-borne disease can spread easily in the right conditions and growers will need to use efficient cleaning and disinfection methods to reduce their risk of infection. Removal of crop remains and effective soil disinfestation is essential to reduce soil inoculum before future lettuce crops once a glasshouse becomes affected."

Kim Parker, Crop Protection Scientist at AHDB, said, "Although the disease is more of an issue under protection in temperate climates like the UK, little is known of the minimum and optimum temperatures required for race 4 to infect, so growers of outdoor as well as protected lettuce crops should be vigilant."

AHDB has received guidelines and protocols from Teagasc, Ireland and a research programme in Belgium (FUNSLA) detailing hygiene measures for the prevention of lettuce Fusarium wilt which are available along with further technical information about the disease on their website: <https://horticulture.ahdb.org.uk/lettuce-fusarium-wilt-and-root-rot>

Over 70 growers, propagators, seed companies, agronomists and representatives from agro-chemical companies attended an event in Lancashire organised by AHDB on 14 December 2017. A full report from the event is available on the **AHDB Horticulture website**.

“ Growers will need to use efficient cleaning and disinfection methods to reduce their risk of infection ”







Emily Livesey, Fruit Manager,  
Lower Hope Fruit Ltd

## NEW PANEL MEMBERS SELECTED TO STEER HORTICULTURE INDUSTRY

Nine new panel members have joined AHDB Horticulture and are set to help drive the UK industry forward and ensure businesses are fit for the future challenges that lie ahead.

Starting in January 2018 for a three-year term, the new panel members will be responsible for delivering the corporate strategy, as well as playing a critical role in assessing and planning research projects that directly impact horticultural businesses.

Emily Livesey, Fruit Manager at Lower Hope Fruit Ltd and new AHDB tree fruit panel member, said, "I believe the panel can really help the industry by continuing their support of research into issues such as improvements to soils, pest and diseases and technology advancement to help improve productivity and quality to help growers remain profitable in testing times.

"The clear challenge over the next three years will be having enough seasonal labour. The industry will need to change and look to innovation to help address that challenge."

James Moffatt, James Coles Nursery and new AHDB hardy nursery stock panel member, said, "In order to combat the issues of staffing, I would like to see the industry embrace technology and mechanisation as much as possible to ensure all areas of any business run as lean and as efficiently as possible.

“It’s great to have that shakeup as it makes us reassess what, and how, we are delivering”

"AHDB is and needs to keep on looking at this side of the industry. I was interested to learn that AHDB is funding research into robotics specifically targeted at horticulture; I'm sure this will have benefit to the growers if not now, then in the near future."

Steve Tones, Strategy Director at AHDB said, "It is always a great pleasure to welcome a new intake of panel members. Their enthusiasm and passion is inspiring, and the fresh knowledge and insight they bring is vital to the continued relevance, impact and value of our work on crop protection, labour, genetics, soil and nutrition."

Dr Georgina Key, Resource Management Scientist at AHDB, said, "New panel members change the dynamic of the existing panels, bringing new perspectives and highlighting new challenges. It's great to have that shakeup as it makes us reassess what, and how, we are delivering."

AHDB Horticulture's strategic key priorities are: extending the available range of plant protection products, adding depth and breadth to the industry's expertise and knowledge, and tackling the rising cost of human labour.

The nine new members will represent the industry on five panels: field vegetables; protected edibles and mushrooms; tree fruit; hardy nursery stock; and protected ornamentals and bulbs & outdoor flowers.

The panel members were selected following an application process which ran until October 2017.

**To see the full list of AHDB Horticulture panel members and find out how to get in touch with your sector representatives, visit [horticulture.ahdb.org.uk](http://horticulture.ahdb.org.uk)**



## NEW PLANT PROTECTION PRODUCTS APPROVED FOR USE IN RECORD TIME

UK herb and sweetcorn growers will be able to protect their crops with new weed control products, identified in record time, following successful trials as part of SCEPTREplus, AHDB's crop protection programme.

To achieve this approval so quickly, the EAMU (Extension of Authorisation for Minor Use) team used intelligence from other EU countries, collaborating closely with manufacturers and growers, to gain approval of Centurion Max (clethodim) for herbs and Dual Gold (l S-metolachlor) for sweetcorn within the first year of the project.

Bolette Palle Neve, Crop Protection Scientist at AHDB said, "The SCEPTREplus weed control trials have identified several products that showed great potential. We're currently conducting residue trials for some of the products to be able to process applications for further EAMUs, which we hope will give growers further tools in their IPM programmes in the future."

Visit [horticulture.ahdb.org.uk/sceptreplus](http://horticulture.ahdb.org.uk/sceptreplus) to find out more

## RED TRACTOR FRESH PRODUCE STANDARDS TO BE RECOGNISED BY TESCO AND GLOBAL G.A.P.



Fresh produce growers may welcome news that from April 2018 Tesco will recognise Red Tractor's standards as equivalent to its Nurture scheme.

UK growers who export fruit and vegetables abroad using GLOBAL G.A.P scheme will also no longer require an additional audit on top of their Red Tractor assessment.

Jim Moseley, Red Tractor's Chief Executive, said, "Reducing duplication, driving down bureaucracy and lowering costs is something that we strive to deliver for farming businesses. This is a huge new benefit of Red Tractor membership for UK growers who no longer have to pay for and pass additional inspections to supply major customers at home and abroad."

**Red Tractor will be contacting its members directly with more details about how the changes will be brought into effect.**

## TREE FRUIT GROWERS INVITED TO HEAR LATEST INDUSTRY RESEARCH

Sustainable integrated pest management (IPM) strategies will be the central theme of the latest research being presented to tree fruit growers at a key industry event in February.

Growers and agronomists will hear the current findings on priority pests and diseases, from apple canker to spotted wing drosophila (SWD), at the AHDB Horticulture / EMR Association's annual Tree Fruit day. The event has been confirmed for 22 February 2018 in East Malling, Kent.

Scott Raffle, AHDB Knowledge Exchange Manager, said, "With increased resistance and reduced availability of plant protection controls, it is critical we are looking at long-term IPM strategies to ensure the UK tree fruit industry remains resilient. There will be a wealth of knowledge shared at the event from AHDB-funded research including: enhancing orchard ecology; monitoring for pear sucker and its natural enemies; and management and control strategies for SWD."

As well as management options for existing known pests and diseases, attendees at the event will also hear about a new pest of pears, pear blossom weevil, recently identified at NIAB EMR.

New insight will also be presented from researchers at NIAB EMR and FAST to help growers optimise harvest and increase productivity and yields.

To book your place, visit [horticulture.ahdb.org.uk/event](http://horticulture.ahdb.org.uk/event)



# INSIGHT INTO AHDB PROJECTS

## PROJECT UPDATE: USING BIOS FOR CONTROL

**AHDB Knowledge Exchange Manager Scott Raffle reveals how optimising and integrating biocontrol agents with conventional fungicides could help to control strawberry powdery mildew**

An increasing number of non-fungicide products are becoming available to strawberry growers and one experiment within this AHDB strawberry disease programme has been dedicated to optimising and integrating these with conventional fungicides in the control of strawberry powdery mildew.

Trials under polythene tunnels used biocontrol agents (BCA) and elicitors, with and without fungicides at 14-day intervals and compared their effects to a seven or 14-day interval standard fungicide programme and untreated plots.

All the treatments applied to the soils grown crop at NIAB EMR reduced incidence of powdery mildew on both leaves and flowers/fruit. The lowest incidence was found on the standard seven-day fungicide programme.

However, *Ampelomyces quisqualis* (AQ10 – currently approved on protected strawberry) and a biocontrol agent from Bayer CropScience (not currently approved as a plant protection product) when applied in a mixture with Silwet, were as effective as the standard seven-day fungicide programme.

When applied alone rather than in mixture with other products, these BCAs provided better control. There were differences in plant vigour between the treated plots, but only those plots receiving the seven-day fungicide programme were significantly better, despite the similar incidence of foliar mildew symptoms in plots receiving biocontrol products.



### AHDB project code:

**SF 157:** Improving integrated disease management in strawberry

**Term:** April 2015 to March 2020

**Project lead:** Xiangming Xu, NIAB EMR

**Project collaborators:** ADAS, University of Hertfordshire

**AHDB contact:** Scott Raffle

## FINAL REPORT: LESS MEANS MORE

**Could deficit irrigation techniques optimised for different soil types help to improve shelf-life in lettuce? AHDB Crop Protection Scientist, Kim Parker, explains more**

The focus of this project phase is to derive irrigation set points for Romaine and Iceberg lettuce in a peat and a silt soil. This involves identifying the soil matric potentials at which leaf growth and other physiological traits are first affected under a gradual soil drying regime.

In all trials, stomatal conductance was the first process to be hindered by the drying-down regime, followed by a reduction in photosynthesis, and then visible wilting. The researchers found that Iceberg lettuce was more sensitive to soil drying than Romaine, with stomatal conductance significantly reduced at around -30 kPa, compared to -80 kPa in Romaine.

Results were generally consistent within each lettuce type irrespective of soil type. Moisture release curves linking soil matric potential with volumetric moisture content (more frequently measured by growers) will be generated for a range of representative soil types. This will be key so that growers can use the project data to 'recalibrate' irrigation scheduling for their own soil types.

To date, very little post-harvest pinking has been detected in any treatment or variety. Harvesting techniques will be modified in the last experiment to allow a further check for the effects of deficit irrigation on discolouration.



### AHDB project codes:

**FV 454:** Improving quality and shelf-life of Romaine and Iceberg lettuce crops using precision and deficit irrigation techniques optimised for different soils

**Term:** April 2017 to March 2018

**Project lead:** Mark Else, NIAB EMR

**AHDB contact:** Kim Parker

# TOMORROW'S SCIENTISTS, TODAY

AHDB's Technical Writer, Luke Garner, visited the 2017 Crops PhD Conference to discover how the next generation of researchers are being cultivated by AHDB and its partners

While the AHDB Studentships Conference was held in Stratford-upon-Avon, in the heart of the country, the first thing that becomes immediately obvious about AHDB's studentships programme is that the research efforts are anything but localised. Spanning all corners of the country, encompassing many nationalities and traversing the whole gamut of horticulture sectors, the students, funded by AHDB, are tackling some of the big questions and problems that UK growers are facing on a day-to-day basis.

These ranged from Emily Forbes' (Harper Adams University) excellent work on utilising the patchy distribution of slugs to optimise targeting of control, to Nikolaos Koukiasas' (University of Reading) project on a leaf specific herbicide applicator for weed control in field vegetables. Emily

managed to track multiple slugs using RFID (Radio-Frequency IDentification) technology, which revealed that, over a period of seven weeks, each slug travelled a mean total linear distance of 246.5cm. Additionally it was revealed that the mean linear distance from release point after seven weeks was only 78.7cm overall. It is hoped that this work will eventually help growers understand why slugs stay in certain areas or patches of a field.

Nikolaos, meanwhile, has shown the efficacy of droplet application of both glyphosate and glufosinate-ammonium on cabbage and leeks. In both crops, applications of both of these control options reduced herbicide volumes by 86-98% and 29-74% respectively when compared to conventional application methods. These results have now been

confirmed in two growing seasons and are very encouraging with regards to ongoing development of an autonomous system for weed control.

But, while the conference was an opportunity to showcase the excellent work that the students are doing, the programme isn't just about the research; it is also about providing the next generation of scientists with the tools necessary to achieve success in horticulture and to ensure the ongoing legacy of the horticulture industry in the UK.

**With all of this in mind, Luke Garner spoke to three students currently undertaking PhD's with the aid of AHDB funding about their projects and their careers:**

## KATHRYN HALES University of Warwick

## Q&A

**Q: What issues does your work address for growers and the industry?**

"My project looks at the disease cavity spot. It's known that it is caused by an oomycete called *Pythium*, but how *Pythium* causes the disease is not well understood so growers find it difficult to predict when it might occur. We're trying to help build understanding of how *Pythium* acts as a pathogen and how we can control it."

**Q: How is this project different from previous research on cavity spot?**

"We're taking a slightly different tack as a lot of previous research has jumped right in with potential control measures but unfortunately, without a deeper understanding of what is happening in the soil there hasn't been much success. We're going back to the start to try and get that initial understanding."

**Q: Why should growers be excited about this project?**

"Cavity spot is a disease that causes sunken lesions on the carrot and renders them unmarketable. We've built a number of molecular tools to improve the detection of the pathogen, including improving our soil sampling and detection of *Pythium* in the soil. It's a big step forward as previous methods used very small amounts of soil, which isn't very reliable for *Pythium* as it is very patchy across a field. We use larger soil samples which will be more reliable and hopefully will eventually allow growers to move away from expensive soil extraction kits."

### AHDB project code:

**FV 391a:** Carrots: Understanding the ecology and epidemiology of *Pythium violae* to enable disease management





## LEONE OLIVIERI

NIAB EMR

# Q&A



**Q: What are the main aims of your project?**

“My project deals with a disease of apple trees called European apple canker, which is a very severe disease in the UK. It can stay latent (hidden) in the plant for up to three years, so we’re trying to understand where this infection is localised in the plant.”

**Q: How are you hoping to achieve your aims?**

“We are dealing with the detection of a fungus which can be latent. The detection tool we are working on at the moment is immuno-based, not molecular-based, so it doesn’t require any DNA extraction and so doesn’t require a microbiology lab, which is much easier than any other method. If we can practically use this, then it can be developed further, and it may be possible to develop a detection kit on an industrial level.”

**Q: Why could endophytes be significant for apple growers?**

“Endophytes are microorganisms that live within plant tissues which do not cause disease. We are trying to study the interactions between these endophytes and the pathogen (apple canker) because we want to see if these endophytes can account for some of the field resistance we see across different apple tree cultivars. If we find any interesting correlation we may be able to harness its biocontrol potential to develop innovative biocontrol approaches to the disease, which is currently relying on a few chemicals that are likely to be withdrawn from the market or banned in the future.”

**AHDB project code:**

**CP 161:** Understanding endophytes to improve tree health

## LUCA SCIMECA

University of Cambridge

# Q&A

**AHDB project code:**

**CP 172 :** Robotic touch, sense, and learning of delicate vegetables

**Q: What does your project focus on?**

“What we do in the lab is tackle a lot of manipulation problems, such as soft-sensing and manipulation in general. We’re looking to put machines out there that behave more intelligently than something purely mechanical.”

**Q: What benefits are you hoping to be able to offer to growers?**

“We’ve been looking at how things have been done in horticulture until now and a lot of the sector relies on human resources; for example harvesting is done by humans because you can’t just use any machine as a lot of the products are very delicate. Automisation could potentially save growers a lot of money. For instance, the lettuce growers we’re working with are spending about 70% of the funds they have on paying people to pick the lettuces as they don’t have a machine to do it for them.”

**Q: What would you like to do after your studentship?**

“Next steps for me will either be a post-doctorate or working in industry. If I had the opportunity to think up interesting experiments and apply them then I’d be more interested in industry than academia.”

**TO DISCOVER MORE ABOUT ANY STUDENTSHIPS PROJECTS OR THE STUDENTSHIPS SCHEME, VISIT [HORTICULTURE.AHDB.ORG.UK](http://HORTICULTURE.AHDB.ORG.UK)**





# CONTROLLING THE ELEMENTS

Key advice and feedback from a masterclass in nutrition for ornamental crops, addressing optimising growth and avoiding reactive treatments

All plants need the necessary nutrient building blocks for growth; there are the major elements such as nitrogen, phosphorus, sulphur, potassium, calcium and magnesium, as well as the trace plant nutrients manganese, iron, nickel, copper, zinc, boron and molybdenum.

All the elements listed (plus a few others, such as sodium, chlorine, silicon and selenium) are essential for plant growth, not only to create new leaves, shoots and flowers but to also enable vital biochemical processes within the plant such as photosynthesis and respiration. Having the right mix of nutrients delivered to the plant when required will result in optimal growth. However, a deficiency or toxicity of a particular element can cause a variety of symptoms.

Andrew Wilson, ICL, Technical Manager, said, "Understanding the mobility of nutrients within the plant is essential in terms of planning crop nutritional programmes and being able to rapidly react to any developing nutritional issues."

## WHY TAKE REGULAR SAMPLES?

"There are three key parameters which should be sampled to assist in the monitoring and adjustment of nutritional programmes, including growing media, plant leaf tissue and irrigation water," explained Neil Gray, Melcourt, Technical Sales Manager.

"It is good practice to take and analyse irrigation water samples at least a couple of times a year, once in the winter and again in the summer, to check bicarbonate levels and make sensible feed changes. You can always contact your local water supplier for the latest water analysis as a barometer (if using mains water), but taking samples from your own irrigation water source is far more accurate," added Neil.

Key advice when taking leaf samples is to select fully expanded mature leaves, avoiding the youngest or oldest leaves and to take as a minimum 20 leaves from across the crop.

## USING TECHNOLOGY TO MONITOR CROP HEALTH

Sending samples to the laboratory for analysis is a useful long-term strategy but what about the potential of real-time techniques? John Adlam, Dove Associates, and Ilse Decour, PCS, showcased the Green Index+ app for the iPhone, CCM-200 plus and atLEAF plus chlorophyll meters and the ProCheck, substrate EC meter, being assessed in the current AHDB project HNS 193 (Nutrient management in Hardy Nursery Stock).

The equipment showcased has proven to have moderate to good accuracy, but results generated need to be correlated against data from analyses and the equipment needs to be used consistently and regularly to build up a database of information from which relative nutritional levels can be extrapolated.

## WHAT NEXT?

"Interpretation of leaf tissue data, water and fertiliser solutions is relatively easy as the methods of analysis are similar worldwide" explained Neil Bragg, Substrate Associates. "However, beware that 'book' values for plant tissue may be for old varieties and it's known that different varieties may accumulate differing amounts of specific nutrients."

Interpretation of growing media analyses is always more difficult due to the wide range of methods used worldwide. If we assume the Pan European method of one volume of substrate to five volumes of water is used then we have sufficient knowledge to interpret the results. The important point is to stick to a method and to regularly have media analysed during the growing season.

“ It is good practice to take and analyse irrigation water samples at least a couple of times a year ”



# A DE-REGULATED FUTURE?

**In an industry heavily reliant on PGRs, one pioneering poinsettia grower has shown that life without these chemicals is possible. AHDB's Luke Garner uncovers the key talking points from AHDB's Poinsettia Discussion Group meeting**

For decades, poinsettia growers have relied almost exclusively on the use of plant growth regulators (PGRs), primarily chlormequat, to ensure plant height and habit meet buyer specifications. Worryingly though, across the industry, the trend is towards the use of PGRs being limited further and further by regulations, and there is concern that, potentially, one day there may even be an outright ban on the use of them altogether. While some believe this could signal the end of the poinsettia growing industry in the UK, one grower at Neame Lea Nurseries has done what some may have believed impossible – namely, grown a range of perfectly healthy, to-spec, marketable poinsettias without using any PGRs whatsoever.

“As a poinsettia grower if someone said to me ‘you can’t use PGRs’ I’d probably panic and say “no, I can’t do that”. But Vasile Agache (Senior Production Manager at Neame Lea Nurseries) has shown that, actually, you can,” remarked BPOA Poinsettia Group Chairperson Graeme Edwards.

In order to achieve this Vasile employed a technique called ‘water deficit irrigation’. This limits the levels of water provided to the plant, causing stress and thereby effectively controlling plant vigour.

Unsurprisingly then, AHDB project PO 021a, which in part deals with the use of water deficit irrigation in poinsettias, was high on the agenda during the event.

The project is testing how effective ‘Delta T multiple pot moisture sensors’ are at monitoring substrate moisture throughout the growing season in a poinsettia crop. The sensors were used to identify the wilting point of poinsettia at different growth stages and to assist in the management of the moisture content of the substrate. Using this information a water deficit was applied to the crop to see if it can be used to effectively control crop growth.

Commenting on the commercial project at Neame Lea, NIAB EMR’s Mark Else explained that, “Vasile went below 15% and 17% substrate moisture on two occasions, which is what really triggered the height and growth control.”

Graeme Edwards set out the long-term hopes for the project, saying, “The end goal is to have a fully-automated watering system that doesn’t require too much input and can be controlled by a computer much more precisely than could be done by hand.”

In the short-term however, potential PGR options for poinsettias and other crops were covered by Jill England and Chloe Whiteside, ADAS.

As part of project PO 019a, a number of PGRs are being evaluated for use on poinsettias, with four potential regulators trialled (Canopy, Regalis Plus, Cutaway, and Terpal plus the wetter Activator 90), as well as Stablan 750 as a reference treatment, and an untreated control. Not all of the products or dose rates used in this trial are currently approved in the UK and were applied under experimental permit. With pinching occurring at week 33 and a first spray application six weeks later, the most promising results came from Terpal plus Activator 90, although the dose rate was slightly high, resulting in small bracts. Regalis Plus caused bleaching but may be useful for application early in the production cycle. With the potential loss of the fungicide Systhane 20 EW (not currently approved in the UK, but hopefully a new approval should be granted in the near future), which growers use to control powdery mildew, Bumper 250 EC was also included in the trial. Although it didn’t cause any leaf or bract discolouration, minor crinkling of bracts was observed and the plants were stunted, but marketable.

**Visit [ahdb.org.uk](http://ahdb.org.uk) for more information on any of these projects.**

# A FERTIGATION COLLABORATION

AHDB Resource Management Scientist, Georgina Key, reports on the main outcomes from FERTINNOWA in Berlin

Across Europe, horticulture is suffering from increasing water scarcity, and the intensity of cultivation can pose a significant threat to water quality. Some areas of the UK are also starting to feel the sharp end of these issues. Innovative solutions and associated knowledge are already available but not implemented at the farm level. EU-wide project FERTINNOWA aims to bring the collective knowledge on fertigation (fertilising through irrigation systems) and available technologies together in one place so that growers can access it, for free.

The main aim of the project is to tackle technical knowledge gaps for all aspects of fertigation, from water quality and storage through to correct fertiliser use and cleaning and recycling of waste water. All currently available technology will then be reviewed and gathered together onto a website that is easily searchable. The project specifically wants to address the gap that still exists between growers knowing of solutions, and solutions actually being viable and implemented. (For ease, the range of solutions covered by this project will hereafter be referred to as 'technologies' but do include low-tech solutions as well.)

This is a complex project as different geographical areas in the EU face different issues and have different needs, however these differences also mean other countries may have come up with solutions that we haven't thought of yet. There are also many common issues faced by growers across Europe regarding fertigation, for example, algae problems in stored water are universal. Some countries already face major problems; Spain has poor quality aquifers and Dutch growers have to be 90% waste water free by 2023, and any waste water has to be free of fertilisers from January 2018 onwards.

UK growers can benefit from the knowledge that is being generated by these pressures in other countries before they become a bigger issue for growers in the UK. Projects such as FERTINNOWA are important for growers, as they help AHDB build relationships with centres of agricultural knowledge and excellence across Europe, helping us to gather knowledge and expertise that we can use in the UK. In the case of this project, the aim is to improve sustainable water and fertiliser use, promote best practice for fertigation, and reduce waste. AHDB is a contractor for this project, rather than funding it.

"The biggest strength of this project is that it involves growers from the very start to identify why more efficient practices aren't being used. From there on we use the collective knowledge and experience of a wide range of people, in different countries, to improve water and fertiliser use across the EU," explained Els Berckmoes, Water Researcher, Proefstation voor de Groenteteelt, Belgium.

## WHO AND WHAT IS INVOLVED?

The project has brought together 23 research institutions, technology companies and agricultural organisations, covering 10 different countries. To identify the fertigation issues that growers face, 371 growers were interviewed, covering 531 different cropping systems across Europe. These growers were also asked for any innovative technology they know of for solving these issues. The FERTINNOWA team have also consulted grower groups, advisors, suppliers, consumer organisations, NGOs, regional authorities, governments and technological innovation companies, such as Priva, to get a wide range of expert input.

**From this first phase of the work, several grower needs were identified:**

1. Increase quality of irrigation water
2. Improve water and nutrient use efficiency in soil-grown crops (e.g. reliable water monitoring tools)
3. Improve water and nutrient use efficiency in media-grown crops (e.g. drainage monitoring)
4. Minimising impact by reduction of emissions (e.g. recovery of nutrients from discharge water)

After the interviews, different technologies were reviewed for their effectiveness, how accessible they are to growers, and what barriers there are which may prevent growers implementing the technology. There are obvious factors such as initial costs, but FERTINNOWA has also considered other factors such as regulation at the regional, national and European level, and social factors (e.g. lack of awareness of a technology). Technological solutions from other sectors that could have applications in horticulture, e.g. mining, were also explored, as well as the feasibility of actually implementing these technologies.



A Grower examines tomatoes at FERTINNOWA



## OUTPUTS

More than 134 technological solutions have been reviewed so far. These are currently being written up into single-page guidance sheets which have practical information on how to implement the technology. These are available to growers from the technology database, for free. It is important to highlight here that these technologies don't just include high-tech solutions, but also low-tech solutions as these are often the most used by growers. It is often the simple solutions that have the most impact (see 'Did you know' box).

Throughout the project the FERTINNOWA team have asked for feedback from growers. This feedback, along with the findings from the interviews, have shown that the best way to help growers implement fertigation best practice is to learn from other growers, to visit demonstration sites for best practice and to have direct face-to-face access to fertigation specialists. In response to this, collective consultations (where groups of growers and other stakeholders are brought together to discuss the technologies and feedback their experiences using it) have been organised, along with events which showcase different technologies or give more general information. Events are currently being planned for UK growers.

As previously mentioned, there is a FERTINNOWA website (see 'Did you know' box). It is interactive, allowing growers to score the reviews of technology to say whether it was helpful, or whether the website is easy to navigate. For the keener among you, all of the information on available technologies is currently being collated into a 'fertigation bible' which can be downloaded from the website. A final FERTINNOWA conference will be held in Almeria, Spain in October 2018, however the website and its resources will remain available after the project has ended.

## DID YOU KNOW?

In tomatoes, one leaking dripper in an irrigation system can lose almost 500L/year which can get into groundwater. Fixing small problems can result in big water and efficiency savings.

At showcase events, FERTINNOWA will demonstrate what modifications are required for technology to adapt it for individual grower needs.

Check out <http://www.fertinnowa.com/technology-database/> for further information on available technology, factsheets, newsletters and upcoming events.

You can also subscribe to the website and find us on **Twitter @fertinnowa**



# EAMU LATEST

Bolette Palle Neve,  
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## OLD PRODUCTS, NEW TRICKS

This year has seen the first year of our new programme of work called SCEPTREplus. The aim is to find new solutions for crop protection across all our sectors and, as more and more active ingredients come under threat, this work is as vital as ever. Many active ingredients are currently going through the renewal programme in Europe and 50 of these have an expiry date between January and June 2018. Many of these will get extended but there are never any guarantees. This is creating a lot of angst and as we have seen with glyphosate, the process can sometimes throw up some surprises.

In the EAMU programme we meet with most of the manufacturers of plant protection products through the winter months. In these meetings we highlight

the main gaps in the crop protection armoury, discuss the future of current products and discuss potential new solutions for growers. Unfortunately, there are not many new solutions coming forward and we therefore need to have a very good look at products that may be available in other crop sectors. SCEPTREplus does just that. We have conducted a number of different trials this year from weed control in carrots to thrips control in ornamentals and the project has provided us with some very useful information. As a result, we have already secured two EAMU approvals – herbicides for sweetcorn (Dual Gold) and herbs (Centurion Max). Several other applications are being progressed, including herbicides for sweetcorn and carrots, and I am sure we will get a few more submitted in the next month or so.

## EAMUS IN FOCUS

### Mainman (flonicamid)

“Controlling aphids is essential for us to maintain a consistent supply of high quality fresh herbs to our customers. So, having lost Pirimicarb as a quick knockdown and with the current pressure on neonicotinoids it is important that herb growers have the choice of actives to implement a proper integrated crop protection plan,” explained Robert Gibbs, Herb Farms Manager at Langmead Farms.

“Currently we only have access to one systemic aphicide so the risk associated with overdependence and resulting resistance on that product is very high. Mainman’s mode of action suppresses stylet penetration very quickly, giving long term protection for many crops.”

### Centurion Max (clethodim)

A new EAMU has been issued for the herbicide Centurion Max (clethodim). The EAMU covers use in a variety of crops including blackberry, blackcurrant and redcurrant, blueberry, cranberry, gooseberry, raspberry and strawberry.

Centurion Max has a broad spectrum of grass weed control through contact action. It has particular advantages over other selective grass herbicides in that it controls annual meadow grass and ACCase resistant blackgrass. These are common weeds in strawberries and bush and cane fruit crops and were identified as a priority in the gap analysis conducted by AHDB.

To discover all of the latest EAMUs visit [horticulture.ahdb.org.uk/eamu-news](http://horticulture.ahdb.org.uk/eamu-news)



# COLLABORATING WITH CRD

**As SCEPTREplus, AHDB's £1.4m crop protection research programme, comes to the end of its first year, AHDB Crop protection Senior Scientist Joe Martin reflects on how a close collaboration with CRD is benefitting growers**

Continued access to crop protection products is one of the main priorities for growers, and the SCEPTREplus programme is designed to deliver new on-label and Extension of Minor Use (EAMU) approvals for the industry. As we come to the end of the first year of the four-year programme, early results from the trials have already enabled six EAMUs to be progressed, applications submitted to the Chemicals Regulation Division (CRD) and two new EAMUs available for herb and sweetcorn growers in record time.

Behind the scenes, the relationships that AHDB has with both crop protection manufacturers and regulators is critical to the success of SCEPTREplus. It enables us to access pre-registered or coded products, discuss approvals and ensures a smooth process on applications to gain use of products in horticultural crops in a timely manner.

## SELECTING THE RIGHT PRODUCTS TO TEST

Product choice is an important process to ensure that products tested are able to gain approval in the long term and fulfil legal regulatory requirements. Having CRD included in SCEPTREplus has aided with protocol development in year one, answering questions on current approval status of products, such as those that are physically acting.

## SPEEDING UP ACCESS

The regulatory timelines and data requirements for EAMUs vary depending on the type of application, but typically include: case for need; resistance warnings/advice; consumer exposure (residues); human exposure; environment.

Where residue data is required and not already generated elsewhere in the EU and/or globally, this can take up to two years to generate depending on the

crop. Viv Powell, Bolette Palle-Neve and Spencer Collins from the AHDB Minor Use programme work on securing data from different areas of the world and manufacturers to help reduce the overall cost of applications.

Once all data requirements have been fulfilled and an application has been made the timelines for an EAMU are up to 52 weeks, although where possible CRD try to prioritise the applications to meet the season of use. This process can be longer if Maximum Residue Level (MRL) setting is required at European level.

For EAMUs, no efficacy or crop selectivity data is required and therefore SCEPTREplus is essential to gain knowledge on a product's activity in a number of different horticultural crops to determine if it will be useful for growers. It also determines if AHDB should pursue further regulatory approval through the EAMU process, which can at times be costly in terms of time and expense.

## UNDERSTANDING GROWER NEEDS

Key personnel at CRD have visited SCEPTREplus trial sites, met with growers associations and spoken to growers at our industry open days. In addition to enabling us to understand CRD's requirements and processes, Chris Rundle, Head of Team-Efficacy at CRD, speaking at a SCEPTREplus event in October said, "By supporting the project it is also helping to raise CRD's awareness of the industry and ultimately should aid SCEPTREplus in developing solutions."

Through the continued relationship AHDB has with CRD both organisations will improve links and understanding of the regulatory and agronomic issues. As we go into year two of SCEPTREplus this will continue to be an important step in the process of finding crop protection solutions for growers.



## SCEPTREPLUS

Visit [horticulture.ahdb.org.uk/sceptreplus](http://horticulture.ahdb.org.uk/sceptreplus) for more information



# MAKE PRACTICE PERFECT

In the third instalment of our four-part series about biopesticides, AHDB's Crop Protection Senior Scientist Joe Martin and Knowledge Exchange Manager Gracie Emeny provide some best practice tips

Effective pest and disease control is a priority for growers. Although we are facing a reduction in the availability of conventional pesticides, we are also seeing more opportunities to incorporate new crop protection technologies into existing practices. The last few years have seen an increasing number of biopesticide products on the market, a trend which is set to continue. Following numerous conversations with growers, it is clear that the majority share the desire to use biopesticides, and understand that when applied accurately in specific conditions, biopesticides have the potential to work well. In practice however, inconsistent results have been reported when they are applied commercially. The reasons for these inconsistencies are not yet known and they are likely to be complex; the wide range of cropping systems on which these products are applied only adds to the challenge.

During the two years that the AMBER project has been running, there have been a number of key areas explored by the project team aiming to improve the efficacy and understanding of biopesticides for horticultural businesses. From the benchmarking trials carried out on commercial sites in year one, it became apparent that the topic of application practice was one of the areas of importance where there were information gaps, and that further work and knowledge exchange within industry was required.

Year two work on application, led by Silsoe Spray Applications Unit in conjunction with Warwick Crop Centre and RSK-ADAS, has been able to identify some potential pitfalls and messages for industry. Since application needs to take account of the crop, pest or disease, the biopesticide being applied, as well as the grower's particular circumstances, the AMBER team have been undertaking some case studies to identify potential improvements specific to a grower, but also generic messages that can apply in a wider range of situations. One of the biggest benefits is likely to be achieved if volumes of spray liquid can be reduced, and so this has been a major focus of the case studies so far.

The outcomes of this were discussed in more detail at a workshop for growers of protected edible crops in October. In order to maximise the efficacy of biopesticides through application, the workshop highlighted the importance of the following areas:

## CLEANING

Thorough tank pre-cleaning is essential to ensure the integrity of the product is maintained and optimal control achieved.

Although it is normally assumed that washing your tank and lines three times will remove residues of conventional products before using biopesticides, it was demonstrated by using soluble dyes that even washing six times still left identifiable residues. This could affect the viability of the biopesticide and ultimately reduce its efficacy.

If possible, consider investing in a separate tank for biopesticides and conventionals.

Nozzles and filters should also be checked and cleaned prior to application, and on a regular basis.

## MIXING

To ensure a full dose of biopesticide is applied at the nozzle, ensure you thoroughly mix/pre-mix the formulation before application to release active ingredient. Sustained agitation of the formulation during application is also essential with most products to maintain equal dispersal of the active ingredient.

## STORAGE

Some biopesticides are based on living micro-organisms and therefore require the appropriate storage conditions to maintain the optimum viability of the product; it shouldn't be assumed that they can be stored in the same way as conventionals. Make sure that you read all product information in advance to establish the required conditions.

“ Even washing tanks six times still left identifiable residues which could affect the viability of the biopesticide ”



### CALIBRATION

Accurate calibration of spray equipment on a regular basis is crucial to optimise the dose applied to the crop and ensuring that legal requirements for use of the products are met. It will also enable the spray operator to identify when equipment is worn or damaged and needs replacing to maintain performance.

### LABEL GUIDANCE

Many growers report difficulties with label guidance and the limited technical information that is present on the product label. It is important to speak directly with the relevant manufacturer to gain additional technical information that they may hold to assist in optimising application techniques.

### APPLICATION

It is critical that growers and spray operators get the basics right when applying biopesticides:

- Invest in appropriate equipment and ensure that it is maintained well. If possible, dedicated equipment for biopesticides should be used
- Understand the pest life cycle. Control may vary depending on the susceptibility of the development stage of the target. The AMBER project is specifically looking at this in more detail during the next stage of the work

- Take into account crop structure. Vine crops and bedding plants are going to require different approaches to application
- Understand where the spray needs to reach and use equipment that can best achieve this
- Optimise the applied volume (which in many cases will mean a reduction) to maximise the total quantity of active substance in the right place on the crop and improve its distribution
- Be aware of your forward speed – this has to be part of your calibration. Increasing your forward speed is a more effective way to reduce volume than reducing pressure, but might not be possible without some automation. If you compare 0.4m/sec (a typical walking speed for manually operated spray booms) with 1m/sec – the lower volume applied at the higher speed resulted in less active ingredient on the floor
- One size doesn't fit all; adapt the application to fit your growing system

Not only was the workshop a great opportunity for attendees to learn more about application best practice, there was plenty of opportunity for discussion between growers and manufacturers. Biopesticide manufacturers are aware of the importance of application accuracy,

and are becoming increasingly aware of the need to liaise with industry through work such as the AMBER project, to ensure the maximum potential of biopesticides is achieved on commercial sites.

### WHAT'S NEXT?

Following the success of the October event, there are plans to develop a further application workshop focusing on ornamental crops which is likely to be held in summer 2018. Growers, spray operators and biopesticide manufacturers are all encouraged to stay up-to-date with the project, and feed in their experiences and questions to the project team via the AMBER website and at future events.

**AHDB project code:**  
CP 158

**Project leader:**  
Dave Chandler,  
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**AMBER is a five-year project designed to help growers improve the performance of biopesticides. Find out more by visiting [bit.ly/AMBERproject](http://bit.ly/AMBERproject)**





# DISRUPTIVE IDEAS

**Michelle Fountain, NIAB EMR, explores the use of the RAK®3+4 mating disruption system to control codling and tortrix moths**

While rom-com film makers have relied on the clichéd ‘boy meets girl’ formula to delight and enchant audiences for decades, UK fruit growers are understandably much less amused when the romantic pairing happens to be between a male and female of the tortrix or codling moth variety. That’s why studies attempting to disrupt the amorous signals given off by female moths to attract males are giving new hope to the tree fruit industry that a long-term solution to these pests can be implemented in the UK.

## SPRAY IT AGAIN

While growers of apples and pears currently have effective spray programmes to combat the potentially harmful codling and tortrix moths, an alternative, novel method to stop the emergence and proliferation of these pests would be welcomed.

To demonstrate the efficacy of one such alternative control method, Michelle Fountain and her team at NIAB EMR, in collaboration with ADAS and BASF, have been using the RAK®3+4 mating disruption system to try to control both codling and tortrix moths. The five-year project, named ‘Improving integrated pest and disease management in Tree Fruit’, looks to exploit the reproductive behaviour of the pests – namely how female moths produce sex pheromones so that they can be located by the male moths.

By releasing high concentrations of sex pheromone into orchards, uniformly across a landscape, it is possible to inhibit the male moths from finding the females and thus prevent mating and the emergence of the immature stages of the pest which cause damage to the fruit crop.

As traditional spray programmes do not reduce moth populations in subsequent years, could potentially lead to resistance and have adverse effects on natural enemies, the project also hoped to ascertain whether a beneficial side effect of the mating disruption system would be to enhance the incidence of natural enemies within the orchards, helping to control other key pests as well.

## IT’S ALL ABOUT VARIETY

Trials were conducted on a handful of farms over two to three years. Large areas (over six hectares) were treated with the mating disruption (MD) devices. All orchards within a block or landscape need to be treated to ensure good coverage. The MD blocks were compared to areas on the same farms that received a standard grower spray programme and a small area on each farm that was left untreated.

At those farms treated and monitored in the study, only small numbers of moths were captured in the growers’ commercial pheromone monitoring traps, indicating that the majority of male moths could not

locate the traps and were being disrupted. However, there was not complete distraction and hence some mating may have occurred. It is important to note that on the odd occasion, when an orchard exceeded the threshold of four codling moths per trap, a spray of Coragen was applied to give extra protection to the fruit.

RAK®3+4 gave comparable control of codling moth and tortrix moths to the growers’ standard spray programme in late ripening varieties (e.g. Gala and Braeburn). At harvest the damage to fruit caused by codling moth was fairly similar on the growers’ standard spray programme (0.1-0.4%) and the MD (0.06-0.6%) side of the farm. However, for early ripening or softer skinned varieties (e.g. Early Windsor and Bramley) an additional application of Coragen was needed for the second generation of codling moth to reduce damage.

## WIGGLY WORRIES

At one site, in three orchards on the same block, there was some concern over tortrix caterpillars in the young shoots in some orchards. These caterpillars were reared through and found to be summer fruit tortrix (SFT), however over 50% of the caterpillars were parasitised by wasps and, later in the season, parasitic flies. Two sprays of Capex, 10 days apart, killed most remaining caterpillars in the affected orchards. Despite this, affected orchards had more damage at harvest.



At a second site there was an unexpected incursion of Blastobasis moth. This is a sporadic pest which has not caused much damage to apple in England for some years. It is not controlled by RAK<sup>®</sup>3+4 and hence good crop scouting and pest monitoring is needed in conjunction with RAK<sup>®</sup>3+4 to ensure that sporadic non-target pests such as this are detected, identified and treated. Currently there is no pheromone monitoring trap for Blastobasis but it is the focus of another objective within the project.

While there was no noticeable increase in natural enemy numbers between the first and third year of RAK<sup>®</sup>3+4 deployment, natural enemies, like earwigs, generally have longer generation times than most pests and it may take longer than two to three years for numbers to increase in orchards.

**ONE AND DONE**

One of the most appealing benefits of RAK<sup>®</sup>3+4 to growers is the fact that, unlike the use of traditional crop protection products which require multiple spray applications throughout the summer, RAK<sup>®</sup>3+4 pheromone devices only need to be applied once at the beginning of the season (in April) each year in order to be effective. This helps to reduce the cost and time spent on control, especially during years of high pest pressure.

Furthermore, not only is mating disruption currently used successfully in many other countries in Europe, as the climate warms, giving rise to more generations of moth within a season and the traditional products continue to decline in availability, mating disruption is likely to become more important as a tool in the fruit grower's arsenal.

“ RAK<sup>®</sup>3+4 gave comparable control to the growers' standard spray programme in late ripening varieties ”

**MONEY MATTERS**

What are the cost implications of a switch from conventional pesticide-based control methods to a RAK<sup>®</sup>3+4 system? The following table provides a cost comparison of using the RAK<sup>®</sup>3+4 versus conventional products. It assumes a low codling and tortrix pressure and no additional products are needed for control:

Table 1. The RAK<sup>®</sup>3+4 versus conventional products cost comparison

	RAK <sup>®</sup> 3+4	Conventional programme
<b>Product cost/ha</b>	£240 - 300	Coragen £71-85/spray x 2 = £142-170 Runner £44-75/spray
<b>Labour cost/ha</b> (£10/hour)	2 hours = £20	1 hour per spray 3 sprays = £30
<b>Total cost/ha</b>	£260 – 320	£216 – 275 <b>NB: fuel, servicing and calibration of equipment not included</b>



**AHDB project code:**  
TF 223  
**Project leader:**  
Michelle Fountain, NIAB EMR  
**AHDB contact:** Scott Raffle

# BEST THE PESTS

**Pest expert Rosemary Collier, Warwick Crop Centre, helps you to stay ahead of crop pests this year with a guide to the main troublemakers**

If you haven't already done so, now is the time to start thinking about pest activity for 2018. We're reasonably good at predicting when certain pests will appear, but it is virtually impossible to predict nationally which species will cause major problems each year. The weather is key; it influences survival, reproduction and activity of all pests, and the abundance and performance of their natural enemies. In addition, most pest insects are able to disperse over relatively large distances so it's impossible to predict the size and location of a new 'invasion.' In contrast, for a few pests such as slugs and carrot fly, on a local scale, previous crop management can influence the size of the infestation.

The aim of the AHDB pest monitoring and forecasting services is to highlight periods when particular pests are likely to be active and abundant. Local conditions will still, to a great extent, determine the actual risk of pest damage and this is where regular crop monitoring comes in. So let's examine the main pests you're likely to encounter:

## APHIDS

Some species, such as peach-potato aphid (*Myzus persicae*), infest a wide range of crops whereas others, such as willow-carrot aphid (*Cavariella aegopodii*), are more specialised. While aphids can cause problems as contaminants and, if very abundant, can affect plant growth, their ability to transmit plant viruses is equally important. There have been particular problems with plant viruses in both carrot and lettuce crops in recent years. New crops are infested by winged aphids and most species are captured in the network of 16 suction traps run by the Rothamsted Insect Survey and SASA in Scotland. This information is available through AHDB Aphid News and the AHDB Pest Bulletin. In addition, for those species that overwinter as 'live' aphids – such as peach-potato aphid, potato aphid (*Macrosiphum euphorbiae*) and cabbage aphid (*Brevicoryne brassicae*) – in early March each year, the Rothamsted Insect Survey produces

a prediction of how early and abundant winged aphids are likely to be, based on weather conditions during the winter. For the aphids that overwinter mainly as eggs – currant-lettuce aphid (*Nasonovia ribisnigri*), lettuce root aphid (*Pemphigus bursarius*), willow-carrot aphid and black bean aphid (*Aphis fabae*) – the AHDB Pest Bulletin provides day-degree forecasts indicating when each species is likely to start moving into susceptible crops. This information should be used to focus crop walking activity, so that treatment decisions are made at the right time according to local conditions.

## CATERPILLARS

In general, caterpillars tend to be more sporadic pests than aphids. Most species overwinter in the UK. Monitoring information for most key species is available on a limited basis through the AHDB Pest Bulletin, mainly based on information collected at Wellesbourne. For cutworms (*Agrotis segetum*), forecasts are available through the AHDB Pest Bulletin to indicate the risk of damaging infestations developing, based mainly on rainfall. As treatments (one of the most effective being irrigation) need to be applied when the caterpillars are very small and hard to find, the forecasts give guidance on what might or might not be a risk period. Through AHDB project FV 440 there has been a recent focus on the two species of moth that do not overwinter widely in the UK – diamondback moth (*Plutella xylostella*) and silver Y moth (*Autographa gamma*). The main sources of moths of both species are influxes from the continent during the late spring and summer. The project led to development of a new Pest Bulletin web page in 2017, summarising sightings of both species in several of the European countries which are potential sources of the moths. The aim is to provide an early warning of their appearance in high numbers in the UK. For diamondback moth this needs to be tied in with information about the resistance status of immigrant moths. Those tested by Rothamsted Research in 2016 and 2017 were all resistant to pyrethroids.

## FLIES

The larvae of root-feeding flies such as cabbage root fly, carrot fly and bean seed fly are a problem that needs to be considered for all susceptible crops. The cabbage root fly forecast, available from the AHDB Pest Bulletin, indicates periods when egg-laying by female flies is likely to be relatively high. Control of second generation carrot fly, and sometimes the first generation, requires well-timed treatment. The carrot fly forecast indicates when spray programmes should start and end and is becoming increasingly important in terms of identifying the risk from third generation carrot fly as a result of climate change. As yet, only monitoring information from Wellesbourne is available for bean seed fly but there may be a possibility of developing a bean seed fly forecast, depending on what type of information growers need. A forecast for large narcissus fly is available from the AHDB Pest Bulletin.

## BETTER

The AHDB Pest Bulletin provides monitoring data from Wellesbourne for several species of beetle and the pollen beetle forecast, which predicts when newly-emerged adult beetles move from oilseed rape to other hosts to feed in mid-summer, sometimes including cauliflower and broccoli as their food sources.


## OTHER SOURCES OF INFORMATION

**AHDB Aphid News** and the **AHDB Pest Bulletin** is complemented by the **AHDB Pest Blog** and by **Syngenta's Brassica Alert**, (focussed on fungal pathogens of brassicas in south Lincolnshire).

**The Brassica Alert** also includes information on diamondback moth, silver Y moth and onion thrips, based on trap captures.

Find out more at [horticulture.ahdb.org.uk/ahdb-pest-bulletin](http://horticulture.ahdb.org.uk/ahdb-pest-bulletin)





“ Local conditions will still, to a great extent, determine the actual risk of pest damage and this is where regular crop monitoring comes in ”



# SHARING SECRETS FOR SECTOR SAVINGS

**GrowSave's Energy Projects Engineer, Ed Hardy, examines how the soft fruit industry can learn from other sectors' solutions to tackle energy consumption issues and ultimately save money**

It comes as no surprise to many soft fruit growers that, driven mainly by the market's demand for consistent, high-quality produce over an extended season, efficient management of energy and glasshouse climate has become a bigger part of their business and technical planning. It therefore follows that work to support greater energy efficiency efforts for soft fruit would be beneficial.

So it was with this in mind that the Soft Fruit Panel commissioned a new GrowSave study designed to identify opportunities to apply existing knowledge from the Protected Edibles and Ornamentals sectors to help reduce energy consumption and deliver improved climate management within the soft fruit industry. This work encompassed discussions with industry key players, investigation of some climate control data and a study tour to leading European production and research facilities.

The study tour revealed a gap between current practice in the UK and standard practice in Belgium and the Netherlands. Fortunately, some of this gap can be bridged by employing the knowledge from growing protected edibles and protected ornamentals crops in the UK.

To further push the boundaries of what might be possible for soft fruit growers in the UK, the tour also gave good insight to how technology can be used to improve growing conditions and crop quality in a state of the art environment. The facilities visited included the research station at Hoogstraten in Belgium, leading soft fruit producers using glasshouses and techniques developed in tomato production, and a semi-closed greenhouse structure employed by Red Star. The widespread use of advanced climate control, LED lighting and water recycling in these countries has resulted in growers making considerable savings, both financial and in terms of energy used. Investigations are also taking place as to the performance of diffuse glass and air movement technology. Trials at Hoogstraten have seen the use of LEDs in combination with HPS lamps result in a 3% increase in production with a 5% decrease in energy consumption for the same light output. The use of a heat recovery unit, meanwhile, has resulted in a 20% energy saving over conventional methods of humidity control.

## HIGHER DEMANDS

To cater for an extended production season many growers have decided to invest in heating systems and climate controls. A structural overview of the sector suggests that around 9,400 hectares of land is used for UK soft fruit production, with 8,000 hectares in polytunnels and 225 hectares under glass.

As energy consumption increases, so does the potential energy (and financial) saving. The best available energy consumption data for glasshouse strawberry production comes from the small number of glasshouse soft fruit production facilities that are in the Climate Change Levy (CCL) discount scheme. This data shows that the mean consumption of glasshouse soft fruit production is around 125kWh/m<sup>2</sup>; applying this to 225ha of glasshouse production, the energy consumption of the sector is estimated at around 281GWh per annum. At an energy cost of 2p/kWh, this is a cost to the industry of £5.6 million.

With this in mind, it is possible to apply energy saving measures to the sector. Practitioners claim that Next Generation Growing (NGG) techniques could save 35% of the energy used in glasshouse production. This would represent an annual saving of nearly £2 million at today's energy prices, although there would need to be significant capital investment for some sites to achieve these levels. For example, soft fruit nurseries may need to invest in fans, screens, additional measuring boxes and upgrades to climate computer systems in order to achieve similar levels of technology already seen in ornamentals nurseries. Savings could be made through better humidity control; lower growing temperatures for soft fruit than for, say, tomatoes mean it is important to ensure the water balance of the plant and glasshouse is maintained. By using fans and screens effectively, the amount of minimum pipe heat can potentially be reduced.

GrowSave believes that a 10% saving to the industry, worth around £560k per annum, is a more realistic aim which could be achieved through application of existing knowledge, benchmarking and practical implementation of low cost techniques.

Under NGG practice, a natural start is to establish current practice and gain understanding of where others are benefitting from implementation of the

techniques, achieved through simple, anonymised data sharing. Once this has been established, focus groups could be established, allowing growers to share climate data with each other and learn from each other. This work would then highlight areas where GrowSave can focus resources, workshops and events.

## WHAT IS NGG?

Next Generation Growing is a set of techniques, which focus on keeping the plant in balance in terms of assimilates, energy and water. Pioneered in the Netherlands, Dutch growers have reported significant energy savings as a result, while crop quality is maintained or even improved. The techniques include ensuring more even temperature and humidity distribution within the glasshouse, and operating screens and vents around what the plant requires at that time, rather than pre-determined set-points.


## HOW CAN I REDUCE ENERGY COSTS?

To reduce energy use and cut costs, growers should consider the following technical solutions:

- Careful monitoring of glasshouse climate conditions through the effective use of a climate control computer
- Ensure set-points are appropriate, well defined and can be achieved effectively
- Efficient use of CO<sub>2</sub> and understanding the cost differences between pure CO<sub>2</sub> and on-site production from a natural gas boiler or combined heat and power system
- The use of fans for air distribution and humidity control in advance of heating and venting
- Using screens for longer to reduce radiative heat loss and minimise energy consumption
- Utilising water recycling systems to minimise loss of irrigation water and fertiliser
- Efficient use of HPS and LED lighting for extended seasonal growth
- Photoperiodic lighting control

For more tips on how to reduce your energy consumption visit the GrowSave website at [www.growsave.co.uk](http://www.growsave.co.uk)



A group of people wearing white protective suits are walking through a large glasshouse. The glasshouse is filled with vertical farming racks that are densely packed with green plants and small, round fruits. The structure is supported by a metal frame, and the lighting is warm and focused on the plants. The people are looking at the plants and talking to each other.

“ Practitioners claim that NGG techniques could save 35% of the energy used in glasshouse production ”





Soil variability is one of the main factors determining differences in crop growth within and between fields. Variations in soil texture, moisture holding capacity, organic matter content, nutrient availability, drainage, compaction and soil depth are often reflected in crop growth differences. Consistency of crop size and quality are key issues for growers. As such, increasing numbers of growers are looking to map their soil variability as the first step towards trying to understand and manage crop growth and yield.

There are two main approaches to precision soil sampling – grid and zone sampling. Both sampling methods are valid options and both have advantages and disadvantages.

### **GRID VERSUS ZONE SAMPLING – WHAT'S THE DIFFERENCE?**

Grid sampling uses a regular sampling strategy to collect a number of samples per ha. The location of each sampling point is GPS logged and this information is used to create a contoured map of soil pH and nutrients using a method of data analysis to estimate values between the measured points.

# ARE YOU IN THE ZONE?

Earlier last year one field in Bedfordshire was intensively sampled and mapped as part of AHDB's GREATsoils programme and an in-depth case study will be published this summer. Here Lizzie Sagoo and Paul Newell-Price, ADAS, provide a brief overview of the techniques used and the options available to growers



“ Grid or zone soil sampling is of most value in variable fields ”

Zone sampling uses existing knowledge of within field soil variability to direct where samples are taken. Soil zones can be based on measured soil and/or crop variability for example using soil EC maps, soil brightness maps, yield maps or any other source of information on within field variability. Once the zones are defined each is sampled separately. The soil pH and nutrient maps produced will reflect the boundaries between the soil zones.

Zone sampling focuses on managing areas by soil type. It uses patterns and boundaries evident from looking at soil surveys or yield maps to form the basis of management zones. However, grid sampling may identify 'hot spots' of soil fertility or pH (often related to field management history) that cannot be detected using zone sampling.



**ECONOMIC BENEFITS**

Whichever soil sampling approach is used, the number of soil samples taken will have an important effect on the level of detail in the soil pH or nutrient maps produced. The limiting factor is normally cost – the more samples that are taken the more accurate the soil map is likely to be, however the cost of additional samples may not always be justified. The most common commercially used sampling intensity is one sample per hectare. Increasing the sampling intensity from one to two samples per hectare will typically increase the cost by a minimum of £6/ha to reflect the additional laboratory analysis (but this excludes any additional labour cost).

Grid or zone sampling is of most value in variable fields where it identifies lower soil index areas which would otherwise have been under fertilised or under limed. For field vegetables the target soil indices are pH 6.5, P Index 3, K Index 2+ and Mg Index 2. Where soil pH or nutrient levels vary above these target levels, this variation should not be expected to affect crop yields, however variable rate fertiliser application may still offer cost savings through not over applying nutrients to higher index areas.

**SOIL MAPPING CASE STUDY**

Soil samples were collected for a case study at Avenue field, F.B. Parrish & Son, in Bedfordshire. In Avenue field topsoil samples were collected in a number of ways, full details of the techniques and analysis will be published in the case study this summer. Presented here are the results of three different sampling strategies:

- Traditional single ‘whole field’ composite sample
- Grid sampling – one composite sample per ha (Fig 1)
- Grid sampling – two composite samples per ha (Fig 2)

For the traditional single ‘whole field’ composite sample 25 subsamples were collected walking a ‘W’ across the field. For grid sampling either one or two composite samples were collected per ha. Each composite sample consisted of 16 subsamples taken in a spiral within a 3m radius of a central point.

Analysis of these samples was used to ‘map’ soil pH and nutrient variability in Avenue field (Fig 1 and 2). The single ‘whole field’ sample provided a good measure of the mean field value for pH and P Index. The more intensive grid soil sampling revealed within-field variation in soil pH and soil P Index (Table 2).

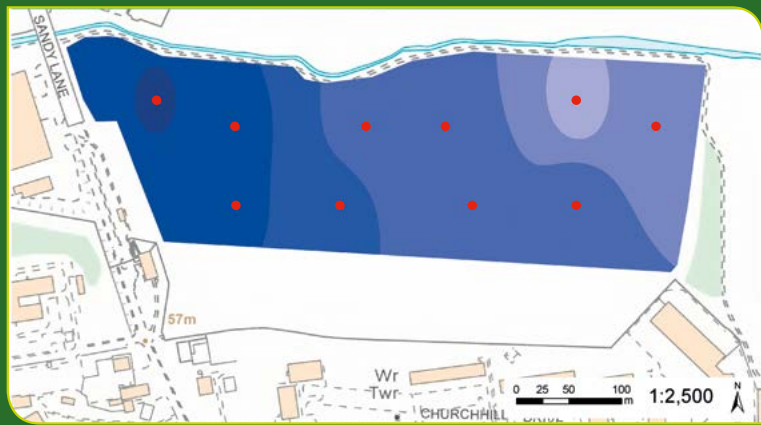


Fig 1. Grid sampling, 1 sample/ha

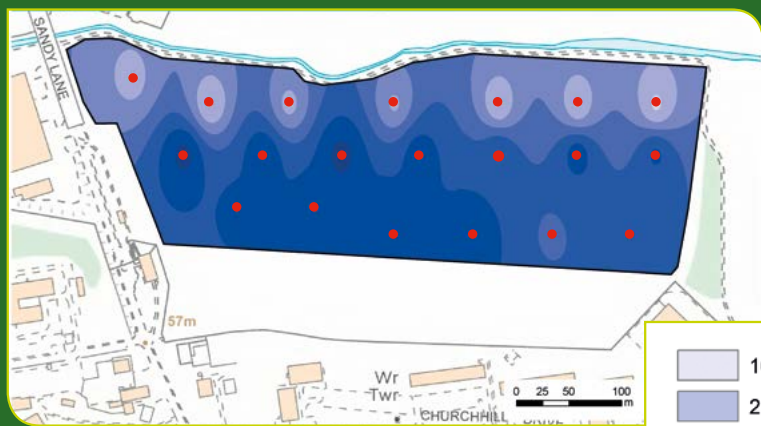
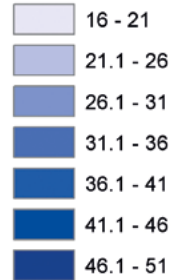


Fig 2. Grid sampling, 2 samples/ha

**GREATSOILS**

Extractable P (mg/l)



**Table 2. Avenue field soil analysis for pH and P – comparison between the whole field soil sample and the mean, minimum and maximum values from grid sampling.**

	Grid sampling, 1 sample/ha			Grid sampling, 2 samples/ha		
	pH	P		pH	P	
		mg/l	Index		mg/l	Index
<b>Mean</b>	6.1	35	3	6.1	36	3
<b>Min</b>	5.8	22	2	5.6	20	2
<b>Max</b>	6.7	47	4	6.7	47	4
<b>Whole Field</b>	6.1	22	3	6.1	33	3

The take home message from Lizzie Sagoo is, “The more samples taken the more accurate the soil map should be, but the additional cost may not be justified. You should decide upon your sampling strategy based on the resolution of the information you require.”

It should also be noted that soil acidity can be patchy and irrespective of soil

sampling for nutrient status regular spot testing of pH with a soil indicator test across the field is often useful.

**The complete case study will be published this summer. Further information on the project and soil management is available from [horticulture.ahdb.org.uk/greatsoils](http://horticulture.ahdb.org.uk/greatsoils)**



# LET BREXIT BE THE CATALYST FOR CHANGE

Hugh Baker, founder of Hub Rural, explains how to ask the difficult questions of your business in the face of Brexit



I was at a 50th birthday party recently (naming no names) and it wasn't long until the conversation turned to that inescapable topic: the great Brexit debate. Any big birthday brings with it not just nostalgia, but thoughts of the future too, and what an interesting time this is for the future of UK horticulture. I've been in the industry my whole working life and it feels harder now than ever to predict with accuracy what the industry will look like five years from now.

Periods of uncertainty such as this one can, and should, encourage a certain amount of navel gazing, but only if done so with objective eyes. The challenge for any business is to embrace uncertain times in the right way, using them as the catalyst for wider, much-needed change inside their own organisation that's often long overdue. This often requires them to ask difficult questions that are easier to avoid.

## CHANGES BIG AND SMALL

If the UK horticultural landscape is about to be shaken up, that will no doubt mean big changes to the rules and regulations. That's either yet another unnecessary change, or a great excuse to force change for the good by questioning other parts of your business which could be more efficient (and more profitable). Every business could be doing something better - sometimes all it takes is a proper look.

## MAKING A SUCCESS OF SUCCESSION

It's the conversation every business needs to face sooner or later, but one that is so easy to put off. Starting early before circumstances force your hand can help you come to an outcome that works for all parties involved. If a conversation's long overdue, use the 'B word' as the excuse you need to set a meeting to discuss business structures. Putting a date in the diary during the quieter months, choosing a location away from the business and setting an agenda in advance will all help to focus minds.

## NO BUSINESS IS IMMUNE

No agri-food business can afford to stand still. Markets are changing faster than ever, but that can mean big opportunities to the business that can adapt. Embracing uncertainty isn't always easy, but doing so can help you start to react positively to change and be prepared for any eventuality.

“ No agri-food business can afford to stand still ”

When deciding where to start first, there are a number of ways to tackle it, from the classic 'SWOT' analysis which identifies your strengths, weaknesses, opportunities and threats compared to your industry and your competitors, to seeking professional advice and support.

Contact: [www.hubrural.co.uk](http://www.hubrural.co.uk)



# WHY LEAN?

We speak to AHDB Horticulture Chairman, Gary Taylor, to discover why horticultural businesses might benefit from introducing Lean principles



Gary Taylor, Chairman,  
AHDB Horticulture  
gary.taylor@ahdb.org.uk



## THE CONCEPT OF LEAN HAS BEEN AROUND FOR DECADES; WHY IS IT SO IMPORTANT NOW?

**GT:** Lean is probably more widely recognised in factories these days, having famously taken hold at Japanese car manufacturer Toyota in the 1980s.

However, today, with Brexit looming ever larger on the horizon and uncertainties around access and availability of labour, we need to demonstrate thought leadership and to equip growers with the tools to make labour more efficient and drive out waste and non-added value elements of our businesses.

## WHAT ARE THE KEY TENETS OF LEAN?

**GT:** There are six basic principles of Lean:

- 1) Focus on the customer
- 2) Understanding and identifying how work gets done
- 3) Manage, improve and smooth out the process flow
- 4) Identify the non-added value elements and waste
- 5) Manage by using fact and data, and reduce variances
- 6) Attain continuous improvement

## WHAT ARE THE EASIEST AND MOST COMMON CHANGES BUSINESSES CAN MAKE TO START APPLYING LEAN PRINCIPLES?

**GT:** As a useful starting point for businesses you need to identify suitable staff through the whole end-to-end chain. These newly empowered staff members will be your Lean champions. Those staff will already be aware of potential savings, efficiencies and what best practice looks like, but may not have had the vehicle or perceived route to engage. Attention to detail, applying small differences soon adds up to some significant savings and efficiencies.

## CAN LEAN APPLY TO ALL BUSINESSES OR JUST CERTAIN TYPES?

**GT:** All businesses of any size or type can apply the principles of Lean. We might think of the packhouse as the obvious

place which might give some quick wins but operations in the crop can also benefit. For example, with harvesting being a more difficult nut to crack for automation it makes a lot of sense to look at this part of the business as well.

## WHAT'S BEEN THE BIGGEST SUCCESS YOU'VE SEEN WITH LEAN?

**GT:** The biggest success I've seen was with a speciality tomato grower who identified a waste stream. They applied a very simple solution that saved them around £65,000 a year. The real success story for this company was that they have now gone through the same Lean process with different parts of the business to continue to save and make efficiencies throughout the whole supply chain.

## HOW IS AHDB HELPING TO PROMOTE THIS WAY OF THINKING?

**GT:** We've previously commissioned work around both Lean and the Champion worker initiatives. The study of six diverse growers we funded this year has just been completed and identified the gains to be had by businesses of all shapes and sizes.

Using the information from these studies, along with the collective experience of four consultants with Lean and labour efficiency expertise, we have put together four workshops to help businesses either to get started with the process or add to the progress they have already made. Growers will be supported in these workshops to set their own Lean or labour efficiency projects, so they can turn these learned principles into real benefits for their own businesses.

## HOW CAN GROWERS GET INVOLVED WITH AHDB'S LEAN WORK?

**GT:** You can get involved directly by registering and coming along to one of the regional workshops, but you need to be quick as spaces are limited.

**Visit our website for further information about Lean and the regional workshops - [hort.ahdb.org.uk/events](http://hort.ahdb.org.uk/events)**





# A GLOBAL APPROACH TO ASPARAGUS

## From breeding virus resistance to asparagus irrigation, Claire Donkin reveals the latest innovations from the International Asparagus Symposium 2017 in Germany

The International Asparagus Symposium is always an interesting opportunity to catch up on the full range of international asparagus research. Held every four years it is a scientifically driven event giving researchers around the world the opportunity to come together, present data and discuss developments in asparagus research, breeding and production. This year the Symposium was hosted by the Leibniz Institute of Vegetable and Ornamental Crops in Potsdam, Germany.

The meeting began with an opening presentation from Professor Mikolaj Knaflewski of the University of Poznan who gave a review of key asparagus research. With so much variation in asparagus production in different environments it is difficult to pick out key information which is transferable to our cultivars and production methods. However, it was interesting to observe the yield potential as defined in this presentation. The lowest mean yield presented was 3.3 t/ha for Polish production but the maximum was described at 11 t/ha for that environment. In Peru, also producing green but with two seasons and warmer growing conditions the mean was flagged at

11 t/ha and the maximum 22 t/ha. Where greatly increased productivity was described it was always where covering systems were deployed to raise soil temperatures and allow better management of the crop environment.

### TACKLING A GLOBAL PROBLEM

The Julius Kuehn Institute, Germany has been breeding specifically to introduce resistance to Asparagus Virus I (AV1) into commercial asparagus cultivars. AV1 is an aphid vectored virus that has been shown to have significant yield impact and a role in asparagus decline; project FV 384 previously identified significant AV1 presence in UK asparagus production. Thirty nine different hybrids were created by the crossing of A. Officialis with A. Amarus and 29 have been identified as resistant.

The breeding programme is continuing and is now looking at refining the eating quality of the material produced. A separate presentation described the extent of AV1 infection, with 100% infection found in samples from Germany, Netherlands, France, Canada, Austria and Greece and 95% of USA samples infected. The rates were just 22% in Peru and 12.5% in Spain. Literature presented

gave a range of 20-70% yield reduction where AV1 was present.

A number of researchers are looking at modelling asparagus growth and yield potential. The Japanese team led by Atsuko Uragami of the Institute of Vegetable and Floriculture NARO, described the correlation of several factors with yield potential for Japanese forcing culture.

In this study the yield was most strongly correlated with chilling hours below 5oC, followed by nitrogen content of storage roots and crown weight, while the least influencing factor was Brix. The higher the N content, the better the yield potential when viewed alongside the other variables. Nitrogen content of storage roots is a new factor in estimating yield; the speculation was that the actual N value itself was not the driver but that it was associated with overall storage root health and nutritional status. In Germany, Joachim Ziegler of Dienstleistungszentrum Landlicher Raum outlined the different climatic management systems being used for white asparagus production in Germany and the yield benefits that come from well-managed covering. Bosch have



## “ Guelph Millennium yields increased 10% over six years when irrigated ”

developed an app, Deepfield Asparagus Monitoring, which is assisting growers in yield and quality forecasting and can give a three-day prediction. For white production the optimum temperatures at 20cm soil depth are a daily mean of 17-20°C for late varieties and 18-20°C for early varieties. Harvest start day was calculated by accumulating the daily mean soil temperature from 1 February until a threshold of >400°C and/or the daily soil temperature at 20cm >16°C/day. Fundamentally, modelling white asparagus is simpler than green, as the whole production is buffered by the soil and plastic covering. This team are two years into tweaking the model for green asparagus and both yield and quality relationships are still being understood.

Michigan State University's Dan Brainard presented work on irrigation to asparagus in Michigan. Water deficit in fern is believed to affect bud development, potentially reducing bud size for the following season as well as

reducing the photosynthetic potential of the fern and resulting carbohydrate reserves. The trial used a Diviner 2000 soil moisture probe to measure the volumetric water content of the soil to 90cm. The irrigation was triggered when the soil moisture content fell to below 50% of the potential available. Irrigation was triggered in most seasons and varieties varied in their responsiveness in yield the following year. Guelph Millennium yields increased 10% over six years when irrigated. There was no yield reduction in Gijnlim through in-season irrigation but as you would hope though the quality was greatly improved with a 50% reduction in open tips.

### REPERCUSSIONS OF REPLANTING

The afternoon of the second day was focused on pathology. The opening presentation from Wade Elmer of the Connecticut Agricultural Experimental Station described research around asparagus decline, replant disease

and emerging pathogens. Increasingly the research focus has been on supporting a healthy soil microbiome to manage Fusarium and promote healthy asparagus stands. Getting arbuscular mycorrhizal fungi (AMF) functioning has been shown to be beneficial in reducing decline and in improving the outcome in replant situations.

Ludger Aldenhoff reported on improved understanding to overcome replant disease. The main impact of replant soils was shown to be in reducing the feeder root production of the crown with data suggesting that both pathogens and toxins were involved in the plant suppression effect. It is worth looking at more sophisticated feeding systems to better support the limited feeding capacity of crowns. Seventeen cultivars were also assessed against replant impact and results showed variation in how strongly varieties were affected. All in all, the rule continues to be to avoid replanting wherever possible.

## “ The rule continues to be to avoid replanting wherever possible ”

### What can we learn?

The Symposium was full of useful information, but here are a few of the salient points for UK growers to take away:

- Irrigation in asparagus, both in season and out, could be helpful in promoting both yield and quality. In fern, supporting asparagus with irrigation helps bud sizing for the following year and in harvest it can help prevent tip opening during stress conditions. Trials have been based on an irrigation trigger of 50% volumetric water content as measured to 90cm via a Diviner 2000 or similar
- Replant disease reduces the number of fine roots produced by asparagus crowns, decreasing the crown's ability to source nutrition. Changing nutritional strategy in replant fields could help support weakened crowns
- Mycorrhizal fungi can be of benefit in supporting nutrition in asparagus, especially where feeder root structures are impacted by replant or disease
- Look out for the new developments on Deepfield Asparagus Monitoring; crop modelling in white asparagus is well defined and research is now turning to green asparagus production







# THE SEEDS OF CHANGE

By exploring the properties of different seed coatings could seed performance be enhanced? Researcher Chun-Chin Wang and Professor Julian Moger, University of Exeter, investigate

For vegetable growers, seed vigour performance is the consequence of both crop genetics and the efficiency of agrochemical uptake during seed coating process. However, the seed is highly selective in its uptake of external nutrients and currently the seed takes up as little as 5% of agrochemicals applied in coatings. By better understanding how chemical compounds enter seeds it may be possible to improve the design and environmental profile of existing and future seed-applied agrochemicals. Currently there are no good tools for monitoring agrochemical ingress into seeds and thus this is not considered during development of commercial seed coatings.

Conventional microscopy requires chemical compound to be labeled with dyes in order to see them. While this is appropriate for many biological applications, it is not compatible with all but a few agrochemicals since the labeling dye molecules are actually bigger than the agrochemical compounds, which dramatically alters how they behave on the seed. Project CP 145, funded by the BBSRC and AHDB

Horticulture, aims to apply a novel laser-based imaging technique (stimulated Raman scattering) to provide label-free chemically specific imaging based on vibrational spectroscopy. Using this technique we are able to track the uptake of unlabeled agrochemicals, and water, into Brassica seeds to better understand the potential of seed coat manipulation for enhancing compound uptake.

As a proof-of-concept, we performed imaging of water and an insecticide (Clothianidin), uptake into seeds. Fig. 1(A) and (B) show the 3D time-lapse imaging of water permeation and seed coat structure. This early data shows that our technique has great potential to aid the rational engineering of a next generation of agrochemical seed coatings with enhanced efficacy.

This work has the potential to impact growers by increasing the reliability of performance of seed they buy from seed companies. Modified seeds have the potential for a more reliable performance for seed companies and growers, combined with more efficient use of agrochemicals. Novel techniques

for imaging the composition and spatial organisation of the seed coat are of great interest to the agrochemical industry and to academic researchers. We are currently working with our partners to optimise the technology in real field conditions.

Nicola Dunn, AHDB Resource Management Scientist, said, "It is exciting to see the techniques being used in this project to track the ingress of chemicals and water into seeds. It is hoped that this method can be used in the future to ensure more efficient uptake of active ingredients by seeds and therefore improve seed vigour."

**AHDB project code:**  
CP 145

**Project lead:**  
Julian Moger,  
University of Exeter

**AHDB contact:**  
Dawn Teverson

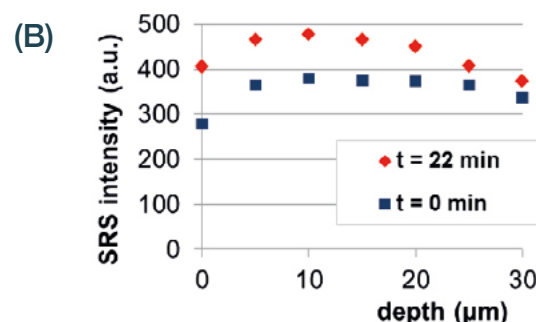
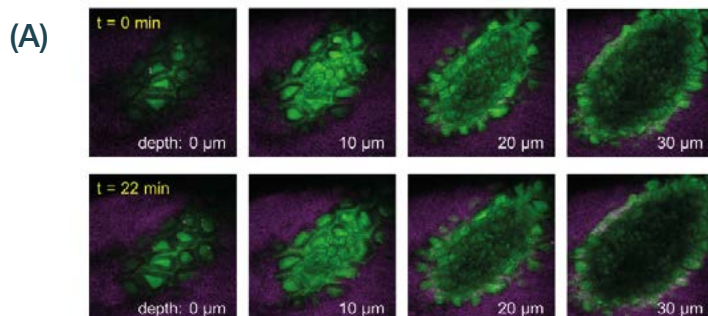


Figure 1: In-situ chemically-specific imaging of intact seeds. (A) and (B) show the time-lapse imaging of water uptake (magenta) into the seed coat (green) can be imaged and analyzed. The images show water in the seed at various depths (μm) initially (t = 0) and after 22 minutes (t = 22). The water uptake at different depths within the seed can be measured using the Simulated Raman Scattering (SRS) Intensity.



# GROWERS LOOK FORWARD TO AUTOMATION

## AHDB's Gracie Emeny reveals the results of the recent Robotics Automation survey

Tackling the increasing cost and decreasing availability of labour is one of the top three priorities in the current Horticulture strategy. AHDB has conducted a survey of businesses to investigate the current and potential use of automation and robotics to help identify where future activity could be directed and to help address concerns about labour.

### HOW CAN AUTOMATION HELP REDUCE LABOUR NEEDS?

Labour accounts for up to 70% of variable production costs in some horticultural crops. With the National Living Wage driving up labour costs and the uncertainty of the future availability of workers, identifying technologies that can help reduce labour costs and pressures for businesses is becoming more critical.

Fifty horticultural businesses, representing the proportion of levy income and size, were surveyed and a supporting sample of 18 growers volunteered to take an online questionnaire.

The results showed that the current use of automation in the industry is high and continually updated. Growers were asked what has been automated in the past 10 years. In the field, the main advancements have been in transplanting/planting, weeding and harvest. Post-harvest product transport, grading and packing have seen recent investment. The use of robotics is not so widespread; 32% of growers had what they described as some element of robotics (which had feedback and sensing)

in their system. The main area of use was for moving the product around on the holding.

The overwhelming majority (82%) felt automation had reduced labour or increased efficiency in the last 10 years and more growers (88%) were positive for future developments. When asked where they could see automation and robotics helping in future, the greatest number of responses fell in the harvesting (56%), grading (28%) and packing (24%) end of the system.

Eighty percent of growers questioned knew of automation that was in development that could be helpful for their system. Many mentioned research projects or commercial companies that were developing technology. Automation discussed included; sensing technology, imaging analysis, crop monitoring, forecasting systems, de-leafing robots, moving robots, harvesting machinery and learning robots.

### KNOWLEDGE EXCHANGE NEEDS

Via telephone, growers were asked whether AHDB should invest money into knowledge exchange on automation/robotics, with 80% saying there should be information shared on the topic.

The telephone survey asked what format growers would like to receive information. The most popular was an event where they could discuss the topic face-to-face with experts and other growers, listing working parties, workshops, seminars, demonstrations and conference styles (Figure 1).

Some growers said they would like AHDB to take a facilitating role in:

- Connecting the research chain (funders, academia, commercial companies, growers and retailers)
- Connecting the industry with commercial companies and industries outside of the horticultural sphere that may have technology, knowledge and capabilities to apply to horticultural systems

### THE FUTURE

In the Horticulture strategy AHDB has committed to:

- Strategically benchmark production systems to determine the scope to improve the use of labour
- Use existing KE networks to cascade awareness of new automation and robotics opportunities to industry
- Seek ways of sharing costs and creating new synergies by working closely with the Agri-Epi Innovation Centre and other global centres of excellence in automation and robotics technologies

AHDB will consider the information generated in the survey and decide with growers on the next steps.

**The full report of the survey can be found online in the labour section of the AHDB Horticulture website, [hort.ahdb.org.uk/labour](http://hort.ahdb.org.uk/labour)**

“ 88% of growers believe investing in automation will reduce their labour requirements in the next 10 years ”





# INSIDER INSIGHT

## A FRUITFUL PARTNERSHIP



**Name:**  
Harriet Duncalfe

**Title:**  
Director

**Company:**  
H & H Duncalfe Ltd

### Soft fruit grower, Harriet Duncalfe, chats with The Grower about her involvement in AHDB's work and how it has helped in their business

**Q: How did you originally come to be involved with AHDB work?**

**HD:** As a business we have been levy payers for over 25 years. I became personally involved with AHDB work over many years, with NIAB EMR scientists visiting our farm for practical trials relating to AHDB soft fruit projects.

When the soft fruit panel agreed to use its own funds to sponsor a PhD studentship to work on powdery mildew in strawberry with Dr Avice Hall of the University of Herts, most of the practical field work was carried out on our farm, including an extension year where the student (now Dr Jolyon Dodson) researched the opportunities of a rule-based prediction system with us for this troublesome disease.

**Q: How have you used AHDB work to improve or make changes at your business?**

**HD:** AHDB project 'SF 62a: Extending and Exploiting New Knowledge of Strawberry Powdery Mildew' made a step change in our understanding of this disease in tunnelled strawberry crops (pictured). A rule-based prediction system was produced and was taken forward into a Hortlink project, with AHDB involvement, by Professor Xiangming Xu of NIAB EMR. He wrote the original software system which we continue to use successfully on the farm to assist in controlling powdery mildew in our strawberry crops.

This is operated alongside key venting practices and targeted control of powdery mildew, including at the end of each season and at the very start of the new season, to keep inoculum levels low for better control throughout the following growing season. This research work has been very beneficial to our farm in controlling strawberry powdery mildew, thereby reducing waste and producing a higher percentage of class 1 fruit. The prediction system, in conjunction with good crop walking practices has allowed targeted crop protection product use resulting in a reduction of treatments applied while still controlling the disease.

**Q: What have you gained from working with AHDB?**

**HD:** We've gained many benefits from working with AHDB through targeted research aimed at solving problems being experienced in our sector. The AHDB Studentships are also an exciting way of developing bright young people who we hope in the future will work in the Horticulture sector.

I have found that being involved with AHDB adds so much value to your business and your sector, and sitting on a panel relating to your crops gives you a voice in what your needs are.

**Q: Are there any current AHDB projects that you're excited about?**

**HD:** We are currently very excited by the SWD Research Programme, a follow-on four-year project that started in 2017. Dr Michelle Fountain and her very capable team from NIAB EMR continue to deliver research solutions to the sectors impacted upon by this invasive pest.

Regular communication on this subject is delivered year-round by Scott Raffle who, along with Vivian Powell and myself, continues to work with CRD, to help deliver additional crop protection products needed to control this pest as part of an integrated system.

### 3 TOP TIPS



Here is Harriet's advice for growers looking to get involved with AHDB:

- 1) Engage with AHDB staff for your sector - they are here to help you and are happy to do so
- 2) Read all communications for the latest news, however busy you are
- 3) Use the AHDB website - it is a mine of information



# HORT THOUGHT

Each issue we ask you to weigh in on a topic that the industry is talking about. This time we take a look at how crop protection regulations will change post-Brexit

**Q: “Do you think there will be fewer restrictions on crop protection product approvals once the UK leaves the EU?”**



**NO**

**TIM LACEY, CAMPAIGN MANAGER,  
BAYER**

“The situation is unclear, but my personal view is that the UK is in fact already more restrictive than most of EU when it comes to product authorisations. The UK regulators adopt their own preferred models and processes on top of what can be loosely described as a ‘common approach’ across the EU – and I can’t see this changing. In addition, I believe that we’ll still have to be aligned with the EU for things like active substance approval, since I doubt that CRD would have the capacity to be able to do this work in addition to the specific product authorisations after Brexit.”



**NO**

**PAUL BROPHY, GENERAL MANAGER,  
PAUL BROPHY PRODUCE**

“If the UK wants access to markets in Europe then it will have no choice but to maintain all the standards currently enforced in Europe. A lot of supermarkets have a presence in mainland Europe, some of these enforcing their own even stricter protocols, so the UK will need to stay with the current requirements to maintain access for all products in the food chain. It is better to have input into PPP legislation in being part of Europe, than having no influence yet having to adhere to these standards. The UK represents 14.6% of the current population of the existing 28 member states; this would mean turning your back on a lot of potential markets if current EU protocols are not adhered to so a relaxation in restrictions may not be a good long term strategy.”

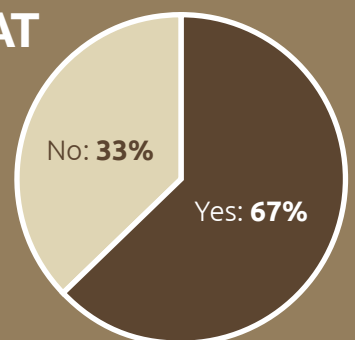


**YES**

**CHRIS STARKINGS, AGRONOMIST,  
ZANTRA**

“Science should have greater influence in decisions than the current political system. We are a long way from knowing the trade arrangement the UK will have with the EU but under the WTO rules it seems possible we could return to a risk-based approval system like 91/414. The scale of the UK agrochemical market could be a limitation to investment in approvals specific to our territory.”

**HERE’S WHAT  
THE REST  
OF YOU  
THOUGHT:**



**WHAT DO  
YOU THINK?**

Have your say and get involved by tweeting us @AHDB\_Hort with your thoughts, using the hashtag #Hortthought





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