

The GROWER

THE TECHNICAL JOURNAL FOR HORTICULTURE

AHDB

Issue No. 240
Jun/Jul 18



A NEW WAY TO MANAGE?

Could vendor managed
inventory benefit your business?

STOPPING THE ROT

Finding a biological solution
to Phytophthora root rot

THE CHAMPION APPROACH

How can you identify the Champions in your company
and boost workplace performance?

LSA CHARITABLE TRUST FELLOWSHIP SCHEME

SCHEME LAUNCH – 27TH JUNE

CLOSING DATE – 17TH AUGUST



LSA Charitable Trust
Fellowship Scheme

OVERVIEW:

The objective of the Fellowship Scheme is to assist developing professionals to become more engaged with the strategic leadership of the commercial horticulture industry.

Throughout the scheme the fellow will increase their understanding of the role played by trade bodies and their associated committees in the development of industry strategies and communications with government. Knowledge of research currently being undertaken will be gained as will the ability to evaluate the possible impact this will have on the industry. Communication channels will be made between the cohort and contacts in other businesses, trade bodies and research organisations.

The program will accept a maximum of 6 Fellows each year into a program of activity that will last two years.

THE SCHEME IS BEING SUPPORTED BY:

National Farmers Union
British Growers Association
Horticultural Trades Association
Chartered Institute of Horticulture
Agriculture and Horticulture Development Board



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NEW AND EXCITING TIMES

I am sometimes challenged by levy payers who say they find the AHDB Horticulture website difficult to navigate and the results of our research hard to find. So do I. But AHDB colleagues are working hard to address this problem.

When the new AHDB website goes live later in the year, and as the many projects we have commissioned in recent years in response to unsolicited proposals from researchers are replaced by larger, flexible programmes procured competitively, our output will become much more readily accessible. When the pilot website was demonstrated to AHDB Horticulture Board members recently, the thumbs were up.

At the same time, we will be stepping up our direct engagement with levy payers through our most ambitious programme of technical events yet, while also ensuring that our digital output and publications continue to meet industry needs.

And we are doing everything we can to share our costs with the other AHDB sectors as and when strategic priorities overlap and opportunities to collaborate arise. Examples include work we are currently planning on pesticide resistance and weed management.

However, most of what we do remains firmly focused on the crop-specific issues that matter most to growers, such as the work on Western Flower Thrips management and apple maturity sensing covered elsewhere in this issue.

Lastly, I wanted to update you on progress in recruiting a new Chair of the AHDB Horticulture Board. The quality of applicants was high, the most promising candidates are being interviewed in June, and we hope to appoint shortly thereafter. In the meantime, Martin Evans is doing an excellent job as acting Chair, preparing the way for his successor to take over in the autumn. I look forward to introducing the new Chair to sector panels and grower associations over the winter.



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



BILL HERRING

A Senior Lecturer in horticulture to further and higher education students and apprentices for 32 years, Bill specialises in commercial horticulture production. He has industry links through field trials work specialising in Brassica crops, mainly cauliflower and spring cabbage for almost 40 years. Bill has co-ordinated the autumn/winter cauliflower trials in Cornwall for 25 years.

Discover the promising new Brassica varieties with Bill on page 12



ERIKA WEDGWOOD

Dr Erika Wedgwood has been a Research Scientist with ADAS since 2005, specialising in disease control measures for ornamental, soft fruit, vegetable and salad crops. Recent work for AHDB has focussed on Phytophthora, Pythium, Fusarium, Verticillium and Thielaviopsis species and the use of biological and alternative control treatments in soil and substrates. Her early career was with NIAB carrying out variety trials on disease and pest resistances of a wide range of crops. She has a BSc in Botany and Zoology, an MSc in the Technology of Crop Protection, and completed her PhD in applied entomology within a MAFF Studentship.

Erika leads the fight against Phytophthora root rot in cane crops on page 16



GEORGINA KEY

Georgina trained as an ecologist and entomologist, working as a researcher on crop pests, agri-environment schemes and soil fertility before joining AHDB in 2015. She is responsible for the Hardy Nursery Stock and Protected Ornamental, Bulb and Outdoor Flower Panels and her main area of focus at AHDB is on resource management (environment, growing media and crop nutrition). Georgina is currently involved with an EU Horizon 2020 project on sustainable water and fertiliser management and is developing a crop nutrient management programme for horticulture.

Georgina is a FACTS Qualified Advisor and completed a PhD in the biological control of crop pests.

Get the farmer's insight on fertigation with Georgina on page 24



GILLIAN HAYTHORNTHWAITE

Gillian runs her own independent HR Consultancy business – HRAnGill (www.hrangill.com) – which specialises in ethical compliance and HR support/expertise. Her clients include major food manufacturing and produce suppliers, high street retailers, trade association, financial services and logistics companies.

Her role as Head of Policy for the ALP is focused on supporting members and developing policies that address issues important to labour providers. The key focus currently is around labour shortages due to Brexit and how to source and retain labour in a full employment economy.

A business studies graduate and Fellow of the CIPD with over 30 years of HR experience, Gillian has held many HR roles at both operational and group level.

Gillian reveals the secrets to recruiting successfully on page 30

NEWS & UPDATES

IN BRIEF

GROWER-LED PEST MONITORING

A group of Brassica growers have joined forces to monitor diamondback moth populations around the UK. Their information will help inform the AHDB Pest Bulletin service that shares pest forecasts and up-to-date reports on most of the key field crop pests. Visit horticulture.ahdb.org.uk/ahdb-pest-bulletin

ASSOCIATE SCHEME CLOSES

The AHDB Horticulture Associate Scheme is now closed, however, access to our literature, communications and events will now be freely available. The decision has been made to ensure our research is widely accessible to support the whole industry. If you have questions about your account, please contact comms@ahdb.org.uk

UNDERSTANDING CONSUMER NEEDS

AHDB's latest Horizon report: International Consumer Buying Behaviour, emphasises the need for industry to monitor and adapt to the needs of each marketplace to create export opportunities. It also considers the impact of British branding overseas. Read the full report at ahdb.org.uk/brexit

NEW FERTIGATION BIBLE

FERTINNOWA, the initiative looking at the transfer of innovative techniques for sustainable water use in fertigated crops, has published a new guide. 'The Fertigation Bible' is a valuable resource of practical information, drawing together a wealth of expertise and encompassing many different cropping systems. Download from fertinnowa.com

THREE NEW PRODUCTS DELIVERED BY SCEPTREPLUS PROGRAMME

Growers now have access to further new weed and pest control products, following testing within AHDB's crop protection research programme, SCEPTREplus.

Herbicide trials undertaken in 2017 aimed to help provide new solutions for growers following the loss of linuron. Carrot growers will now have access to 'Gamit 36 CS' following an Extension of Minor Use (EAMU) approval for the control of various weeds in outdoor carrot, and permits the use of clomazone post-emergence.

The EAMU for 'Wing-P' will provide growers of courgette, summer squash, winter squash and pumpkin with good control of broad leaved weeds and annual meadow grass.

Control options for Western Flower Thrips were also examined in the first year of the programme. 'Azatin' used in combination with *N. cucumeris* showed significant reductions in mean percentage flower area damaged, compared with the *N. cucumeris* and water control and therefore shows

good potential to form part of an IPM programme. An on-label approval has now been secured by Certis.

These approvals follow on from two further weed control EAMUs secured from successful trials in the project's first year; Dual Gold on sweetcorn and Centurion Max on herbs.

Spencer Collins, AHDB Crop Protection Scientific Officer, said, "We have been working closely with both CRD and the manufacturing companies to ensure that only near-market products are trialled within SCEPTREplus. As a result, we have been able to help turn successful results within trials into products that growers can access and use as quickly as possible."

Further information about the crop protection trials can be found at horticulture.ahdb.org.uk/sceptreplus



NEW RULES FOR WATER

From 2 April 2018 all farmers in England need to meet new government rules to protect water quality.

The new farming rules for water are broken down into eight parts, five about managing fertilisers and manures and three on managing soils.

The fertiliser rules require farmers to test their soils, then plan and apply fertiliser or manure to improve soil nutrient levels and meet crop needs.

They include minimum storage and spreading distances from water bodies, as well as requiring farmers to assess weather and soil conditions to reduce the risk of runoff and soil erosion.

The other rules require farmers to protect land within five metres of water and reduce livestock poaching of soil.

The new rules will be rolled out by the Environment Agency. More information can be found at: www.gov.uk/defra/farmingrulesforwater

PROVIDING THE NEXT GENERATION WITH 'FOOD FACTS OF LIFE'



AHDB has a new three-year education strategy, designed to provide children with engaging content and facts that link farming, food and nutrition.

Partnering with the British Nutrition Foundation, a single streamlined education programme will be produced that aligns directly to the national curriculum.

The partnership will target teachers and key influencers and aims to provide children with a clear understanding of how food is produced and a positive outlook on British farming.

To get in touch with the AHDB Education Team please email education@ahdb.org.uk

FUNDING CONFIRMED TO BETTER UNDERSTAND XYLELLA

A new PhD studentship post is currently being advertised to develop the industry's knowledge about the genetic factors involved in plants becoming infected by *Xylella fastidiosa*.

With no known current effective control methods, *X. fastidiosa* is one of the most harmful bacterial plant pathogens in the world, which can infect an extensive range of woody and herbaceous plants. While not currently in the UK, outbreaks have occurred in mainland Europe.

AHDB has funded the PhD position in order to help develop novel control measures, through a better understanding of the disease infection in different hosts. The project will be run by University of Reading and NIAB EMR and the successful candidate is expected to start in autumn 2018.

A new report has also been made available by AHDB: 'Review of bacterial pathogens of economic importance to UK crops' which contains an in-depth review of the current knowledge of *X. fastidiosa*.

Visit horticulture.ahdb.org.uk/xylella-fastidiosa to read the report

NEONICOTINOID PESTICIDE RESTRICTIONS

On 27 April 2018, the Standing Committee on Plants, Animals, Food and Feed met to vote on further amending the conditions of approval for three neonicotinoid active substances: imidacloprid, clothianidin and thiamethoxam. These substances are used within many insecticide products, primarily as seed treatments.

Following conclusions delivered in a report by the European Food Safety Authority on 28 February, the committee voted to adopt restricting the three substances to greenhouse use only. All outdoor use, including seed treatment, will be banned.

Alternatives are being sought for the control of lettuce root aphid, which is currently controlled by neonicotinoid seed treatments, as part of the AHDB SCEPTREplus crop protection research programme. The trial will take place in 2018, with any promising products taken forward as part of the AHDB Extension of Authorisation for Minor Use (EAMU) programme to secure approval for growers.

STATUTORY REQUIREMENT – HORTICULTURE RETURN FORM

You will soon be in receipt of your Horticulture Return covering the financial period from the 1st April 2017 to the 31st March 2018. As per previous years, the completed return is due back on or before the 30th June 2018 and payment is due on invoice.

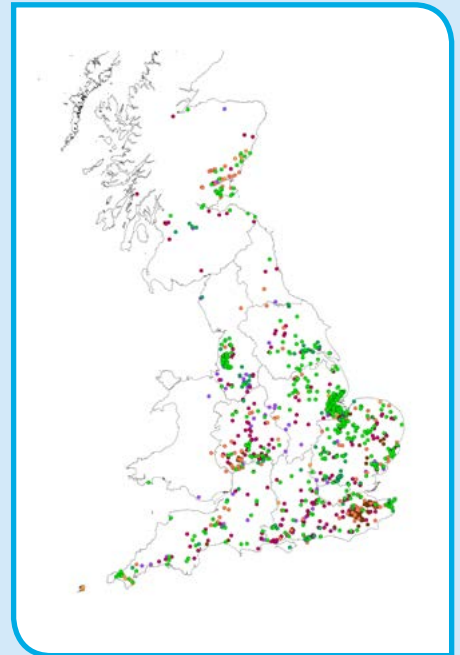
Please be aware, as part of a systematic audit process, the board requires a selection of returns to be accountant certified before they are returned – failure to do so will render the return invalid. Further to this, we audit a random selection of growers throughout the year to ensure the correct amount of levy is being paid.

In certain cases, for example; where there is a complex business structure or process in place, we can arrange for a field auditor to visit you at site in order to assist with filling out the form, if this is something you are interested in please contact the number below.

We will offer help and advice where we can, however, the responsibility for submitting accurate returns remains with the grower and is a legal requirement.

To take advantage of direct debit payments for levy, please ensure you complete and return the form before the due date stating that you wish to pay by direct debit, completing the attached mandate if you have not already done so in previous years. This will enable you to spread the cost of levy throughout the year and allows for more streamlined, cost effective service to you as the grower.

If you have any difficulties in completing the return, or in making payment of the levy please contact 024 76 478609 or levy@ahdb.org.uk in the first instance and we will be more than happy to assist where we can.



Location of UK Levy payers



FARM EXCELLENCE

THE BEDDING AND POT PLANT CENTRE OPEN DAY

Baginton Nurseries, Coventry

19 June 2018

View the current trials including
evaluating new plant growth
regulators

To book your place, visit
horticulture.ahdb.org.uk/events

Follow the trial progress on twitter @AHDB_Hort #bppc

INSIGHT INTO AHDB PROJECTS

FINAL REPORT: STORAGE WARS

AHDB Resource Management Scientist Nicola Dunn takes a look at the outcomes from the recently completed carrot storage alternatives trials

Alternatives to straw for field storage of carrots are becoming increasingly attractive due to variability in both cost and availability of straw supplies. In addition agronomic issues such as nutrient lock-up from incorporated straw and potential for introduction of weed seeds are of concern. AHDB project FV 398b investigated the use of reduced-straw and non-straw alternatives by assessing insulative properties and impact on crop quality, and in addition the practicalities of their use.

The treatments included straw, cellulose fibre (a recycled paper product), polythene foam and an uncovered control. Straw treatments were at standard and reduced rates, both alone or with polythene (either under or over the straw). Cellulose fibre treatments were alone or with polythene (both under a sheet of polythene or between two sheets of polythene). Closed cell polythene foam was included as a re-usable alternative. Treatments were assessed on their effect on marketable yield; percentage of damaged carrot

roots at harvest; and insulative properties (a calculation of outgoing and incoming heat values).

All of the treatments provided effective frost protection during the winters in which they were tested. Differences between cover treatments were not statistically significant so the viability of alternatives for field storage will depend upon economic considerations and practicalities of use. Straw alternatives such as cellulose fibre and closed cell polythene foam may be useful alternatives but are not economically attractive at present.

The results show that growers wishing to reduce straw usage could consider moving to polythene over straw in order to use one-third of the normal amount of straw. This would require some modifications to existing straw-laying machinery but could save in the region of £2000 per hectare.

Rodger Hobson, Hobson Farming, discussed the trials, saying, "This project was very interesting. In the initial stages, we (the growers) learned a lot



AHDB project code:

FV 398b: Carrots: Practical evaluation of field storage alternatives

Term: August 2015 to October 2017

Project lead: Dr S. Roberts, Plant Health Solutions Ltd

AHDB contact: Nicola Dunn

about heat transfer and from this how straw works from the point of view of insulating carrots. The latter stages involved looking for alternative insulation media. After extensive evaluation, other media were found, but nothing that is more 'effective' and 'cost effective' than the current straw system."



A NEW WAY TO MANAGE?

Vendor Managed Inventory is a new supply chain model that is gaining popularity among ornamental growers in North America. But what is it and who might it benefit? Albert Grimm, from Jeffrey's Greenhouses in Ontario, Canada, explains a bit more about it

Q: WHAT EXACTLY IS 'VENDOR MANAGED INVENTORY' AND HOW DOES THIS RELATE TO 'PAY-BY-SCAN'?

Albert: Vendor Managed Inventory (VMI) is a supply chain model where the responsibility for product inventory at a garden centre location rests with the supplier rather than with the retailer. The supplier (i.e. the grower) manages product inventory, replenishment, and retail display of all plant material. The supplier has direct access to in-store sales data via electronic data interchange (EDI).

Pay-by-Scan emerged from the VMI environment. Somewhat similar to consignment sales, the grower retains control and ownership over the product in the retail store until it is scanned at the retailer's cash register.

VMI and Pay-by-Scan are concepts that aim to give the producer of live plant material the opportunity to make more effective use of in-house expertise in managing and restocking inventory in the retail stores.

Q: WHERE IS VMI BEING USED MOST SUCCESSFULLY AT THE MOMENT?

Albert: Primarily in big box stores in North America – there are different models of VMI implemented by different retailers (e.g. Costco, Walmart, etc.) but to my knowledge only Home Depot runs Pay-by-Scan programs in North America.

Q: WHAT ADVANTAGES DOES VMI PRESENT TO THE GROWER OVER OTHER, MORE TRADITIONAL, SUPPLY CHAIN MODELS?

Albert: Ultimately it can increase sales. The grower also has more control over what to ship and when to ship, as there are fewer limitations imposed by the retailer as the grower is the risk taker.

Other advantages include branding, quality recognition, and repeat sales. With VMI it becomes worthwhile for a grower to invest into better shelf-life and better consumer performance of plant material. The consumer may not recognise a specific greenhouse as a brand, but if a consumer associates better quality with the retailer's brand, it will increase repeat sales in the long-term.

Other supply chain models remove direct control from the producer over what is marketed to the consumer. The interests of the retailer with respect to in-store sales and activities can dramatically diverge from the interests of the producer with respect to consumer exposure and product success. The success of VMI and Pay-by-Scan depends on close cooperation and thus allows for a 'win-win' environment.

“The grower has more control over what to ship and when to ship, as there are fewer limitations imposed by the retailer”

Q: AND ARE THERE ANY DRAWBACKS TO THIS SYSTEM?

Albert: From an immediate practical perspective, the grower has to invest in systems and people to manage this program. Retaining qualified seasonal staff is challenging.

On a more fundamental level, this system works if there is a balance of co-dependency of grower and retailer. It works if the retailer would have as much difficulty to find a new supplier with adequate competency, as it would hurt the grower to have to find a new retail opportunity for the product. As a consequence, the company has to continuously grow its production along with sales and presence of the retail chain.

Q: IF A UK GROWER WANTED TO MOVE TO A VMI MODEL, WHAT DO THEY NEED TO DO TO GIVE IT THE BEST CHANCE OF SUCCESS?

Albert: The most important thing is to have a commitment to quality. The grower has to be prepared to invest in quality in order to be able to benefit from the sales results created by a product of better quality.

Going hand-in-hand with this is having a 'yes-we-can' attitude; growers must identify with the concept and wholeheartedly support it. This requires an excellent sales team, which is in tune with and in control of store inventory numbers, as to achieve success they'll need meticulous production planning and flawless execution of these plans.

Q: AS I'M SURE MOST GROWERS ARE THINKING ABOUT OVERHEADS, HOW DOES A VMI MODEL IMPACT ON THE NUMBER OF STAFF REQUIRED BY THE GROWER AND HOW CAN THIS CHALLENGE BE TACKLED?

Albert: The in-store service piece is very different from what goes on inside the greenhouses. It really is like another business within the business. Depending on the number of stores that are being serviced it can easily grow to one, two or even more full-time people per store, depending on the store volume and, of course, the contract agreement with the retailer.

To deal with this, I would say the most important thing is to have clear lines as to where responsibilities lie between each party involved in the agreement – it is best to have all details spelled out upfront. A good working relationship with the retailer is key and it's important to be able to work together to find a 'win/win'.

There are a lot of advantages to VMI and, ultimately, a more effective inventory management should improve the retail environment and increase sales for the benefit of both the producer and the retailer.

Pictured right: Albert Grimm

“A good working relationship with the retailer is key”

VMI: our view

With proof of concept established in North America, could VMI become a normal working practice here in the UK? AHDB Board Member and Managing Director of Ovation Business Consultants, Neville Stein, gives his expert insight on the likelihood of a switch to VMI:

“As we’ve have seen from Albert Grimm’s comments, VMI is predominantly operated by ‘big box’ retailers in the USA. While there are fewer big box retailers here in the UK, I can foresee those that do operate here becoming interested in this model. Perhaps, more significantly, multiple retailers such as Waitrose,

Tesco, etc., might become interested in this model, especially as we are seeing many of the traditional grocery retailers entering the garden plant category. VMI would present them with an opportunity to reduce wastage and thereby improve their margin.

“I very much doubt if this model would gain traction in the independent garden centre market though. It could work very well for a large grower supplying multiple retailers where there is an opportunity for significant scale but providing this service to an independent retailer would be time consuming and expensive. Making VMI work

requires excellent IT systems and, of course, dedicated sales or business development staff within a company.

“The advantages to engaging in VMI for the grower are significant though, not least the ability to obtain very accurate sales data which could then feed into more accurate production planning, which in turn will reduce wastage. So often the grower has lacked control once plants have arrived with the retailer. VMI would give them an opportunity to gain more control over how their plants are sold, which in turn, should enable higher sales to be achieved.”

AHDB



“ Given equivalent quality, and no price differential, consumers prefer home-grown produce over imported produce ”

THE SEARCH FOR BETTER BRASSICAS

Bill Herring, Team Lead in Horticulture at Duchy College, reports on the latest results from the Brassica trial work that AHDB has been funding to help find new cultivars for growers

Over 90 per cent of all autumn/winter cauliflower and spring cabbage produced in the UK is now sold through the supermarkets as a programmed part of their 52-week supply. The industry's predominant need is to maintain and grow this market.

The autumn/winter cauliflower industry is currently worth in the region of £35 million per annum, while the spring cabbage industry clocks in at £6 million per annum. Over the past few seasons growers have used the results from this project to plan and improve marketable yields and subsequent returns compared to cultivars previously available to them. This has enabled the industry to consolidate and increase the area planted, to remain competitive. The information produced by Bill and his team is used in all areas of the UK where Brassica crops are grown.

Any loss in competitiveness would damage the industry irreparably and displace production and associated jobs to the UK's main competitors in France, Spain and Italy. Varietal development is crucial to ensure that all home-grown produce continues to match or exceed the quality and year-round availability of imported produce, with which it is in direct competition.

Consumers have come to expect a year-round supply of premium quality home-grown produce from the supermarkets. Given equivalent quality, and no price differential, consumers prefer home-grown produce over imported produce. Providing a consistent supply of Class 1 home-grown autumn/winter cauliflower and spring cabbage is therefore essential to maintain the strong marketing position for UK vegetables in the supermarkets.

POSITIVE SIGNS

The 2016-17 season was an exceptional season with nearly all cultivars of autumn and winter cauliflower harvested between October and June producing yields of between 10 and 20 per cent above long term seasonal averages. This was due to excellent planting conditions, very good cabbage root-fly control and weather conditions that was conducive to good growth with limited flushes of over production throughout the season. This put growers in good heart for the 2017-18 season. A 10 per cent increase in yield of winter cauliflower produces an additional gross income of £394/acre (£973/hectare).

Duchy College, funded by AHDB and working in partnership with eight national seed houses and local growers, have carried out the evaluation of commercially available autumn, winter cauliflower and spring greens cultivars over the past 23 years. With the improvement in plant breeding, uniformity, disease resistance, and curd protection there is an on-going need to evaluate new cultivars being introduced alongside current and established varieties, in order to compare both yield and quality. The trials are being done at Trevarnon Farm, Gwithian, Cornwall, on sandy clay loam where the farm rotation is based around Brassicas, cereals and grass break crops.

AHDB project code: FV 202g

Project lead: : Bill Herring, Duchy College

AHDB contact: Dawn Teverson

Autumn cauliflower – top performing cultivars 2017

Seed House	Cultivar	% Class 1	Trays (per acre) Class 1		Heading period 10 – 90% dates
			8/tray	6/tray	
Rijk Zwaan	26 - 440	79	893 (2,205)	154 (380)	21.10.17 – 29.10.17
Rijk Zwaan	26 - 322	82	897 (2,216)	199 (492)	23.10.17 – 30.10.17
Sakata	Amandine	84	910 (2,248)	226 (558)	30.10.17 – 5.11.17
Enza Zaden	217740	92	931 (2,300)	195 (482)	31.10.17 – 7.11.17
Monsanto	SV 5965	75	891 (2,200)	91 (225)	1.11.17 – 8.11.17
Enza Zaden	217752	80	805 (1,988)	72 (178)	3.11.17 – 12.11.17
Monsanto	5982	84	1047 (2,586)	39 (96)	7.11.17 – 14.11.17
Elsoms	Telde	74	907 (2,240)	56 (138)	15.11.17 – 29.11.17

INFO: Transplanted on 14/07/17 26 cultivars from six seed houses 10,249 plants/acre (25,315/hectare)

Winter cauliflower – top performing cultivars 2017/18

Seed House	Cultivar	% Class 1	Trays (per acre) Class 1		Heading period 10 – 90% dates
			8/tray	6/tray	
Clause	Diwan	80	574 (1,418)	383 (946)	13.11.17 – 22.11.17
Clause	Bernoulli	77	600 (1,482)	298 (736)	13.11.17 – 26.11.17
Monsanto	SV5697	78	829 (2,048)	0	13.01.18 – 23.01.18
Hazera	Trevaskis	78	831 (2,052)	0	20.01.18 – 07.02.18
Monsanto	Carantic	83	893 (2,206)	0	31.01.18 – 26.02.18
Syngenta	Bretten	79	849 (2,097)	0	07.02.18 – 10.03.18
Clause	CLX 33611	84	902 (2,228)	0	25.02.18 – 13.03.18
Syngenta	Caylen	84	870 (2,149)	32 (79)	02.03.18 – 23.03.18
Clause	Mascaret	83	890 (2,198)	0	07.03.18 – 30.03.18
Elsoms	Tempest	82	724 (1,788)	197 (487)	31.03.18 – 09.04.18
Hazera	AK 2706	83	778 (1,922)	143 (353)	02.04.18 – 12.04.18
Hazera	Vedis	86	858 (2,119)	90 (222)	04.04.18 – 11.04.18
Clause	CLX 33518	83	885 (2,186)	0	09.04.18 – 12.04.18

INFO: Transplanted on 14/07/17 and 25/07/17 29 cultivars from seven seed houses 8,580 plants/acre

Spring cabbage – top performing cultivars 2017/18

Seed House	Cultivar	Comments	Average weight of marketable green
Monsanto	Winter Supreme	Very uniform. Very good greens. 86% crop marketed. Compact	300 grams
A. L. Tozer	Wintergreen	Variable sized greens. 73% crop marketed	236 grams
Nickerson	Kempsey	Uniform. 80% crop marketed. Good greens. Easy to pack	280 grams
Monsanto	Winter Special	Very uniform. Very good greens. Dark green. Short nodes. 93% of crop marketed	328 grams

INFO: Transplanted on 07/09/2017 Harvested on 02/04/2018 Spacing 57.2cms between rows, 20.3cms between plants 31,000 plants/acre

For these crops, consistency in yield, quality of product, harvesting periods and suitability for various end users determines which cultivars are grown year-on-year. Future work of the project will also include comparing the use of different foliar feeds/trace elements throughout the growing season.

To keep updated with the latest trials and results, visit the Duchy website – www.cornwall.ac.uk/rosewarne-brassica-trials

EAMU LATEST

TRIALS AND TRIBULATIONS

Now is the time to put planning into action,
writes AHDB Crop Protection Scientist Bolette Palle Neve



Bolette Palle Neve,
Crop Protection Scientist, AHDB
bolette.palle-neve@ahdb.org.uk

We're now out the other side of one of our busiest times of the year, where we plan trials for the months and year ahead. However, that doesn't mean all of the hard work is done. Many of the trials funded by AHDB Horticulture focus on crop protection and we work hard to make sure the right plant protection products are chosen for inclusion in our trials.

In general, we try to pick products where there is a clear route to the UK market. This means that the active ingredient is approved in Europe and the approval holder supports use in the crop in question.

Sometimes we include products that are further from market if our options are limited – this is particularly true for herbicide trials as very few new products are being put forward for trials.

As part of the EAMU programme we also conduct residue trials to support approvals in edible crops. In 2017 we invested £350,000 in such trials to support approvals in Brassicas, herbs, cane fruit, alliums, cucurbits and sweetcorn. This work is essential for some of the smaller crops where approval holders consider that the potential market is too small.

Plans for 2018 residue trials have been finalised and we are currently planning to generate data for two herbicides in celery, Flexidor in pumpkin, Dual Gold for sweetcorn grown under plastic covers, fungicides in rhubarb, outdoor herbs and protected oriental cabbage, as well as an acaricide in protected cane fruit. Where possible, we work with colleagues in other EU Member States to share the cost of data generation. This allows us to get better value for growers. We are hopeful that this approach can continue after Brexit but at the moment it is not clear what will happen from 2020 onwards.

EAMUS IN FOCUS Gamit 36 CS

With linuron due to be withdrawn in the near future (3 June 2018) SCEPTREplus trials in 2017 and 2018 have focussed on finding potential replacement products and understanding how they are best included within current programs.

Gamit 36 CS was one of the products included in the SCEPTREplus research conducted by Angela Huckle of ADAS. Some phytotoxicity was identified, early after applications, and growers are advised to refer to the SCEPTREplus report.

The phytotoxicity was due to heavy rainfall after spray application, giving rise to bleaching on the tips of the leaves and also a reduction in plant population. This bleaching is known to occur in Brassica crops if the product gets washed down into the rooting zone and this is also a risk when used in carrots. Where heavy rain did not occur after application of Gamit 36 CS this phytotoxicity did not happen and the crop was unaffected.

“It should be a useful product for growers to use post-harvest, but care needs to be taken with product application timing and consideration of the weather forecast following application,” explained Angela.

To discover all of the latest EAMUs visit horticulture.ahdb.org.uk/eamu-news

RESISTANCE IS FAR FROM FUTILE



Head of Crop Health & Protection at AHDB, Jon Knight, responds to the recent spate of reports of pest resistance in the UK

When news breaks of resistance to actives by pests, weeds and diseases, especially if a number of reports occur in a short space of time as has happened in late 2017/early 2018, it can perhaps seem to the casual observer that the sky is falling – and for growers it is yet another headache to deal with. Fortunately, that is not the case.

It is true that some might say we're currently caught in somewhat of a perfect storm: fewer and fewer actives are remaining available for growers to use to combat pests, decades of less-than-perfect choice and application of actives has led to increased opportunity for pest resistance, and warmer winters are providing an increasingly tolerable climate for migrating pests.

There have also been a number of new cases of insecticide resistance in the first few months of this year that have no doubt helped to fuel any view that resistance in pests is reaching a tipping point; in January this year it was discovered that diamond back moth was successfully overwintering in the south west of England and that resistance to pyrethroids was found in individuals from that area; in February willow carrot aphid (*Cavariella aegopodii*) was found to be resistant to pyrethroids insecticides (although this was a clone kept in a laboratory since 2014, indicating it has been present for longer); and also in February it was confirmed that onion thrips (*Thrips tabaci*) resistant to spinosad had been discovered.

When inundated with such a plethora of cases in such a short timeframe, understandably this might cause some concern. However, it is certainly not time to panic; the problem in the UK, while still challenging, is not as great as it is globally, and there are still a number of quality and effective tools that UK growers have in their arsenals to successfully tackle pests in their crops.

Critically, at AHDB we're constantly working with organisations such as the Chemicals Regulation Division (CRD) to provide new ways of dealing with pests, disease and resistance. For example, our Crop Health & Protection team recently managed to rush through an EAMU for Ranman Top in protected crops of cucurbits, aubergine and tomato. The EAMU was secured in response to a sudden increase in reports of *Phytophthora infestans* in tomato, and it provides a new mode of action, enabling growers to quickly deal with this fungus.

Furthermore, our flagship SCEPTRE project (now followed by SCEPTREplus) aimed to address key gaps in crop protection, trialling a variety of known actives to see if they could have further, previously untested uses on other crops. During the five-year project, 38 trials were carried out on priority crop protection problems along with 137 field, greenhouse and cold-store experiments. These culminated in 10 successful on-label approvals and 12 EAMUs.

It is important that all growers consider resistance management strategies, including the use of a proper Integrated Pest Management strategy, when instigating pest control activities on their crops to maintain the active ingredients that we do have at our disposal. By following sound advice and working together we can ensure a successful future in the fight against pests.



STOPPING THE ROT

Will there ever be a biological solution to prevent *Phytophthora* root rot from damaging cane fruit crops? Dr Erika Wedgwood, ADAS, reveals the work being done to hopefully achieve that aim

Phytophthora root rot (often caused by *P. rubi*) has long been an issue for growers of cane fruits as the disease leads to cane dieback and reduced emergence of primocanes. It has caused major issues in soil-grown cane fruit plantations, and is one of the factors in growers changing to container-grown production. It is often not obvious if planting material is infested until more roots become infected, followed by stem base damage leading to wilting. In both soil and substrate there is also potential for infestation by flagellate zoospores of *Phytophthora* via untreated irrigation water.

Work on *Phytophthora* root rot is being carried out as part of a larger project seeking to tackle major pest and disease problems on cane fruit in which practices for achieving benefits from biological control measures are being investigated.

PROTECTANT TREATMENTS

Work within AHDB project SF 158 has confirmed that a transition from 5°C to ambient triggers a flush release of zoospores from *P. rubi* sporangia and it was hypothesised that this could be relevant to the development of infection in springtime. In strawberries and grapevines, research elsewhere has also indicated that cold-storage has increased their susceptibility to crown and root pathogens on planting, and this project has started to examine if microbial products applied to raspberry long-canes either before, or soon after, cold-storage could protect them from zoospore infection. On cane fruit, the biofungicide Serenade ASO (*Bacillus subtilis*) can be applied to outdoor crops as a single drench and an experimental permit is required for drenching under protection. Prestop (*Gliocladium catenulatum*) can be drenched up to three times outdoors, whereas edible protected crops can be treated at four to six week intervals. The mycorrhizal product Root Grow HYDRO (not a fungicide) can be incorporated into the substrate at potting. If these beneficial microbes can colonise plant roots then hyper-parasitism or competition with root infecting pathogens and stimulation of the plant's own defence mechanisms is possible. Paraat (dimethomorph) is the standard drench currently used by most growers. In preliminary experiments on agar plates both Prestop and Root Grow HYDRO colonies reduced the spread of *P. rubi* mycelium. Serenade ASO and Paraat were tested by being added to molten agar and both killed *P. rubi* mycelium, the activity of Serenade ASO being attributed to the metabolites produced by the *B. subtilis*.

In the first year of the project, Tulameen root cuttings were treated in propagation trays under protection in April, May and June/July and then again in October when potted up. After cold-storage and potting in spring into 10-litre containers the plants were assessed and further applications made over two cropping years outdoors.

A second batch of pots were not cold-stored and were inoculated with *P. rubi* in a polytunnel at ADAS Boxworth after potting in spring. In propagation trays following the application Prestop the leaves became a yellowish green for a few weeks, but no phytotoxicity arose following application of any of the products to mature plants at either location.

CROP GROWTH

Significantly more primocanes were produced in ambient overwintered inoculated plants in the tunnel at Boxworth by November 2016, after applications of Prestop, Root Grow HYDRO and Serenade ASO (with a mean 2.8 canes) compared with a mean 1.5 canes for the untreated and Paraat treated plants. At the start of the second fruiting year in 2017 of the outdoor crop significantly more primocanes had grown by May in plots treated with Serenade ASO the previous spring, producing a mean 5.5 canes compared with an average 3.1 for the untreated and Paraat treated plants. Across the two cropping years no other differences were seen in either plant vigour or fruit yield. Primocane production can be reduced by *P. rubi* infection and so increasing the number of primocanes available for selection as floricanes could be beneficial.

PHYTOPHTHORA ROOT ROT AND STEM DIEBACK

Further work has commenced on long cane Tulameen to examine any benefit from drenching with either Prestop or Serenade ASO, in comparison with Paraat, either just before or following cold storage. The plants will be grown on in a tunnel alongside outdoor overwintered containers that will have been treated at the same times. After potting (and drenching, if required) inoculation with *P. rubi* will be carried out in April and cane vigour, stem dieback and root rot will be examined during the year. It will then be possible to determine if pre-winter treatment may benefit plants better than post-winter and if plant susceptibility to root infection is affected by how they achieve their winter chilling period.

AHDB project code: SF 158

Project lead: Dr Erika Wedgwood, ADAS

AHDB contact: Scott Raffle


“ If beneficial microbes can colonise plant roots then hyper-parasitism or competition with root infecting pathogens and stimulation of the plant’s own defence mechanisms is possible ”



Row of young cv Tulameen ADAS. (Current experiment: raspberry pots, some having been treated, before overwintering either outside or in cold-storage)



Cold store crate with plants ADAS. (Current experiment with plants ready for cold-storage)



Thanks to their small size and tendency to remain hidden away in flower buds, it is often difficult to detect the presence of Western Flower Thrips (WFT, *Frankliniella occidentalis*) before the signs of damage become visible, such as the fruit bronzing seen here.

Feeding by larvae and adults causes bronzing of the fruit, which makes the crop unmarketable, leading to high financial losses for growers and, in some cases, complete crop loss. WFT is particularly difficult to control because it has developed resistance to all the crop protection products available to UK strawberry growers.

AHDB project code: SF 156

Project leaders:

Jean Fitzgerald, Glen Powell,
Adrian Harris, NIAB EMR

AHDB contact: Scott Raffle

DETECT AND PROTECT

Glen Powell, Jean Fitzgerald and Adrian Harris, NIAB EMR, reveal the work they've been doing to help identify levels of pests and their natural predators in fruit crops

Growers currently rely on introductions of the predatory mite *Neoseiulus cucumeris* (formerly called *Amblyseius cucumeris*) to control WFT. This natural enemy is relatively inexpensive to mass produce and can therefore be released regularly and in large numbers. However, it only predate the youngest stage (first-instar larvae) of the pest. Previous work at NIAB EMR has shown that, if sufficient numbers and multiple releases of *N. cucumeris* are made in the crop, WFT populations on the flowers and fruits decrease and fruit damage is reduced. For effective biocontrol, a high proportion of flowers and fruits must contain the predatory mites. Unfortunately the mites are even smaller than their thrips prey and also tend to hide away, so are very difficult to spot on the surface of crop plants. It is therefore not always easy to assess whether the released *N. cucumeris* populations have established adequately and are giving good control of the pest. For this reason, we have developed a straightforward and easy method for detecting the presence of WFT and *N. cucumeris* and estimating their populations in the field.

The method combines a hand-held extraction device with a volatile fumigant, causing mites and thrips that are present on sampled fruits or flowers to drop onto a surface where they can be observed and counted. The following description may sound complicated, but in practise the method is relatively simple to set up, provides a robust in field method and draws on background work from the project to provide corrections of counts to actual populations.

The cylindrical device (Figure 1) was constructed by modifying and joining two 'Lock & Lock' plastic tubs with 'Clip Seal' removable lids, with a disc of 3mm aluminium 'Mod Mesh' forming a sieve partition at the junction between the tubs. The top lid is removed and plant samples (e.g. groups of approximately 20 button fruit or flowers) are placed in a single layer on the upper sieve surface, next to a newly-opened vial containing a cotton wick wetted with a small quantity (1g) of methyl isobutyl ketone (MIK). The top lid is then closed to create a seal, allowing the MIK to act as a fumigant for a 20-minute exposure period, anaesthetising any thrips, mites or other invertebrates present. The base can then be removed, allowing small bugs that have fallen from the plant material to be counted and identified using a hand lens or microscope.

We have carried out laboratory-based calibration experiments to investigate whether the device provides a reliable assessment of numbers of mites present on plant material sampled. A paint brush was used to transfer known numbers of *N. cucumeris* to strawberry button fruit under a microscope, at a range of different densities from zero to 10 mites per fruit. The number of mites recovered using the extraction technique could then be compared with the number known to be present on the fruit, in order to assess whether the device gives a reliable assessment of numbers. These experiments showed that approximately half of the mites that are present on the fruit surface actually fall off when exposed to the MIK fumes, allowing them to be counted under the microscope. So the extraction technique does not allow us to observe all the mites that are present, but we can double the number of mites counted in each laboratory sample to obtain a reliable estimate of numbers present.

“ We have developed a straightforward method for detecting the presence of WFT and *N. cucumeris* in the field ”

We have also tested the device under field conditions, using it to sample populations of WFT and its predators, including *N. cucumeris*, in commercial strawberry crops. The method has proven particularly useful for sampling *N. cucumeris*.

When groups of 20 button fruit or flowers were placed in the device, it was possible to observe and count the fumigated mites, even when none could be detected when plant surfaces were initially inspected using a hand lens. In these field tests, the sampled fruits and flowers were removed from the extraction device and placed into tubes of 70 per cent ethanol, allowing us to take samples back to the laboratory and thoroughly wash off, filter and count any bugs that remained on the plant samples instead of being counted in the field. This ethanol wash technique recovers more insects and mites than the extraction device, but is much more time-consuming and labour-intensive. Under field operation with more variable conditions and using a hand lens rather than a microscope, the recovery of mites from button fruit using the extraction device represented a lower proportion (27 per cent) of those present on the plant surface, compared with the recovery levels in the laboratory (57 per cent). It would therefore be advisable for users to multiply field-extracted counts by a higher correction factor (3.5) in order to estimate numbers of *N. cucumeris* present on fruit sampled in the field. The device was more effective at recovering WFT from fruit in the field. Only a small proportion of WFT that were present on button fruit could be observed directly by examining the fruit surface using a hand lens. However, when the extraction technique was used, a much higher proportion (68 per cent) of WFT could be observed and counted. Using the device will therefore give growers and agronomists a much better chance of detecting WFT early, when the pest is present in the crop and starting to damage fruit but bronzing is not yet visible. The device can also reveal whether *N. cucumeris* continue to be present and well distributed within the crop following release, allowing more informed decisions regarding the need and timing of further releases.



Figure 1. Extraction devices when empty (a) and containing 10 button fruit when set up for experiment (b) overhead view with the MIK dispenser visible, (c) side view

TRYING TO STAY A STEP AHEAD

Dr Steve Foster, Rothamsted Research, looks at the AHDB project which monitors and manages insecticide resistance in UK pests



Insects are remarkable creatures as they can adapt very quickly over the course of just a few generations. This can often spell trouble for growers as it makes some of them major pests that they battle against to protect their crops. An important part of our control armoury are synthetic insecticides which can be highly effective and often act quickly. Unfortunately for the grower, many pests have the capacity for rapid adaptation and thus evolution of resistance to insecticides. So, keeping a close eye on resistance is vital to ensure that growers, advisors and chemical regulators have up-to-date information to base their control decisions on. This is being done through a cross-industry-funded project (collaboratively-funded by agrochemical companies, crop commodity boards, including AHDB, and agronomy companies) and is being led by research entomologist and Chair of the Insecticide Resistance Action Group (IRAG-UK), Dr Steve Foster, who is based at Rothamsted Research.

The work includes monitoring UK pest samples for evidence of reduced sensitivity or stronger resistance to a range of insecticides, particularly after reports of control failures. The results are showing the scale of the problem in a broad range of pest species. It is important that any developments in resistance are picked up early so that industry can respond by not using insecticides with the same mode of action where there's an alternative available. This approach is helping to slow down resistance development.

A major part of the monitoring work is focusing on live samples of peach-potato aphids (*Myzus persicae*) that have been collected from open fields and protected environments around the UK. These samples are being screened with the insecticides available for aphid control in the UK using lab-based bioassays to measure their efficacy and look out for any signs of shifts in response that could lead to strong resistance. This close vigilance is safeguarding the contribution of these compounds to *M. persicae* management and control as this pest can damage a wide range of horticultural and agricultural crops,

and it has proved itself to be particularly adept at developing insecticide resistance, e.g. it is currently strongly resistant to pyrethroids and pirimicarb in the UK.

Why some insect species evolve multiple forms of resistance, and why others do not, is probably caused by the number of host crops the pest is found on, its population size and exposure to insecticides. In *M. persicae* at least four different resistance mechanisms are now known. These are based on either increased breakdown of insecticides (metabolic resistance which intercepts insecticide molecules before they can reach their targets in the insect) or modification/mutation of the target proteins within the insect (which stop the insecticide molecules binding and working).

The continued development of insecticide resistance means that we may run out of effective control agents as there are few new actives coming onto the market. So, we need anti-resistance management strategies to prolong their life and have tactics in place in anticipation of the arrival of new forms of resistance, either through mutation or coming from abroad, such as strong (Nic-R++) neonicotinoid resistance now seen in *M. persicae* in southern mainland Europe and north Africa. This is a 'spectre on the horizon' and reinforces the need for continued resistance monitoring. The good news is that the monitoring work has shown no evidence of Nic-R++ aphids in the UK. However, their appearance in this country would have very serious repercussions for neonicotinoid seed, spray and drench treatments on a range of crops, including brassicas, salads and ornamentals. In addition, the presence of resistant aphids would accentuate the risk of the evolution of resistance to alternative, non-neonicotinoid compounds, such as pymetrozine, flonicamid and spirotetramat, which are currently effective against *M. persicae* in the UK. Screening aphids from protected environments, such as glasshouses and polytunnels, remains crucial as they are more likely to carry resistance mechanisms seen abroad, as the monitoring work suggests that some of these have probably come in on imported plant material.

Monitoring is also being done on other UK pests. This has shown pyrethroid resistance in willow-carrot aphids (*Cavariella aegopodii*), lettuce aphids (*Nasonovia ribisnigri*), grain aphids (*Sitobion avenae*), cabbage stem flea beetles (*Psylliodes chrysocephala*), pollen beetles (*Meligethes aeneus*), pea and bean weevils (*Sitona lineatus*), diamondback moths (*Plutella xylostella*) and onion thrips (*Thrips tabaci*) demonstrating that the problem is becoming more widespread. In addition, spinosad resistance was recently found in *T. tabaci*.

In addition to the evolution of resistance, insecticides are under threat from legislation. This started in 2013 when the European Commission imposed an initial two-year restriction on the use of neonicotinoid seed treatments on some flowering crops as a 'precautionary measure'. This has since been extended to the present and to all outdoor crops in response to concerns about declining bee populations throughout Europe, a phenomenon that still needs clearer understanding. The use of a smaller range of active ingredients to control the same pest pressures increases the risk of resistance development and underpins the need for the resistance monitoring provided by this project.

Continued monitoring for resistance is key if we are to make informed decisions on insecticide usage. If you suspect resistance in any UK insect pest that you are trying to control contact Steve via email stephen.foster@rothamsted.org or phone (01582 763133) to discuss sending a sample to Rothamsted for testing.

AHDB project code: FV 344a

Project leader: Dr Steve Foster, Rothamsted Research

AHDB contact: Dawn Teverson

“ *M. persicae* has proved itself to be particularly adept at developing insecticide resistance ”

The science behind: pest resistance

Insects are known for their ability to develop resistance to insecticides. Currently there are insects resistant to every synthetic chemical insecticide used. There are many factors to developing resistance. In a population of insects there may be a few individuals that carry the genes for resistance. These genes arise from mutations and are rare. In the natural environment the mutant insect is typically compromised, weaker and produces less progenies. Upon exposure to insecticides, insects that do not carry the resistance genes die, thus allowing the individuals with the resistance genes to survive and reproduce, creating more resistant insects. With every generation the number of resistant insects increase¹.

1) http://www.bt.ucsd.edu/pest_resistance.html

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SHARING IS CARING

Ed Hardy, FEC, delves deeper into GrowSave's Next Generation Growing Clubs and reveals how growers can benefit from new ways of thinking

Over the past few months, GrowSave has been running a pilot study group implementing Next Generation Growing (NGG) techniques in the UK horticulture sector. The group is a mix of growers of protected edibles, soft fruit and herbs, as well as a crop consultant. NGG expertise is provided by Mark van der Werf, a Dutch grower turned consultant, who has worked extensively on NGG in the Netherlands, where the concept was first developed.

The study group programme is based around an ethos of data sharing, made possible through the online LetsGrow.com platform, which enables growers to upload real-time data from their climate computers. Once uploaded, the whole group can view each other's data; the role of the consultant is to provide insight into how current operations can be tweaked to be more in-line with NGG principles. The group is also encouraged to discuss their views, commenting on what is working well and what needs more attention. The overall aim is to increase productivity while also reducing energy consumption, as has been successfully demonstrated in the Netherlands by growers adopting the NGG approach.

For many of the group, Next Generation Growing is a new concept, and some of the principles can be uncomfortable to start with, as they go against traditional growing practices. Others have already experimented with NGG in recent years,

with mixed success. The common theme among everyone though is a desire to learn and understand the theory behind the practice. Rather than just being advised on what to do, the growers are learning why the techniques have been so successful. This has been achieved through a group meeting and an online training session. Over the coming months, two further online sessions are planned, as well as another group meeting to be hosted by one of the group. Meanwhile, the growers are kept on track through regular feedback on their climate data.

As the group is comprised of a mix of crops and geographic locations, each grower should find what works for him and his crop variety. It is important, therefore, to have a good grasp of the theory so that it can be applied to what is actually being seen. There is no one-size-fits-all solution!

Importantly, this pilot project aims to introduce NGG to the UK horticulture sector. The first year is expected to be a steep learning curve for all involved, but in the medium-term, it is hoped that the techniques and concepts will be adopted by the industry as a whole. As with anything new, though, significant effort is required in the early stages to overcome initial resistance. In time, the results will hopefully speak for themselves, and many of the techniques could, ultimately, become industry best practice.

“ Rather than just being advised on what to do, the growers are learning why the techniques have been so successful ”

If you would like to know more about Next Generation Growing, please contact the GrowSave team or visit growsave.co.uk where there is a range of information on the subject.

grow save
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FERTINNOWA: THE FARMER'S POINT OF VIEW

AHDB's Georgina Key kicks off our series about fertigation with an overview of the results from a recent grower survey

FERTINNOWA aims to evaluate existing and novel techniques to improve crop fertigation across Europe by creating a knowledge exchange platform useful to growers. The project kicked off by asking growers around Europe about their water and fertigation practices. Here we outline some of the grower responses from the 531 surveys conducted, and over the next few issues we will pick out key technologies that have emerged from the project, detailing how best to use them.

OVERVIEW

The survey covered the following topics:

- Technical characteristics of farms: areas, crops, and production systems
- Irrigation water: origin, consumption, availability, quality and storage
- Technological management: irrigation management, fertilisation and equipment
- Socio-economic aspects: environmental sustainability, legislation

Results are divided into North-western, Mediterranean and Central East regions.

Although the Mediterranean region experiences the most problems, even here in the northwest, water availability is reduced at certain times of the year, despite a diverse range of water resources being used.

This is partly due to difficulties in storing water and partly due to the large quantities needed in summer, especially if a grower is more reliant on rainwater. Quality problems are country specific, however they are generally linked to pot-grown and hydroponic production (i.e. not in soil), and recirculating water for use, which can have high EC, and high levels of chloride and sodium. There are issues with pesticide residues, but to a much lesser extent.

“ The experience of the growers themselves was seen as the most widely used resource for managing irrigation ”

The experience of the growers themselves was seen as the most widely used resource for managing irrigation. Experienced growers who know their site and crops and understand when to irrigate do however use technical systems as well, including irrigation programmes, dripper volume measurements, weather forecasts, and tensiometers. Fertilisers are added according to the nutrient status of the crop mainly based on soil analysis data.

In the UK foliar analysis is mainly used to diagnose problems whereas elsewhere in Europe it is used on a regular basis for monitoring purposes. Pot-grown or hydroponic growers tend to monitor the nutrient solution including the recirculating water where relevant. Recycling is more prevalent in Belgium and particularly the Netherlands with new waste water regulations coming into force.

With the exception of UK growers, the project found that few growers are willing to switch to other, more sustainable, sources of water. Familiar reasons are cited, including a lack of alternatives, high investment costs, technical limitations or no perceived need to change. Growers are more open to more sustainable fertigation if there is the possibility of producing better crops and yields, and reduced production costs. There is also universal interest in using new technologies to manage fertigation better, with remote automatic sensors and real-time diagnostic tools for nutrient monitoring at the top of the wish list.

While UK growers generally expect little of public bodies regarding production, there was interest from growers in a carrot (subsidies to improve fertigation) rather than stick (restrictive regulation) approach being used, as well as in simplifying regulations and guidelines.

GROWING SICK OF YIELD DECLINE

Yield decline is a persistent problem for coriander growers, but what causes it? Ian Singleton and Amanda Jones, Edinburgh Napier University, detail the experiments that are trying to determine just that

Coriander is an important herb worth £50 million a year to the UK economy and demand for the crop is increasing. However, many growers have reported a form of coriander yield decline (CYD). This issue is not well-defined and growers variously describe the effects as stunted plants and reduced emergence, rather than the lowered yields and root rots associated with specific pathogens. Growers suggest yield losses of 50 per cent, with effects lasting up to eight years – considerably longer than crop rotations typically used in the herb industry.

Yield decline, also known as ‘soil sickness’, is generally linked to monoculture and shortened rotations. The phenomenon is poorly understood, as symptoms vary with crop species and environment. Suggested causes include linked factors such as autotoxicity (plant toxins that reduce the growth of plants of the same species), degradation of soil physical properties, and microbial issues, all of which are difficult to pinpoint.

Early project results demonstrated that CYD could be induced under greenhouse conditions and that a healthy coriander crop had a very different bacterial community in the rhizosphere (soil close to the roots) compared to a crop showing yield decline. This fact raised questions about UK coriander crop practices: do they sometimes create poor growing conditions that induce a problematic soil microbiome?

In CP 117a, extensive pot trials are being carried out to assess crop management strategies that may reduce susceptibility to yield decline. In addition, a metagenomic study (using MinION nanopore sequencing) is underway to see how management practices affect soil microbiology. The overall aim of the project is to provide new information for growers and ultimately contribute to the wider understanding of yield decline.

Ongoing pot trials have produced a range of decline effects, with stunted plants or reduced emergence (and sometimes both). Experimental evidence has shown factors which may reduce (or maintain) coriander yield in a second crop cycle. In particular, drying of crop soils post-harvest significantly reduced potential decline. Interestingly, some growers whose coriander does not suffer from CYD allow soils to dry out post-harvest. In pot trials, this practice appeared to help maintain soil structure, also potentially affecting or ‘resetting’ microbial communities. Additionally, glasshouse trials showed that harrowing, or at the least the avoidance of surface compaction, was a key element in producing a successful second coriander crop. This could again be linked to maintaining soil structure, and consequently the associated microbiome. Preliminary results of a sterilisation experiment also suggest a reduction in the yield decline effect. This technique, not unlike the practice of solarisation used in southern Spain, again suggests a microbiological cause for coriander yield decline.

In conclusion, pot experiments have advanced previous work by showing that CYD will occur when growing conditions are compromised. Therefore, if optimum growing conditions are met, it is possible that coriander can be grown for a second cycle, without suffering from yield decline. This hypothesis has been supported by some growers, and is currently being investigated in pot trials.

“ Interestingly, some growers whose coriander does not suffer from yield decline allow soils to dry out post-harvest ”

AHDB project code: CP 117a

Project leader: Ian Singleton, Edinburgh Napier University and Science and Advice for Scottish Agriculture (SASA)

Student: Amanda Jones

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MEASURING AND MANAGING SOIL HEALTH

Do you know how to tell if your soil is healthy or if it needs a boost? Audrey Litterick, Earthcare Technical, gets to grips with methods for measuring soil health

Many farmers and growers are considering management changes with a view to improving the health of their soils. But, before you start to plan and implement major changes, it's important to define the health of your soils as they are now. Only if you have good baseline data can you effectively evaluate the impact of management changes on your soils.

Soil health is critically important to growers because there is a direct relationship between well-functioning, healthy soils and reliable good yields of quality crops. Soil health therefore has a clear impact on profit margins. Many growers have become aware that their soils have suffered following years of intensive cultivations with little or no organic matter returns.

AHDB have been investing in the GREATsoils programme since early 2015. The first, three-year, part of the programme was led by The Soil Association and involved Earthcare Technical Ltd. and Organic Research Centre. The project aimed to inspire and support fruit, vegetable and salad growers to develop the abilities and confidence to assess the health of their soils and take practical action to improve management strategies. Here, we'll take a look at what we mean by the term "soil health"; the most appropriate soil health measurement techniques for growers will be described, and we'll have a look at the ways in which one grower is looking to measure and manage soil health.

SOIL HEALTH DEFINED

Soil health can be defined as "the capacity of soil to function as a vital living system, to sustain plant and animal productivity, maintain or enhance water and air quality, and promote plant and animal health".

It has physical, chemical and biological components, all of which can be measured in various ways:

- Physical components include soil structure and the degree to which water infiltrates down through the soil profile;
- Chemical components include soil pH, crop nutrient indices and soil organic matter content;
- Biological parameters include earthworm numbers, soil respiration and the degree of diversity in microorganism populations.



“ Earthworm counts are a useful indicator of soil biology when taken regularly at similar times of the year, every year ”

The results obtained when we test soil health are strongly affected by the ways in which we manage our soils. Some aspects of your soil cannot be changed, such as soil depth and soil texture (the relative percentages of sand, silt and clay), but it is worth being aware of these properties too since they can impact strongly on the way in which soils behave under different management regimes.

HOW TO MEASURE SOIL HEALTH

Soil health is complex. You cannot assess it adequately by looking at a single measure. There are a wide variety of soil assessment methods and techniques

available. An important element of initial work in the GREATsoils project was to work with growers to identify the best methods for use in UK soils, to evaluate them and then test them in the field. Key methods include:

- Physical – soil compaction test; infiltration test; visual evaluation of soil structure; full soil profile investigation
- Chemical – soil pH; extractable P, K, Mg; base cation saturation ratio; soil trace elements; soil organic matter (Loss-on-ignition)
- Biological – earthworm counts; soil respiration; soil foodweb

KEY OUTPUTS AND FUTURE WORK UNDER GREAT SOILS

Aside from around 46 practical grower and adviser workshops conducted over the three years of the project, a range of guidance notes, case studies, videos, webinars, grower blogs and reports on the field trials/field labs have been published, all of which are available at:

www.ahdb.org.uk/greatsoils



**CASE STUDY:
BALBIRNIE HOME FARMS**

David Aglen is Farms Manager at Balbirnie Home Farms, a 1200ha mixed farming enterprise in rural Fife. His soil is a moderately varying sandy loam with a sandy subsoil. This allows a varied rotation which includes carrots, potatoes, cabbages and cauliflower as well as combinable crops, grass and forage crops for the cattle enterprise.

David said, “Nurturing the fragile structure of these soils while growing mechanically intensive crops is becoming a major driver of the rotation. An absolute minimum level of cultivation is used for the establishment of the combinable crops along with a vegetable and root crops only being grown one year in four across the 900ha of cropped land.”

David is keen to maintain or increase soil organic matter levels on the cropped fields and to that end chose to look at the impact of using chopped straw and green compost on soil health as part of the GREATsoils project.

For the trial, David chose a 10ha field with a sandy loam topsoil which he felt was in need of some organic matter. The field was in an arable/vegetable rotation, with carrots and potatoes each being grown roughly one year in six and cereals and cover crops being grown in intervening years.

TRIAL FACTS

After carrot harvest in April 2017, the field was divided into four treatment areas. The eastern half of the field had chopped straw applied at approximately 50 t/ha and the western half no straw. The northern half of the field had compost applied at 20 t/ha and the southern half had no compost.

Soil physical, chemical and biological assessments were made prior to the 2016/17 carrot crop, during carrot growth, at barley growth stage 31 in 2017, and after barley harvest in October 2017.



Figure 1: Field trial design

TRIAL FINDINGS

Bulky organic materials can have multiple benefits to soil health including:

- Liming value (in some cases)
- Nutrient value (P, K, Mg, S and trace elements)
- Organic matter which can improve soil water holding capacity, soil structure, nutrient retention and the activity of soil organisms including microorganisms and larger soil fauna such as earthworms

Regular inspections of soil structure, through frequent test digs and allocation of structure scores (e.g. VESS) can give quick, useful indications of the physical aspects of soil health, but these can have limited value where intensive cultivations are regularly carried out.

Earthworm counts are a useful indicator of soil biology when taken regularly at similar times of the year, every year. AHDB provide a guide to counting earthworms at www.ahdb.org.uk/greatsoils

Soil respiration measurements are a relatively new method for estimating the biological life in soil on farms; further results must be gathered on different farms, soil types and growing systems in order to learn how to interpret the data gained and take actions based upon it.

DAVID'S VIEW

While there are well-established laboratory methods for soil chemical analysis and a range of practical methods for measuring soil physical properties, we are now seeing methods emerge for soil biological analysis. David feels that some of these tools have started to provide him with the reassurance that the innovations he's introducing to his mechanically intensive vegetable production system are having a positive impact on the health of his fragile soil.

AHDB project code: CP 107b
Project leader: Audrey Litterick, Earthcare Technical
AHDB contact: James Holmes

THE CHAMPION APPROACH

Want to know how to identify the champion workers in your company and improve your overall workforce performance too? Chris Rose, Owner and Independent Management Consulting Professional at Chris Rose Associates, explains how

SMARTHORT

Every business wants to improve their workforce, but not everyone knows how, or even where, to start. In this two-part series aimed at maximising the potential of your workforce, I draw on Champion projects funded by AHDB, subsequent commercial experience and a wider study of maximising performance. In this first part I will define 'Champion' and address the arrival and integration of your potential champions.

WHAT IS CHAMPION?

Champion - One that is clearly superior or has the attributes of a winner

(Definition provided by Online Free Dictionary)

Wherever there are many people performing the same task, job or undertaking there is invariably a wide range of performance levels. From the London Marathon to any commercial business sector, the range of performance is huge. The best are miles better than the average and the worst are way below the average.

Champions are individuals, teams or companies that began with great potential and have realised all or most of that potential. While we don't all have the same future prospects, the biggest differences by far are caused by how much of our ability we have realised.

We can define champion as 'one who achieves superb results (eg very high output), consistently (day in, day out) while meeting required standards (eg picking to supermarket specifications, not missing or leaving any ripe product) without needing constant supervision.

This could equally apply to an individual (eg Lewis Hamilton), a company (eg Apple) or even a whole country (eg Post-war Germany and Japan). However, for now, let's focus on workers (pickers, cutters, packers, etc) and supervisors.



SOURCING SEASONAL LABOUR

All agree that seasonal labour is getting harder to recruit and many feel that the calibre is below what we have become used to. A potential Brexit solution that may arise regarding seasonal labour is that the Government will make some concessions to enable UK horticulture to recruit foreign labour, but with restrictions that will exacerbate the current situation. If we work on this premise, there will be little chance to pick and choose; businesses will have to take what they can get and use that precious resource efficiently and effectively.

In a drought, we conserve water by mending leaks, irrigating wisely and prioritising key areas. Therefore, in a period of reduced labour availability, we must conserve resource by:

- Avoiding loss – ensure everyone makes the grade and stays
- Utilise labour wisely – mechanise and automate where possible, ensure systems of production are efficient, optimise hours worked (maximum that is sustainable)
- Prioritise key tasks – be prepared to walk away from marginal crops, delay non-harvest tasks, harvest only class 1 rather than lower grading

AVOIDING LOSS – LOOKING AFTER YOUR WORKFORCE

The big picture is that UK horticulture must become more attractive than other countries and other manual work. Your piece of the jigsaw is to ensure that your business is more attractive than others so that workers come, stay, thrive and spread the word. Many businesses have increased the proportion of returnees they have and also encourage them to bring a relative or friend. The returnee can be a mentor to the new recruit as long as your returnees are in alignment with your requirements.

“ By the end of day two, every one of them had achieved the farm’s standards for quality and output ”

In my experience the most successful grower businesses provide:

- Very good, uncrowded accommodation and facilities
- Plenty of work – enough hours, overtime opportunities, and few or no slack periods
- Supervisors who give excellent training to competence, followed by coaching to excellence
- Opportunity to earn very well when the right attitude is combined with conditioning and experience
- Clear rules and boundaries and a consistently enforced disciplinary process for deliberate transgressors

Businesses, managers and supervisors that bend over backwards to be friendly, but don’t explain and consistently enforce rules, are less successful. They tend to have far more employment issues and a lower level of worker satisfaction.

Do you have a website, Facebook page or Twitter account? Social media is powerful and a great way to connect and engage with potential recruits. It also helps them to build a picture of the business before they arrive.

Also consider whether, if you have a short or peaky season, could you lend out labour to other businesses to ensure workers are kept happy and employed?

MANAGING EXPECTATIONS: A CASE STUDY

A soft fruit farm required 100 new recruits, whom we brought over to the UK on two coaches from Poland. They had been selected in their home towns from an initial group of 150 and the process included showing a video of the business, being honest about the nature of the work and that it could be hard (strawberry picking at ground level). Around 25 walked out at that point, while more were rejected in interview.

On arrival, we had Polish speakers welcome them and in four groups of 25 explain what would happen immediately and over the following two days: we would allocate accommodation, provide time to

get settled, organise a trip to a supermarket, complete induction forms, give them time to sleep, perform a classroom induction to the work (including champion picker video), take them to the field, provide 1:8 ratio training, four hours picking on day one, six hours on day two, etc.

We then proceeded to do exactly what we had outlined. The new recruits saw that this was a well-organised, welcoming setup and they started to trust us quickly, which helped the induction and training. We stressed that there was opportunity to earn very well if they learned well and worked hard, but also that they would get aches and pains in the early days. We also made it clear that camp rules and picking standards must be adhered to if they wanted to stay and earn. In the training we taught efficiency as well as quality from the outset (e.g. pick

with both hands, keep the tray close, good search pattern).

By the end of day two, every one of them had achieved the farm’s standards for quality and output – something that typically took up to 10 days to get a 90 per cent success rate.

However you source your labour, I encourage you to carefully plan the recruitment, arrival, induction and training process. With the relevant key staff, map it out step-by-step. The resulting plan should excite all involved and lead to a determination to make it happen.

When you get this right, you will have a workforce that is with you rather than against you. Of course there will be issues and challenges during the season, but a great start will minimise the labour drought, increase productivity and hopefully avoid the need to walk away from crop.

Don’t miss the next article, which focuses identifying ‘champion’ performance and lifting the workforce towards that level.

THE PICK OF THE CROP

The Association of Labour Providers' Head of Policy Gillian Haythornthwaite explains how you can attract the best employees to your business



Gillian Haythornthwaite, The Association of Labour Providers' Head of Policy

Good labour is often a scant resource, no matter what industry you work in, so attracting the best is a constant challenge. But for an industry that is heavily reliant on seasonal labour, the potential for a dwindling pool of available quality workers once Brexit hits means that the need to attract and retain the best employees is perhaps more important than ever. Fortunately, there are ways to do this, and the good news is you don't have to break the bank to do so.

"Historically labour users have probably had it quite easy in that when they've needed labour they could just pick up the phone, ring a provider and labour has turned up. Of course it's not like that now so they need to be thinking about the way they're doing things," explained Gillian Haythornthwaite, Head of Policy at The Association of Labour Providers (ALP).

SLIM PICKINGS

Recent reports by the Office for National Statistics (ONS) have shown that fewer EU workers are coming to the UK in the wake of the 2016 referendum result. These are typically the types of workers who would end up in the vital manual roles that need fulfilling in the UK's farms and greenhouses. This presents new challenges for UK horticulture to overcome, says Gillian.

"A lot of seasonal workers will keep coming back to the same place year-after-year, but at the moment because of Brexit there's a great feeling of uncertainty about whether that will continue and I know some businesses have lost labour to other parts of Europe because of that. So I think it is about building confidence and talking about the agreements that the UK Government have got in place that they will be able to continue to work here."

Recruiting from further afield, where English language skills are perhaps less developed also poses significant issues for horticultural business that they haven't had to face in such large numbers previously. But whatever their English language skills, providing a

supportive and trusting environment can help to settle workers into your business, help them to hit the ground running, and display your business in a positive light, explains Gillian.

"I think historically, workers have come into the UK and their English language skills have been reasonable, and therefore it's been possible to put them to work and train them as they're working. People are now going further and further afield to source the labour and they're going to countries where English is not well developed. So what we're seeing is that these workers coming into the country now sometimes have little or no English and that puts a big strain on any business," she elucidated. "We're now seeing some organisations setting up training or learning centres to be able to train people better. So that first bit when they arrive is a more supportive experience so that that they can keep more of the people that have been recruited. What you don't want is whenever you've recruited these people, that they get here, they last five minutes, and then they're gone and you have to do it all again."

HONESTY IS THE BEST POLICY

One of the best tips Gillian offers for ensuring you build trust early on with workers and retain their services is also perhaps one of the simplest, yet often overlooked.

"It's vital to be honest with your workforce," enthuses Gillian. "You've got to explain to people what is to be expected. If they've got it in their mind what they're coming to do and that it's all going to be rosy and wonderful and then they turn up and it is completely the opposite, then they're not going to stay. Obviously you don't want to make it sound dreadful, but you need to be honest about it; for example, if it is outside work, then explain the amount of hours that are spent outside, and the amount of hours you can guarantee. Maybe you can't guarantee

it for everybody, but at least for the vast proportion of your workforce."

MEET THE LOCALS

Efforts to entice workers from further afield shouldn't only be limited to other European countries either. Word of mouth is very important among the workforce, so a positive opinion of your business and becoming well-known and respected in the local area can also do wonders for your business.

"In terms of being seen as a good place to work, you can actually achieve this locally by getting involved in things like charities, working with organisations locally, and promoting yourself locally. So, when seasonal workers come over from other countries they might start working somewhere else but not like it and see an option to come and work for you because they've heard good things," reveals the ALP expert.

Given the premise that horticulture is competing with other similar industries for the same pool of workers, then some might argue that the answer is to simply offer higher wages to entice people onto growers' farms. However, that likely wouldn't work and would come with its own set of problems, reasons Gillian.

"The wage issue is quite difficult. I'm not sure the answer is just to increase the rate because then you'll have to increase the rate for everything. That obviously then puts the cost of food up, which depends on whether or not the retailer and the public are willing to pay more for their food. Again, there are lots of other jobs out there that are (arguably) better than doing agricultural work – out in the fields, cold, wet and quite physical – so therefore you'd have to move the rate up a lot. I think it is really about making it more attractive as a job; making it more about the facilities, selling the fact that it's out in the open air, making it a good place to work with a good reputation. That's probably the more realistic way of doing things."

“ When they needed labour they could just pick up the phone, ring a provider and labour has turned up. Of course it's not like that now ”



IT'S GOOD TO TALK

Perhaps the easiest way to retain a great workforce is one that some of the best companies are already doing. Businesses that treat their seasonal labour as easily expendable and don't make the effort to make connections with individual workers are less likely to see those workers return the following year. As Gillian explains, the relationship is everything:

“Over the years a lot of businesses have developed very good seasonal worker relationships and they've kept in touch with them.

If you're not doing that then you can't expect workers to go home and then just turn up again next year. You really have to keep that connection with them. To keep people coming back again you've got to develop ways to keep in touch with people that you already know and make it more attractive, make it a nice place to come when they come back the following year, to make them feel valued.”

To find out more visit labourproviders.org.uk

BUDDING RESULTS FROM THE BPPC

Jill England, ADAS, provides an update on the exciting developments from the Bedding and Pot Plant Centre's 2017/18 research results



The Bedding and Pot Plant Centre (BPPC), located at Baginton Nurseries, Coventry, was established in 2014 and is now preparing for its fourth year of trials work. Funded by AHDB Horticulture and run by ADAS, the Centre aims to address industry technical challenges via a programme of work to trial and demonstrate new product opportunities and practical solutions to problems encountered on nurseries. The work programme is guided by a grower-led management group that includes members of the British Protected Ornamental Association (BPOA) Technical Committee, representatives from Baginton Nurseries and growers representing both the bedding and pot plant sectors.

Last year's trials focused on several issues including plant growth regulators (PGRs), hellebores, and a leaf spot symptom on verbena. Here, Jill England summarises the findings from these and other trials:

IMPROVING CUTTING SUCCESS

Inspired by the work of Dr John Dole (North Carolina State University Cooperative Extension) this trial was developed to resolve cutting quality issues that establish during delays in transit or incorrect storage conditions. The 2017 trial assessed treatments applied alone and in combination, to cuttings of Geranium Green Leaf Series 'Bianca'. Products included were: Omex SW7 (0.5 L/ha), Signum (1.35 kg/ha), Rhizopon AA (six

tablets/L), Serenade ASO (10 L/ha) and water (control). Treatments were applied either as a spray, quick dip (five seconds) or long dip (30 minute submersion) to two batches of cuttings on 3 March and 6 March.

The results indicated that simple, cost effective treatments can provide the best results. For example, rooting can be improved significantly simply with a water only quick dip, also evident in the 2016 trial. Rhizopon AA appeared to improve

rooting when applied in combination with a number of other products or alone; in the case of the latter, cutting quality was also improved. In general, the treatments did not improve cutting quality, and some caused deterioration. The combination of Omex SW7 + Signum (long dip) is not a suitable treatment for geranium cuttings. Cutting dipping should of course follow best practise to avoid cross contamination of any pest and disease on incoming material.

PLANT GROWTH REGULATOR (PGR) EVALUATION

Two trials were carried out in 2017 to evaluate the efficacy and phytotoxicity caused by a range of PGRs on bedding and pot plants, including poinsettia.

The active ingredients of the products trialled were predominately anti-gibberellins, which inhibit gibberellin production at various stages in its biosynthesis, and can be arranged into three broad groups: 1) Quaternary Ammonium Compounds (QAC), e.g. chlomequat chloride (Stabilan 750) and mepiquat chloride (Product containing Mepiquat chloride/prohexadione-calcium and a component of Terpal), which inhibit gibberellin production early in the process; 2) triazoles, e.g. paclobutrazol (Bonzi, Pirouette), propiconazole (Bumper 250 EC) and myclobutanil (Systhane 20 EW); and 3) a group which prevents gibberellin production late in its biosynthesis: prohexadione calcium (Regalis Plus, Mepiquat chloride/prohexadione-calcium product), trinexapac-ethyl (Primo Maxx II, Moddus and Cutaway) and daminozide (B-Nine SG, Dazide Enhance). The exception was ethephon (a component of Terpal) which breaks down within the plant to produce ethylene. Of the three groups, the triazoles are the most active, although the level of activity varies within this group.

Products not currently authorised for use on protected ornamentals were applied under experimental permit.

Subsequent to this trial, Terpal and Primo Maxx II have been authorised for use on ornamentals under EAMU 0151/18 and EAMU 0621/18 respectively. The product containing Mepiquat chloride/prohexadione-calcium is not currently approved for use in ornamentals. However, AHDB have submitted an EAMU application for this use and expect an outcome later this year.

BEDDING AND POT PLANTS

PGRs were trialled on Begonia semperflorens 'Heaven', Dianthus 'Festival', Geranium 'Horizon', Pansy 'Matrix', New Guinea impatiens 'Divine Cherry Red' and Zantedeschia (twelve varieties from the 'Captain Series'). Spray and drench applications of the Mepiquat chloride/prohexadione-calcium product, Regalis Plus, Terpal + Activator 90, Primo Maxx II, Moddus and Dazide Enhance (reference product) were applied at full label/EAMU rate. Key findings from this trial were:

- Terpal + Activator 90 was the most promising of the products tested, controlling growth of all subjects when applied as a spray, although the rate used appeared to delay flowering in New Guinea impatiens and pansy
- The Mepiquat chloride/prohexadione-calcium product showed promise in controlling the growth of dianthus
- Spray applications of Moddus and Regalis Plus appeared less effective than some other products, however only one application was made to all species due to label restrictions. No phytotoxicity was recorded by either of these treatments at the final assessment
- Drench treatments of most products tended to be too strong, and lower dose rates will be tested in 2018

In 2018, promising treatments from 2017 will be taken forward and rates refined for both spray and drench application on Dianthus 'Festival', Geranium 'Horizon', Osteospermum 'Akila' and Pansy 'Matrix'. Products to be tested include the Mepiquat chloride/prohexadione-calcium product, Terpal, Regalis Plus, Primo Maxx II and Pirouette (reference product).

Drench applications can be labour intensive and so expensive to apply, so a second trial in 2018 will look at drench application of PGRs on plugs of the same species prior to transplant, with a view to reducing application costs.

POINSETTIA

Spray applications of Medax Top, Regalis Plus, Terpal + Activator 90, and Primo Maxx were made at full and half label rate, and Stabilan 750 was applied at the 2016 EAMU rate (reference) rate. The fungicides Bumper 250 EC, Systhane 20 EW (reference, no longer approved) were applied at label/EAMU rate, Bumper 250 EC was included as an alternative to Systhane 20 EW to control powdery mildew. Key findings, compared with Stabilan 750, were:

- Terpal + Activator 90 applications at both dose rates reduced poinsettia growth although bract size was slightly reduced
- Medax Top, Primo Maxx II and Regalis Plus reduced growth but caused phytotoxicity, suggesting potential for growth control at lower dose rates
- Bumper 250 EC caused minor leaf crinkling and reduced growth, which should be taken into consideration when applying Bumper 250 EC to control powdery mildew

In 2018, application rates will be refined to reduce phytotoxicity, and the trial will include paclobutrazol. Efficacy of selected PGRs will also be evaluated in combination with the adjuvant Elasto G5; if successful, this could enable growers to reduce the rate of PGR used at each application.

ADVANCING FLOWERING OF COLOURED HELLEBORES

The market for hellebore grown as pot plants has increased over the last five years as new seed and micro-propagated varieties have become available. This trial aimed to advance flowering of selected hellebore varieties to meet the pre-Christmas marketing window.

The varieties 'Anna's Red', 'Molly's White', 'Penny's Pink', Helleborus Gold Colleccion (HGC) 'Madame Lemonnier', HGC 'Paradenia' and 'Royal Emma' were subjected to cold treatments (2°C, 12 hour day/night, 100 watt incandescent light) in two batches for six weeks from mid-August and mid-September.

- The mid-August cold treatment advanced flowering in 'Anna's Red', 'Madame Lemonnier', 'Paradenia', 'Penny's Pink' and 'Royal Emma', and advanced bud development in 'Anna's Red' and 'Royal Emma'
- The mid-September cold treatment advanced flowering in 'Madame Lemonnier' and 'Paradenia', and advanced bud development in 'Molly's White', 'Penny's Pink' and 'Royal Emma'
- Flowering of 'Molly's White' was not advanced by either cold treatment

'Anna's Red' and 'Paradenia' were too tall, based on a height specification of 20-30cm. There were some quality issues; 'Paradenia' in particular was stretched by both cold store treatments and flower colour started to fade in 'Penny's Pink' and 'Anna's Red', likely due to the relatively warm glasshouse temperature.

SHELF-LIFE PERFORMANCE OF WHITE HELLEBORES

The ideal hellebore variety for marketing as a pot plant is floriferous, to maintain flowering over a long period, and has flowers that do not fade with minimum stamen drop. A trial was devised to evaluate shelf-life performance of five hellebore varieties: HGC 'Wintergold', HGC 'Jesko', 'Royal Emma', 'St Antonia' and 'St Lucia'. Plants were potted in week 16 and grown outdoors until flowering. Four plants per variety were subjected to shelf-life conditions (20°C, 12 hour day/night, 1000 lux light) for four weeks from week one, 2018.

HGC 'Wintergold' and HGC 'Jesko' were the first to flower in weeks 25 and 36 respectively. Newly open flowers of both varieties during shelf-life turned green very quickly. 'St. Antonia' and 'St. Lucia' produced many white flowers while outside and when transferred into shelf-life conditions petal colour faded after approximately 11 days. The plants produced few buds during shelf-life, and flowering was short-lived. 'Royal Emma' was the best performing variety under shelf-life conditions and, with sustained bud and flower production and a seven day timeframe for progression from bud to open flower, showed most promise as a house plant. However, 'Royal Emma' was the last variety to flower, which may have contributed to its promising shelf-life performance compared with the other varieties.

“ Terpal + Activator 90 was perhaps the most promising, controlling growth of all bedding plant subjects when applied as a spray ”



TABLE 1.

White hellebore trials: Flower development and colour change from the start of the shelf life test (04.01.18) until week 4 (25.01.18)

	HGC Wintergold	HGC Jesko	Royal Emma	St. Antonia	St. Lucia
04.01.18					
08.01.18					
11.01.18					

VERBENA LEAF SPOT AND CHLOROSIS

Symptoms including necrotic leaf margins and spots, and chlorosis appearing both in propagation and post-transplant stages are intermittently experienced in commercial verbena production. Symptoms have not been associated with any pathogens and tend to be worse in blue flowered varieties.

The 2017 trial investigated the influence of plant nutrition (growing media pH 4.5 and 6.5); irrigation regime ('wet' and 'dry'); environment (ambient and humid) and water quality (high EC borehole water, rainwater and a 50:50 blend of the two) on symptom development in *Verbena* 'Quartz' blue.

Irrigation regime and environment had the strongest influences, with more symptoms developing in wet, ambient conditions. The 'ideal' environment appears to be somewhere between the two growing environments tested. Consideration of vapour pressure deficit (VPD) may enable growers to determine a range within

which a balance is struck where plants are sufficiently active to maintain quality without symptoms developing.

Growing media moisture influences root development, with poorer root development in plants grown under wet conditions. This limits the ability of plants to respond during stress conditions (e.g. high light, temperature and VPD). Growing media should not remain wet for long periods and should be allowed to dry sufficiently before watering. Good root development will produce plants with more resilience against sharp increases in VPD, and temperature.

VPD (vapour pressure deficit) was generally below 0.5 kPa in the humid environment, and approaching or above 1.0 kPa in the ambient treatments; VPD between 0.4 kPa and 1.2 kPa is generally considered a target range for bedding plant production, with lower values more appropriate to plants during propagation or early growth, and higher values for late vegetative growth onwards. High VPD

(>1 kPa) imparts a strong drying effect on plants, while at 0.0 kPa VPD the air is fully saturated. Plant stress can be moderated through ensuring that plants are not produced under high or extreme VPD conditions, the appropriate range varying according to plant species.

For the plants in this trial, fewer symptoms developed in plants grown under generally low VPD conditions. Irrigation regime and environment had the strongest influences, with more symptoms developing in wet, ambient conditions. The 'ideal' environment appears to be somewhere between the two growing environments tested. Consideration of vapour pressure deficit (VPD) may enable growers to determine a range within which a balance is struck where plants are sufficiently active to maintain quality without symptoms developing.

FARM EXCELLENCE

Further information on these trials will be published shortly in the annual report. Keep up-to-date with trial progress by following the BPPC on Twitter @AHDB_Hort

The annual Open Evening will be on Tuesday 19 June at Baginton Nursery, Coventry. Further details are available on the AHDB website at: horticulture.ahdb.org.uk/events

AHDB project code: PO 019

Project leader: Jill England, ADAS

AHDB contact: Wayne Brough

ELECTRIC AVENUES

Against the backdrop of ever-increasing restrictions on the availability of effective herbicides, Lynn Tatnell, ADAS, examines one of the non-chemical solutions currently being developed – electrical weeding

Electrical weeding is not a new concept, however its adoption has been slow mainly due to the widespread use of glyphosate and other systemic and contact herbicides over the past 40 years. This technology was therefore largely forgotten about until more recently, due to a combination of herbicide resistance, a decline in the availability of herbicide active ingredients and environmental pressures to find alternative solutions. As the need to consider other options within an integrated weed management programme have increased the technology has come to the forefront again and is looking very promising.

WHY IS IT NECESSARY?

Weeds in horticultural production systems are typically controlled using a range of herbicide products. However, very few new herbicide active ingredients have been developed over the last ten years or more, a good number of active ingredients have been revoked for various reasons and there is an ever increasing risk of resistance to those that remain.

Electric weeding is just one of a number of alternative physical approaches to weed control, which include solutions based on laser, thermal (flame, hot water, steam, hot foam etc.), infrared radiation (IR) and microwave radiation technology.

The principle behind electric weeding is straightforward, electricity penetrates the vascular system of the weeds boiling the water in the plant cells, killing it. The system is more effective on non-woody plants which naturally have a higher water content. Established weeds, especially those which spread via rhizomes, can grow back after treatment (but less vigorously) so multiple passes have to be made before they are fully controlled.

The technology is non-chemical, with no soil disturbance, so no further weed germination is stimulated and soil erosion is reduced. Carbon emissions are also reduced and costs are comparable with herbicides as no consumables are required other than fuel.

Initially there were concerns with the system, primarily centred around operator safety and the potential for collateral damage of the crop (but less so than with a herbicide weed wiper). These have been addressed as a result of further investments and development of the technology. Originally the systems were based on a hand lance powered by a mobile generator and were aimed at use in the landscape for chemical-free weed control. Work in CP 086 (Weed control in ornamentals, fruit and vegetable crops – maintaining capability to devise sustainable weed control strategies) examined the potential of the system to control perennial weeds in bush fruit crops. Subsequently, boom mounted systems were developed for use in crops which work closer to the ground permitting control of smaller weeds and more recently the procedure has been linked with visual recognition technology to precisely target weeds in arable crops.

COMMERCIAL OPTIONS

There are several companies developing the use of electricity to kill weeds as an alternative to herbicides. One example, is the recently launched RootWave Pro from Ubiquitek. This system, currently used as a spot weeder in parks and gardens in the UK, Ireland, Canada and New Zealand, has particular interest as a weed specific spot treatment giving it better potential for use around

non-target species e.g. in vegetative areas than other less precisely targeted physical methods such as steam weeding and hot water treatments. The manufacturer claim that one treatment will be sufficient for annual weeds with several treatments likely to be needed for tougher weeds, especially those with rhizomes. This product is included in a new three year European Agricultural Fund for Rural Development (EAFRD) funded project led by the Soil Association in collaboration with RootWave, ADAS, Suntory (Ribena) and Anthony Snell (a major soft fruit grower in Herefordshire). The project will investigate electrical weeding at the base of blackcurrant bushes and other bush and cane fruit.

As part of an EU grant, RootWave are also currently working with Steketee to create an automated weeder for vegetable crops which uses cameras to spot and zap weeds while moving through fields at 5km/hr.

Another company in the electric weeder market is the Zasso Group. Just like any technology, the electric applicators in this system must be adapted to specific crop culture geometries and needs. Zasso state they can adapt the technology to the crop situation aiming for a hybrid weed management system selecting the optimum of the chemical and digital weed management world. Joe Martin (Crop Protection Senior Scientist) will visit the Zasso demonstration site in June to find out more about the technology and applicability to UK growers.

AHDB as part of the Integrated Pest Management programme are planning to conduct a review of different current and future weed control solutions both nationally and internationally on a global scale that would be of benefit to UK crop production in the short, medium and long term and to gain knowledge of emerging technologies in terms of timeliness, economics and feasibility.

“The technology is chemical free, systemically kills the roots and does not disturb the soil”

GET INVOLVED

A field-lab is now set up, part of the Innovative Farmers Programme, to run in conjunction with the EAFRD project. It is open to any growers who would like to find out more about this type of technology. It provides a forum for idea sharing and to ensure the design and capability of the manufactured system is tailored to the practical needs of the grower. Please contact Lynn.Tatnell@adas.co.uk for more details or visit <http://bit.ly/electricweeding>



INSIDER INSIGHT

A FUTURE HOPE

Panel members play a critical role in helping AHDB Horticulture to plan research projects that directly impact horticultural businesses. We speak to James Moffat, newly-appointed member of the Hardy Nursery Stock Panel, about what he is hoping AHDB can deliver for the industry over the next three years

Q: Why did you apply to be an AHDB panel member?

JM: I've been involved with the industry for over 20 years and in that time I have read many pieces of AHDB literature or gone to AHDB events which I have found useful. The last two years I've been involved with an AHDB project which was challenging and informative and thought it would be good to be more involved. It's good to know the challenges that face the industry and hopefully I can have some input in trying to solve one or two of them.

Q: What is the biggest challenge you think the wider industry or HNS growers are going to be facing over the next three years?

JM: The next few years will be particularly challenging for the industry on several fronts.

As an industry it will be interesting how we cope with Brexit and the issues this may raise. One of these will be staff availability, particularly seasonal staff, and the pressure this will put on business. If you throw the increases proposed for the minimum wage into the mix, then I think this will compound the issue.

Pest and disease issues will be a concern for many, with the emergence of *Xylella* a particular concern for Hardy Nursery Stock growers. There seem to be new pests and diseases or strains identified regularly but effective control seems to be decreasing.

What do you hope the panel can achieve for the industry?

JM: 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.

The AHDB is and needs to keep on looking at this side of the industry in my opinion, some work has been done on equipment to read nutrient levels in nursery stock (HNS 193), in order to determine when supplement feeding is required. This in turn could help with plant health and also reduce the risk of over feeding so cutting waste.

I was interested to learn that the 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.

Q: What is the one thing that you would like to see change in the industry?

JM: One thing I think needs to change within the industry is the way in which staff are recruited. It seems as a whole people fall into the industry for one reason or another. Is the industry getting enough people and are they the right people? The industry needs to have a more targeted approach to marketing itself when considering recruitment. I've spoken to many people and staffing always seems to crop up as an issue. Horticulture has a lot to offer - we need to be more proactive in telling people.

For the full list of AHDB Horticulture panel members and to find out how to get in touch with your sector representatives visit: horticulture.ahdb.org.uk

Name:
James Moffat

Company:
James Coles & Sons Nurseries

Job title:
Nursery Manager

“ Horticulture has a lot to offer – we need to be more proactive in telling people ”



SAFE AND SECURE

Kyle Ross, Plant Health Coordinator at Wyevale Nurseries, explains how they've made changes in their business to help safeguard the UK's biosecurity

Biosecurity is the topic on everybody's minds at the moment; it directly affects nearly every type of horticultural and agricultural business in the UK, from supermarkets to landscapers, and everyone should be aware of its importance, as well as what can be done to minimise the risks of pest and disease threats to protect our surrounding environment.

I personally believe that education is one of the industry's strongest tools to help combat pest and disease threats, with the more people aware of what problems are out there, the better. In my experience, the lack of awareness from the public and even businesses working in horticulture of the threats facing them is alarming. More publicity within the media should be given to these to emphasise the severe consequences should these pests or diseases reach the UK.

Educating students hoping to break into the industry on current topics as part of the curriculum such as neonicotinoid use, reducing plastic usage and soil sustainability can help bring young people into the industry who may have fresh ideas on how to tackle these issues.

As a graduate of Pershore College/ University of Worcester I benefited immensely from the links between educational establishments and horticultural businesses. Regular visits to conservation projects, historical gardens and production horticulture nurseries helped open my eyes to the diversity of the sector and the variety of employment avenues available. This contact directly led to my employment at Wyevale Nurseries as a Plant Health and Biosecurity Coordinator.

At Wyevale Nurseries we are 100 per cent committed to plant health and biosecurity and consequently we have changed the way we work and the way we trade and grow crops in several different ways.

Training and education has been a huge push for us; we regularly give our staff training on the latest pest and disease problems and have even rolled this training out to our retail customers, which has received an excellent response. We hope to make this training available to our amenity customers in the very near future.

I have created a Plant Health Information Pack, which is available to our customers and I regularly attend scientific seminars to bring knowledge back to the company. The pack has been created for our customers and includes information on what we deem to be some of the biggest threats facing the industry currently – these include Asian longhorn beetle, Xylella, Xanthomonas, fire blight and Phytophthora ramorum, and the pack is available upon request.

To further improve our own biosecurity, we have carried out supplier audits with our Dutch trading partners to ensure we are getting crops of the highest quality and have maximum traceability. Increasing home-grown propagation volumes of key crops such as Prunus laurocerasus dramatically reduces dependence on imports and emphasises the British-sown, British-grown message. I believe all horticultural businesses have a duty to strive to improve their biosecurity and help to safeguard our industry.



“ We regularly give our staff training on the latest pest and disease problems ”



Crop Protection at Fruit Focus 2018

AHDB will once again be at Fruit Focus sharing latest innovative fruit research and with knowledgeable experts on hand to talk through new best practice methods growers can adopt.

Fruit Focus provides a unique opportunity to update on the hottest technologies and industry developments, exchange views and network with fellow producers. As well as soft and orchard fruit, vines also feature at Fruit Focus.

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