HDC Weed control in container-grown hardy nursery stock workshops

The Bransford Webbs Plant Company, Johnsons of Whixley Limited and Palmstead Nurseries Limited

2, 10 and 30 October 2013
### Event Programme

<table>
<thead>
<tr>
<th>Time</th>
<th>Subject</th>
<th>Speaker</th>
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</thead>
<tbody>
<tr>
<td>12.45</td>
<td>Registration and buffet refreshments</td>
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<tr>
<td>13.15</td>
<td>Common nursery weeds - biology and identification.</td>
<td>John Atwood, ADAS</td>
</tr>
<tr>
<td></td>
<td>Weeds sources.</td>
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<td></td>
<td>Nursery hygiene measures.</td>
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<td></td>
<td>Cultural and non-chemical weed control measures.</td>
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<tr>
<td>14.00</td>
<td>Break</td>
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<td>14.10</td>
<td>Available herbicide products.</td>
<td>John Atwood, and David Talbot</td>
</tr>
<tr>
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<td>Herbicide programmes for:</td>
<td>(first event only), ADAS</td>
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<tr>
<td></td>
<td>• General nursery stock including protected crops.</td>
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<td></td>
<td>• Herbaceous / alpine crops.</td>
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</tr>
<tr>
<td></td>
<td>• Moss and liverwort control.</td>
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<td></td>
<td>• Beds and paths.</td>
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<tr>
<td></td>
<td>‘Life after Ronstar 2G / Ronstar Liquid’.</td>
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<td></td>
<td>Recent herbicide screening trials.</td>
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<tr>
<td>15.15</td>
<td><strong>Transfer to nursery site</strong></td>
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<tr>
<td></td>
<td><strong>Location - Bransford Webbs Plant Company / Johnsons of Whixley / Palmstead Nurseries</strong></td>
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<tr>
<td>15.30</td>
<td>Weed identification on the nursery.</td>
<td>John Atwood, ADAS and nursery staff</td>
</tr>
<tr>
<td></td>
<td>Problems, products and solutions in different situations on the nursery.</td>
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<tr>
<td></td>
<td>Weed control in:</td>
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<tr>
<td></td>
<td>• A range of nursery stock crops.</td>
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<tr>
<td></td>
<td>• Gravel and sand beds.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Stock plants.</td>
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<tr>
<td></td>
<td>• Liners and plugs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Crops under protection.</td>
<td></td>
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<tr>
<td></td>
<td>Dealing with established weeds.</td>
<td></td>
</tr>
<tr>
<td>16.15</td>
<td>Technical discussion and Q&amp;A</td>
<td>All</td>
</tr>
<tr>
<td>16.30</td>
<td>Refreshments and depart</td>
<td></td>
</tr>
</tbody>
</table>
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<td>35</td>
</tr>
</tbody>
</table>
Introduction - devising a weed control strategy

Assess and consider:

- Weed sources
- Weed pressure
- Weed spectrum
- Nursery hygiene
- Crop types and growth stage
- Situation (outdoor / under protection) and timing (summer / winter)
- Cultural / non chemical control
- Review

1. Common weed problems

- Annual weeds (mainly)
- Wind or explosive distribution mechanism
- Prime germination sites - growing media surface
- Moss, liverwort and algae
### 1. Common weed problems

<table>
<thead>
<tr>
<th>Category</th>
<th>Weeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual wind blown seed</td>
<td>Groundsel, Willowherb, Sowthistle, Goat willow</td>
</tr>
<tr>
<td>Explosive seed distribution</td>
<td>Bittercress, Oxalis</td>
</tr>
<tr>
<td>Seeds adhering to pots, trays, cuttings etc</td>
<td>Chickweed, Annual meadow-grass, Pearlwort</td>
</tr>
<tr>
<td>Water / wind dispersal</td>
<td>Moss, Liverwort</td>
</tr>
<tr>
<td>Root fragments in growing media</td>
<td>Sorrel, Creeping yellow cress</td>
</tr>
</tbody>
</table>

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**Groundsel**

![Groundsel Image]
Cardamine flexuosa

Mouse-ear chickweed

Mouse-ear chickweed
Creeping yellow cress

Liverwort

2. Weed sources

- Growing media
- Dirty pots and trays
- Irrigation water
- Container beds, paths and surrounding areas
- Cuttings and liners
- Old stock
- Waste heaps and skips
3. Nursery hygiene measures

They are about reducing weed pressure by:

- Covering growing media storage areas
- Covering irrigation water tanks
- Controlling background weed pressure (e.g. paths, beds, old stock)
- Distancing waste heaps from the production area (10 metres)
- Keeping reservoir banks clean (inc. near abstraction points)
- Using clean pots and trays (e.g. biodegradable pots)
- Crop monitoring and hand weeding (before weed flowering)
4. Cultural and non-chemical weed control measures

They are about:

- Maintaining nursery hygiene to reduce weed pressure
- Growing not ‘ranching’
- A measured approach to irrigation
- Using capillary / drip point irrigation
- Being prepared to hand weed
- Using non-chemical weed control measures as an alternative to herbicide programmes where appropriate
Mulch applicator

Coir pot topper

5. Available herbicide products

- Ronstar 2G – oxadizon
- Flexidor 125 – isoxaben
- Various – metazachlor
- Devrinol – napropamide
- Venzar Flowable – lenacil
- Dual Gold – s-metolachlor
- Sumimax – flumioxazine
Ronstar 2G (oxadiazon)

- Stock virtually gone, use up by 30 June 2015
- Very widely used
- Good safety record
- Easy to apply granule after potting
- Good weed spectrum
- Lasts up to 12 weeks
- Some resistant weeds

Flexidor 125 (isoxaben)

- Popular and widely used
- Spray application
- Good control of Ronstar resistant weeds
- Outstanding control of bittercress
- Lasts up to 24 weeks
- Use in programmes for best results
- Some HNS subjects are sensitive
- Poor control of willowherb and groundsel
- No control of grasses, moss and liverwort

Flexidor damage on cornus
**Flexidor damage on lavatera**

![Image of Flexidor damage on lavatera]

**Flexidor damage on buddleia**

![Image of Flexidor damage on buddleia]

**Metazachlor products**

- Approved for ornamentals but Butisan S has specific restriction on containers – use other similar products e.g. Sultan 50 SC
- But, No more than 1000 gm/ha metazachlor in 3 year on same field
- Safer in autumn / winter period
- Good control of Ronstar resistant weeds
- Good control of liverwort, willowherb and groundsel at full rate
- Use in programmes with Flexidor 125 or mix
- Lasts 12 weeks plus
- Can damage soft growth
- Some HNS subjects are sensitive (e.g. herbaceous)
- Possible alternative – Springbok (metazachlor + dimethenamid-p)
Delayed growth on cotoneaster liners

Devrinol (napropamide)
- Wide range of recommendations
- Winter use, outdoors only
- Long persistence
- Good control of groundsel, chickweed and willowherb
- Can be used on herbaceous
- Poor control of bittercress
- Tank mix with Flexidor 125 for best results

Venzar Flowable (lenacil)
- Approved under LTAEU, outdoor use only
- Excellent control of liverwort (HNS 93), bittercress and willowherb
- Moderate control of groundsel
- Conifers can be safely treated
- Useful option for conifers and some herbaceous crops
- Lasts < 18 weeks
- Very soluble (leaching): avoid spring/summer application
- Can persist in container beds
Lenacil damage on deutzia

Sumimax (flumioxazine)
- EAMU for outdoor ornamentals
- Winter use only due to contact action
- Can be damaging to some evergreens and a few deciduous
- Used in USA but mainly granular product
- Some experience from HNS 139, 139a
- Broad weed control spectrum up to 3-4 true leaf in winter

Sumimax damage on hebe
Leaf scorch pyracantha

Cornus ‘Hedgerow Gold’

Dual Gold (s-metolachlor)

- EAMU - May 1 – 31 application window
- Mix with Flexidor
- Adds willowherb, grasses, some groundsel control
- Can cause slight damage to tips
- Potential use on herbaceous
6. Herbicide programmes

- Flexidor 125 (+ Dual Gold) post potting
- Devrinol + Flexidor 125 (November onwards)
- Sumimax / Venzar (winter - selected crops)
7. Recent herbicide screening trials

- Horticultural fellowship in weed control
- Funded by AHDB, HTA and EMT
- Five year project (April 2011- March 2016)

Aims

- Mentor next generation in horticultural weed control
- Develop new chemical and non-chemical treatments for weed control in horticultural crops
- Develop links with researchers working on minor crops in Europe

Who's who?

Who's who?

Trials work in years one and two

Ornamentals

- Glucosinolate meal assessment
- Herbicide efficacy screen – pot tests
- Container HNS screen
- Field tree HNS screen
Typical twelve plant species tested for phytotoxicity

Container HNS trials 2012

- To assess crop safety of three herbicide products and a glucosinolate seed meal on a range of deciduous and evergreen nursery stock subjects

<table>
<thead>
<tr>
<th>Product name</th>
<th>A.I.</th>
<th>Rate (l or kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>HDC H18</td>
<td>Confidential</td>
<td>4.0</td>
</tr>
<tr>
<td>HDC H14</td>
<td>Confidential</td>
<td>4.0</td>
</tr>
<tr>
<td>Sinapis alba</td>
<td>Glucosinolate</td>
<td>24 g/3 l pot</td>
</tr>
<tr>
<td>Ronstar 2G</td>
<td>Oxadizon</td>
<td>200.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Species damaged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>None</td>
</tr>
<tr>
<td>Wing P</td>
<td>Olearia</td>
</tr>
<tr>
<td>HDC H14</td>
<td>Cornus, buddleia, olearia, ceanothus,</td>
</tr>
<tr>
<td></td>
<td>spiraea, aucuba</td>
</tr>
<tr>
<td>Sinapis alba</td>
<td>Cornus, buddleia, spiraea, olearia, cistus,</td>
</tr>
<tr>
<td></td>
<td>hypericum, hebe, aucuba, buxus*</td>
</tr>
<tr>
<td>Ronstar 2G</td>
<td>Hydrangea</td>
</tr>
</tbody>
</table>

Species in black showed signs 2 WAT, species in red showed signs 6 WAT
*slight discolouration
S. alba phytotoxicity on escallonia and fungal growth on seed meal.

Severe phytotoxicity on hebe and other species.

Container HNS trials 2013

- To assess crop safety of two herbicide products on a range of deciduous and evergreen nursery stock subjects

<table>
<thead>
<tr>
<th>Product name</th>
<th>A.I.</th>
<th>Rate (l or kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Flexidor 125 (standard)</td>
<td>isoxaben</td>
<td>1.0</td>
</tr>
<tr>
<td>Wing P + Flexidor 125</td>
<td>pendimethalin + dimethenamid + isoxaben</td>
<td>4.0</td>
</tr>
<tr>
<td>Wing P + Flexidor 125</td>
<td>pendimethalin + dimethenamid</td>
<td>4.0</td>
</tr>
<tr>
<td>HDC H18</td>
<td>Confidential</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Damage was apparent with the following the crop/herbicide combinations

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Species damaged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>None</td>
</tr>
<tr>
<td>Flexidor 125 (standard)</td>
<td>Buddleia, cornus, hydrangea, perovskia.</td>
</tr>
<tr>
<td>Wing P + Flexidor 125</td>
<td>Buddleia, ceratostigma, cistus, cornus, escallonia, hydrangea, perovskia, physocarpus, sorbaria, spiraea</td>
</tr>
<tr>
<td>Wing P + Flexidor 125</td>
<td>Buddleia, ceratostigma, cistus, cornus, escallonia, hydrangea, perovskia, physocarpus, sorbaria, spiraea</td>
</tr>
<tr>
<td>HDC H18</td>
<td>Buddleia, cornus, hydrangea, perovskia, physocarpus, sorbaria, spiraea</td>
</tr>
</tbody>
</table>

Species in black showed signs 2 WAT, species in red showed signs 6 WAT
*slight discoloration
Plans for year four

- Specific weed control spectrum screening (seeded pot tests)
- Container nursery – phytotoxicity trials
- Candidates: Wing – P, Springbok, HDC H18, new coded product, new product from SCEPTRC screen

8. Moss and liverwort control

Control measures:

- Cultural controls
- Biocides
- Herbicides

Cultural control HNS 93c HNS 126

- Reduce overhead irrigation
- Avoid excess liquid feeding
- Mulches
- Reduce percentage peat in growing media
- Growing media supplements
Control  Sylvafibre + herbicide

Herbicides with activity against moss and liverwort
- Venzar Flowable
- Metazachlor products
- Springbok
- HDC H 18 (?)
- Sumimax – slight effect
- Chikara (non cropped areas only)
- Finalsan Plus (non cropped areas only)

Fungicides and biocides with activity against moss or liverwort
- Mogeton (quinoclamine) EAMU applied for
- Copper
- Miscellaneous algae control products
### 9. Container beds and paths

**Container beds:**
- Ronstar Liquid + Flexidor 125 (+ a contact if required)
- Ronstar Liquid + Stomp 400SC
- Chikara (limited data)

**Paths:**
- Chikara (approved for “land not intended for cropping”)

### Chikara

- Non cropped land use only
- Replacement for Diuron, Casoron G
- 6 month persistence
- Good weed control spectrum but no control of speedwell, black nightshade, black bindweed
- Broad leaved weeds, grasses, moss and liverwort
- Tested also as sand bed treatment and dormant season treatment on shrubs

### 10. Prevention of rooting through on sand beds - HNS167

- Ardent no longer available
- Most herbicides have minimal effect
- Stomp effective and safe for heathers
- Chikara gave best weed control
- Chikara an effective sandbed treatment for some shrubs, only approved for weed control
- Chikara not approved for use over crops
11. HNS under protection

- Ronstar 2G (not during summer and only in well-vented structures)
- Flexidor 125 (under specific off-label approval)
Delay in spring growth on cuttings

Euonymus 9cm liners

Cotoneaster
12. Herbaceous perennials + alpines

Main residual herbicides used (HNS 35e and HNS 166):
- Ronstar 2G
- Flexidor 125
- Venzar Flowable
- Devrinol (not on alpines)
- Dual Gold

Ronstar 2G – lodging of granules

Flexidor – typical damage to herbaceous
Untreated Ronstar 2G teridox
Flexidor Springbok Dual Gold

HDC Weed control in container-grown HNS - John Atwood

Any questions, thank you?
HDC HNS Weed Control Workshops 2013

Herbicide programme for container grown shrubs and trees

(Note brackets indicate provisional recommendation based on limited data)

Potting

<table>
<thead>
<tr>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
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- Flexidor 125 (+ Dual Gold)
- (Springbok)
- Devrinol + Flexidor 125 (or + Venzar)
- (Sumimax)
Life after Ronstar

John Atwood and David Talbot look at the implications for the nursery stock industry of the impending withdrawal of one of its most widely used and reliable herbicides

Ronstar (oxadiazon), available in both granular and liquid form, is one of the most widely used herbicides in both container and field-grown nursery stock production.

On container crops, one application of granules after potting gives around 12 weeks of weed control, while the liquid offers a broad spectrum of control in field-grown crops and, as there is no root absorption, crop safety is reliable as long as sprays avoid young leaves and shoots.

Unfortunately, oxadiazon is scheduled for re-registration at EU level and its manufacturer, Bayer, says the size of the market no longer justifies the cost of the necessary work to enable it to be re-registered, so approval for all uses will be withdrawn when the current one runs out. Distributors will no longer be able to obtain supplies of the herbicide after the end of December this year. Growers won’t be able to take deliveries after June 30 next year and all stocks must be used up within a year, by June 30, 2015.

This inevitably leaves a significant gap in the herbicides available to most nursery stock growers. It will be a particular problem for the container nursery stock industry as it removes the only available granular product – granules being very practical and easy to use compared with sprays on batches of plants after potting.

As part of its work to help the industry prepare for the loss of Ronstar, HDC has been in discussion with herbicide manufacturers about potential replacements. Some have already been tested in screening trials as part of the Horticultural Fellowship on weed control (CP 086).

EXISTING ALTERNATIVES
The main issue is finding alternative herbicides that are safe to apply over foliage immediately after potting container stock, and for follow-up treatments later in the summer. At present the main herbicide that can be used during this period is Flexidor 125 (isoxaben). Until now, growers have used this as a supplementary treatment to follow up Ronstar 2G, but it’s likely to become the main treatment once Ronstar is no longer available.

However, there will be problems if growers have to start relying more on Flexidor 125. For example, some shrubs, and a larger number of herbaceous species, are sensitive to it and it doesn’t offer control of groundsel, willowherb, moss or liverwort. On top of that, only two applications are permitted in a year. And, inevitably, as with any chemical crop protection product, over-reliance on one herbicide will lead to resistance problems in weeds.

Trials in HNS 139 and HNS 139a identified Dual Gold (S-metolachlor) as a possible summer treatment to supplement Flexidor 125. This will be particularly useful once Ronstar 2G is withdrawn, but the approval only permits its use during May and there is a further range of species that have been slightly damaged in HDC trials (although most recover).

The fellowship project includes two screening trials of new herbicides. The first, in 2012, included an experimental herbicide tested under a code number (HDC H14), and a recently introduced vegetable herbicide Wing-P (pendimethalin + dimethenamid-P). The experimental product was considered less promising as it had poor residual control and caused some crop damage.

Wing-P looked to be of greater interest. It shows good residual control of groundsel, willowherb and grasses – which are resistant to Flexidor 125 – and has potential to use as a mix with Flexidor. There have also been good crop safety results so far – although relatively few species have been tested.

Wing-P currently has an EAMU allowing use on ‘outdoor ornamentals’. However, this only permits use pre-crop emergence, so while it could be applied to a tree seedbed before seedling emergence, for example, or to a herbaceous crop after the foliage has died back in the autumn, it does not help container stock growers.

An EAMU application to allow for use post-crop emergence was refused by the Chemicals Regulation Directorate (CRD) earlier this year. HDC and BASF are discussing whether further data can be obtained to support a new EAMU application.

The 2013 container nursery stock experiments included another experimental herbicide (HDC H18), which is already approved elsewhere in Europe. Results are promising and HDC will be investigating the possibility of an approval or EAMU, perhaps based on mutual recognition. As with most herbicides adopted by the nursery stock industry, there will be some species that should not be treated.

Crop safety on varieties tested with Wing-P,

<table>
<thead>
<tr>
<th>Variety</th>
<th>Safety level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buddleja davidii Black Knight</td>
<td>Safe</td>
</tr>
<tr>
<td>Ceratostigma plumbaginoides</td>
<td>Safe</td>
</tr>
<tr>
<td>Cistus x pulverulentus Sunset</td>
<td>Safe</td>
</tr>
<tr>
<td>Comus kelsayi</td>
<td>Safe</td>
</tr>
<tr>
<td>Escallonia Red Dream</td>
<td>Safe</td>
</tr>
<tr>
<td>Hebe pinguifolia Sutherlandii</td>
<td>Safe</td>
</tr>
<tr>
<td>Hydrangea macrophylla Maniessi Perfecta Blue Wave</td>
<td>Safe</td>
</tr>
<tr>
<td>Perovskia atriplicifolia Blue Spire</td>
<td>Safe</td>
</tr>
<tr>
<td>Physocarpus opulifolius</td>
<td>Safe</td>
</tr>
<tr>
<td>Santolina chamaeyparissus</td>
<td>Safe</td>
</tr>
<tr>
<td>Sorbaria sorbifolia Sem</td>
<td>Safe</td>
</tr>
<tr>
<td>Spiraea nipponica Snowmound</td>
<td>Safe</td>
</tr>
</tbody>
</table>

Variety
FURTHER WORK
Over the next few months HDC’s Hardy Nursery Stock Panel will consider what further trials may be needed, and what approval applications may be worth exploring, to open up as many options as possible for weed control in container stock.

The fellowship project is due to undertake a further pot screening trial of new products for their effectiveness against key weeds – promising candidates will be put forward for a nursery phytotoxicity trial on container nursery stock next year. This will include the experimental herbicide H18, mentioned above, which still needs testing on key UK weeds of container stock – although we have some information from earlier work on its active ingredients. It would also be advisable to test it on a further range of woody and herbaceous nursery stock species, though screening on herbaceous plants is not currently planned as part of the fellowship project.

An experimental herbicide on trial in field vegetables in the SCEPTRE project has been identified as being worth testing as a potential herbicide for ornamentals. This could be done by including it in the screening trials undertaken in the fellowship project. Growers should bear in mind that this herbicide is some way from commercial release in the UK.

Springbok (metazachlor + dimethenamid-P) is a pre-emergence residual herbicide previously tested for use on field-grown nursery stock which will be reassessed as a late summer or autumn treatment for container plants because it is similar in some respects to Butisan S (metazachlor). However, because the ‘dose’ of metazachlor is lower in Springbok it could be used year after year on the same site at a useful application rate.

Springbok is currently approved through the long-term arrangements for extension of use (LTAEU) and was included on the list of products that growers wanted an EAMU for once it is through the re-registration process. We understand from CRD that it has undergone an initial worker exposure assessment. It will continue to be approved through LTAEU and CRD should issue an EAMU once the product has been through re-registration.

We are expecting a further residual herbicide product will be made available for testing in 2014.

RONSTAR LIQUID
Ronstar Liquid, although relatively expensive, has been a reliable herbicide used both in field production and on container beds before standing down. There are a number of alternatives that could be used in field-grown stock although many of them are less persistent. The fellowship project identified the potential for Wing-P as an addition to the range of residual herbicides for field-grown stock but, as already mentioned, an appropriate approval is needed before any further investment in HDC trials.

Trials in HNS 167 showed Chikara (flazasulfuron) to be an alternative to Ronstar Liquid for use on container beds before standing down, and subsequent commercial practice has confirmed its value. However, it’s unlikely be safe for use on beds destined to be stocked with herbaceous plants. It gives incidental control of rooting through on sandbeds, though is only permitted for outdoor use.

ABOUT THE AUTHORS
John Atwood (above left) is a principal horticultural consultant with ADAS and David Talbot (above right) an ADAS horticultural consultant
Notes
Notes
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- 04/13 Ornamental plant production: The use of chemical plant growth regulators on protected crops
- 25/12 Non-chemical weed control for container-grown hardy nursery stock
- 18/10 Host plant range of vine weevil
- 17/10 Control of powdery mildew diseases on hardy nursery stock and herbaceous perennials
- 15/09 Control of rose downy mildew
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- 10/07 Guidelines on nursery hygiene for outdoor and protected ornamental crops
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- 01/06 Capillary irrigation of container grown nursery stock
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- Pocket Weed identification guide

Crop Monitoring Pads
- Hardy Nursery Stock Crop Monitoring Pad

Guides
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- BOPP Best Practice Guide: Managing water and preventing pollution on ornamental nurseries
- Herbaceous perennials: A guide to the production of container grown plants
- HNS Cold Storage – A growers’ guide
- Ornamental plant quality – developing a whole business management system - a grower guide
- Slow Sand Filtration – A growers’ guide

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- Spray Check: A Tutorial DVD for Spray Operators.
- Health & safety in horticulture - an awareness DVD in ten languages (plus English)
Computer Programmes

☐ HDC Irrigation Calculator – A graphical tool to improve irrigation water distribution
  (accompanies factsheet 16/05)
☐ ROSIE - A Windows program to assist in the scheduling of containerised roses grown outdoors under UK conditions

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17/02 Powdery mildew diseases of poinsettia (PC 191)
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08/02 Control of Sciarid flies in protected ornamentals

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- HDC Irrigation Calculator – A graphical tool to improve irrigation water distribution
  (accompanies factsheet 16/05)
- Poinsettia Tracker Version 2.0 - A graphical tracking tool to assist in height management of poinsettia

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