



Horticultural
Development
Company

Grower summary

HNS 166

Hardy ornamentals: herbicide
screening for herbaceous
perennials and grasses

Final Report 2010

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If you would like a copy of the full report, please email the HDC office (hdc@hdc.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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Headline

A range of herbicide products have been assessed for crop safety when applied to newly potted and established container-grown herbaceous perennial nursery stock.

Background and expected deliverables

Good weed control continues to be important for hardy ornamentals growers to ensure that plant quality is maintained and that accreditation standards are achieved. Herbicides remain the most cost-effective weed control method although herbaceous subjects are particularly vulnerable to herbicide damage.

With the loss of herbicides and changes in weed populations on nurseries it is important to continue to assess new products to help combat resistant weed species and extend the range of subjects screened for which herbicides can be used.

The recently completed HDC project HNS 139 (Atwood, 2009) identified herbicides, new to the UK, which appear to have potential for use on herbaceous perennial and grass crops. The focus of HNS 139 was mainly on shrub species, so further screening work is required specifically on herbaceous perennial and grass crops.

This project is evaluating several new herbicides for efficacy and safety for use on a wide range of container-grown herbaceous subjects as well as extending the range of crop species phytotoxicity information for currently used herbicides

Summary of the project and main conclusions

In 2008, an experiment was done to investigate the phytotoxicity of six herbicide treatments on a range of container-grown herbaceous species in a commercial nursery situation. A summer experiment examined treatments applied immediately after potting. Results were reported in the 2009 annual report.

In 2009, two further experiments were done, similar to those conducted in 2008 but with a different range of herbaceous species. One experiment was set up at Howard Nurseries using newly potted 9 cm plants (Table 1), the other at Hawkesmill Nurseries using established 2 or 3 litre container plants (Table 2). Further experiments are planned for 2010 commencing in early spring with dormant potted plants.

Table 1. Plant species used in newly potted herbaceous plant experiments, 2009

<i>Artemisia</i> 'Lambrook Mist'	<i>Kniphofia</i> 'Tetbury Torch'
<i>Brunnera macrophylla</i>	<i>Leucanthemum</i> 'Agalia'
<i>Campanula glomerata</i> 'Superba'	<i>Lobelia</i> 'Russian Princess'
<i>Centaurea</i> 'Parham'	<i>Pulmonaria</i> 'Cotton Cool'
<i>Centranthus albus</i>	<i>Rudbeckia</i> 'Peamii'
<i>Crambe cordifolia</i>	<i>Salvia</i> 'East Friesland'
<i>Crocosmia</i> 'James Coey'	<i>Sisyrinchium striatum</i>
<i>Dicentra</i> 'Spring Morning'	<i>Stachys byzantium</i> 'Silver Carpet'
<i>Geranium striatum</i>	<i>Tradescantia</i> 'Zwanenborg Blue'
<i>Hemerocallis</i> 'Stella d'Or'	<i>Verbena bonariensis</i>

Table 2. Plant species used in the established herbaceous plant experiments, 2009

<i>Acanthus spinosus</i>	<i>Helleborus orientalis</i> (pink/white)
<i>Agapanthus</i> 'Headbourne Hybrids'	<i>Hemerocallis</i> 'Catherine Woodberry'
<i>Ajuga</i> 'Catlin's Giant'	<i>Heuchera</i> 'Chocolate Ruffles'
<i>Bergenia</i> 'Ergot'	<i>Liriope muscari</i> 'Blue'
<i>Brunnera macrophylla</i>	<i>Lobelia</i> 'Russian Princess'
<i>Coreopsis</i> 'Rum Punch'	<i>Ophiopogon</i>
<i>Crocsmia masoniorum</i>	<i>Phlox</i> 'Purple Eye Flame'
Ferns, one of each of the following species: <i>Dryopteris affinis</i> 'Crispa Congesta', <i>Matteuccia struthiopteris</i> , <i>Athyrium</i> 'Ghost', <i>Polypodium vulgare</i> , <i>Polystichum setiferum</i> 'Herrenhausen'.	<i>Teucrium</i> 'Purple Tails'
<i>Geranium</i> 'Brookside'	<i>Verbena rigida</i>
<i>Hakonechola macra</i> 'Aureola'	<i>Zantedeschia aethiopica</i> 'Crowborough'

Herbicide treatments were applied on 16 June 2009 (Howard Nursery) and 23 June 2009 (Hawkesmill Nursery) (Table 3).

Table 3. Treatments used in herbaceous plant nursery experiments, 2009

Product	Active ingredient	Product application rate	Approval status
Untreated control	-	-	-
Ronstar 2G	oxadiazon (2 % w/w)	200 kg/ha	Label
Teridox ¹	dimethachlor (500 g/L)	3.0 L/ha	Not in UK
Lenacil 80W ¹	lenacil (80 % w/w)	2.8 kg/ha	Label
Flexidor 125	isoxaben (125 g/L)	1.0 L/ha	Label
Springbok	metazachlor (200 g/L) + dimethenamid-p (200 g/L)	2.5 L/ha	SOLA requested
Dual Gold	s – metolachlor (960 g/L)	1.4 L/ha	Not in UK

¹Teridox was only used in the newly potted plant experiment, Lenacil was only used in the established plant experiment.

Where a SOLA application has been requested products may be used in the same situations as currently approved. For example Springbok is approved for use on outdoor crops, such as oilseed rape, so may be used under the Long-Term Arrangements for Extension of Use on outdoor ornamentals.

Susceptibility to herbicide damage

Fifty two of the 63 species were tolerant of all the herbicides tested on them (Table 4). The exceptions are described below.

Brunnera were initially affected by Teridox, Flexidor 125 and Springbok causing stunting and necrosis (Figure 1) although all recovered. *Pulmonaria* can be susceptible to herbicides and Teridox and Springbok both caused a severe growth check (Figure 2) although they recovered later. *Campanula* was most severely damaged by herbicide treatments (Figure 3), only Flexidor 125 appeared safe although plants treated with Ronstar 2G or Dual Gold recovered quite well. *Geranium* was relatively unaffected by the treatments, only Teridox caused some initial stunting. Plants subsequently grew away normally. *Rudbeckia* was most affected by Teridox and Flexidor 125 with a significant loss of vigour, still noted at the second assessment. Dual Gold caused a more temporary growth check. *Stachys* has sometimes been suspected to be susceptible to Flexidor 125, but in this experiment there was no effect. Although Teridox and Dual Gold caused a slight initial check, subsequently there was full recovery. It is interesting to note that the ferns all appeared tolerant of the herbicides tested. There was some foliage deterioration on *Matteuccia*, *Athyrium* and *Polypodium*, but the effect was not associated with any particular herbicide and could be attributable to end of season senescence.

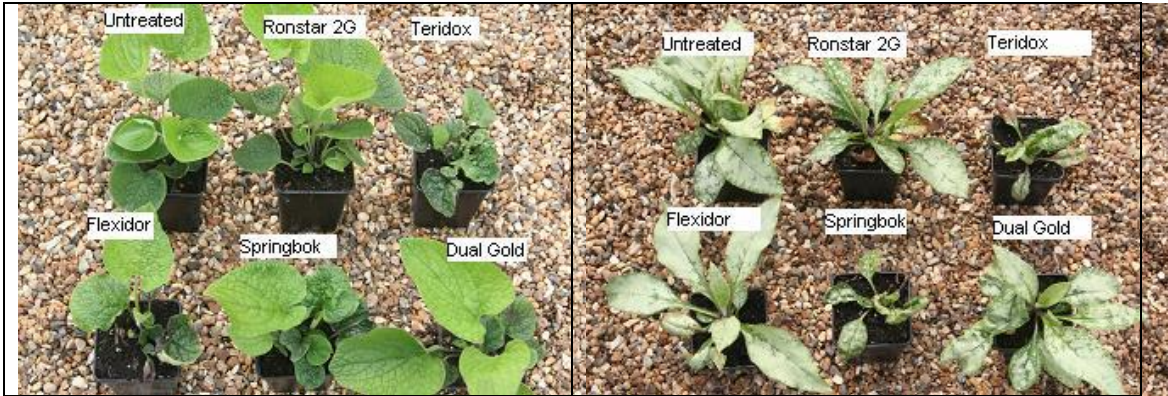


Figure 1. *Brunnera* 4 weeks after treatment

Figure 2. *Pulmonaria* 4 weeks after treatment



Figure 3. *Campanula* 4 weeks after treatment

Table 4. Herbicide tolerance summary for project Year One and Two,

Plant species	Dual Gold	Flexidor 125	Lenacil 80 W	Ronstar 2G	Springbok	Teridox
<i>Acanthus spinosus</i> *	T	T	T	T	T	
<i>Achillea</i> 'Salmon Beauty'	T	T		T	T	T
<i>Agapanthus</i> 'Headbourne Hybrids'*	T	T	T	T	T	
<i>Ajuga</i> 'Catlin's Giant'*	T	T	T	T	T	
<i>Alstromeria lutea</i>	T	T		T	T	T
<i>Artemisia</i> 'Lambrook Mist'	T	T		T	T	T
<i>Bergenia</i> 'Baby Doll'	T	T		T	S	T
<i>Bergenia</i> 'Ergot'*	T	T	T	T	T	
<i>Brunnera macrophylla</i>	T	mS			S	S
<i>Brunnera macrophylla</i> *	T	T	T	T	S	
<i>Campanula glomerata</i> 'Superba'	mS	T		S	S	S
<i>Centaurea</i> 'Parham'	T	T		T	T	T
<i>Centranthus albus</i>	T	T		T	T	T
<i>Coreopsis</i> 'Rum Punch'*	T	T	T	T	T	
<i>Coreopsis</i> 'Zagreb'	T	T		T	T	T
<i>Crambe cordifolia</i>	T	T		T	T	T
<i>Crocosmia</i> 'James Coey'	T	T		T	T	T
<i>Crocosmia</i> 'Kathleen'	T	T		mS	T	T
<i>Crocosmia masoniorum</i> *	T	T	T	T	T	
<i>Dicentra</i> 'Spring Morning'	T	T		T	T	T
<i>Dryopteris affinis</i> 'Crispa Congesta'*	T	T	T	T	T	
<i>Dryopteris goldinia</i>	T	T		T	T	T
<i>Fragaria</i> 'Pink Panda'	T	T		T	T	T
<i>Geranium</i> 'Brookside'*	T	T	T	T	T	
<i>Geranium nodosum</i>	T	T		T	T	T
<i>Geranium striatum</i>	T	T		T	T	mS
<i>Hakonechola macra</i> 'Aureola'*	T	T	T	T	T	
<i>Helenium</i> 'Bruno'	T	T		T	T	T
Plant species	Dual Gold	Flexidor 125	Lenacil 80 W	Ronstar 2G	Springbok	Teridox
<i>Helleborus orientalis</i> (pink/white)*	T	T	T	T	T	
<i>Hemerocallis</i> 'Catherine Woodbery'*	T	T	T	T	T	
<i>Hemerocallis</i> 'Stafford'	T	T		T	T	S
<i>Hemerocallis</i> 'Stella d'Or'	T	T		T	T	T

<i>Heuchera</i> 'Chocolate Ruffles'*	T	T	T	T	T	
<i>Hosta albo marginata</i>	T	T		T	T	T
<i>Iris germanica</i> 'Jane Philips'	T	T		T	T	T
<i>Kniphofia</i> 'Tetbury Torch'	T	T		T	T	T
<i>Leucanthemum</i> 'Agalia'	T	T		T	T	T
<i>Leymus arenaria</i>	T	T		T	T	T
<i>Liriope muscari</i> 'Blue'*	T	T	T	T	T	
<i>Lobelia</i> 'Queen Victoria'	T	T		T	T	T
<i>Lobelia</i> 'Russian Princess'	T	T		T	T	T
<i>Lobelia</i> 'Russian Princess'*	T	T	T	T	T	
<i>Lupinus</i> 'Galaxy mixed'	T	T		T	T	T
<i>Matteuccia struthiopteris</i> , <i>Athyrium</i> 'Ghost'*	T	T	T	T	T	
<i>Ophiopogon</i> *	T	T	T	T	T	
<i>Penstemon</i> 'Sour Grapes'	T	S		S	T	T
<i>Peonia</i> 'Prima Verde'	T	T		T	T	T
<i>Phlox</i> 'Purple Eye Flame'*	T	T	T	T	T	
<i>Polypodium vulgare</i> *	T	T	T	T	T	
<i>Polystichum setiferum</i> 'Herrenhausen'*	T	T	T	T	T	
<i>Pulmonaria</i> 'Cotton Cool'	T	T		T	S	S
<i>Rudbeckia</i> 'Peamii'	mS	mS		T	S	S
<i>Salvia</i> 'East Friesland'	T	T		T	T	T
<i>Schizostylis</i> 'Sunrise'	T	T		T	T	T
<i>Sedum</i> 'Autumn Joy'	T	T		T	T	T
<i>Sisyrinchium striatum</i>	T	T		T	T	T
Plant species	Dual Gold	Flexidor 125	Lenacil 80 W	Ronstar 2G	Springbok	Teridox
<i>Stachys byzantium</i> 'Silver Carpet'	mS	T		T	T	mS
<i>Symphytum</i> 'Wisley Silver'	T	T		T	T	T
<i>Teucrium</i> 'Purple Tails'*	T	T	T	T	T	
<i>Tradescantia</i> 'Zwanenborg Blue'	T	T		T	T	T
<i>Verbena bonariensis</i>	T	T		T	T	T
<i>Verbena rigida</i> *	T	T	T	T	T	
<i>Zantedeschia aethiopica</i> 'Crowborough'*	T	T	T	T	T	

*Established plants - all others were newly potted.

T = Tolerant, mS = Moderately susceptible, S = Susceptible. Where no indication is given the treatment was not tested on that subject.

Key features of the herbicides tested

Dual Gold was safe to most of the subjects tested. Only *Campanula*, *Rudbeckia* and *Stachys* suffered a temporary growth check following treatment. Dual Gold in particular could be a useful herbicide for herbaceous growers. Although there are gaps in the weed control spectrum – notably bittercress – results from HNS 139

showed that it does give good control of willowherb and grasses and some control of groundsel so could be a useful supplement to Flexidor 125 which gives poor control of these weeds.

Springbok was damaging to more subjects, particularly the newly potted plants of *Brunnera*, *Campanula*, *Pulmonaria* and *Rudbeckia*. There were some indications of damage to *Leucanthemum*, and *Bergenia* was damaged in 2008 but not in 2009. One of the active ingredients in Springbok (metazachlor) has been associated with damage to container-grown herbaceous plants in the past when used as Butisan S. Flexidor 125 was safe to use on all species except for *Brunnera* and *Rudbeckia* and in 2008 *Hemerocallis* and *Penstemon* were damaged. Flexidor 125 is already widely used on herbaceous crops particularly for good control of bittercress. A number of species are highly susceptible to damage from Flexidor 125 however. The results reported here indicate a further range of species that can be safely treated. Teridox is relatively unknown as a herbicide for ornamentals. Initial crop safety results from 2008 were encouraging but more damage occurred in 2009 indicating that it may have more limited application.

Ronstar 2G is widely used on herbaceous crops particularly after potting. Some species suffer temporary foliage damage from Ronstar 2G however. Ronstar 2G was safe to use on all but *Penstemon* and *Crocsmia* in 2008 and *Campanula* in 2009. The results reported here indicate a further range of species that can be safely treated.

Financial benefits

It is difficult to establish the full financial benefit from the project at this stage because one of the key new herbicides identified is not yet available on the UK market. However the benefits from extending the range of crops to which Ronstar 2G and Flexidor 125 can be applied can be estimated to save around £2,500/ha in hand-weeding costs for those crops less the cost of herbicide at £54/ha for Flexidor 125 or £1,000/ha for Ronstar 2G.

Action points for growers

- When available in the UK, Dual Gold shows promise for use in container-grown herbaceous perennial nursery stock during the growing season but would require a SOLA for use on ornamentals.
- Dual Gold could be a useful supplement to Flexidor 125 to improve control of groundsel, grasses and willowherb.
- Springbok appears safe to a limited range of herbaceous perennials. It is currently available in the UK and can be used under LTAEU on ornamentals as a SOLA application has been requested.
- Further crop safety information is available to extend the use of Ronstar 2G, Lenacil 80W and Flexidor 125 to a wider range of species.