Factsheet 11/13
(HDC project BOF 073)

Bulbs & Outdoor Flowers

Chemical weed control in narcissus crops

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This factsheet provides a summary of the herbicide options for weed control in narcissus crops. It takes into account recent trials work funded by the HDC to evaluate new herbicide products and programmes.

Action points

- Review weed control programmes in light of recent HDC funded research and the availability of herbicides outlined in this factsheet.
- Use the tables of weed susceptibility to herbicides to plan treatment programmes, bearing in mind any anticipated weed populations.
- Be prepared to change programmes to avoid over-reliance on particular herbicides.
- Test a small area of crop first before treating the entire crop with any new herbicide product if there are any doubts about particular varietal sensitivities.

1. A commercial crop of narcissus with excellent weed control achieved by appropriate herbicide use

Background

Narcissus crops are high value crops, being in the ground for up to three or more years. Weed growth reduces the yield and quality of both flowers and bulbs, and impedes flower picking and bulb lifting. Excessive weed growth may also delay crop maturity and introduce pests (such as stem nematode) and diseases.

Research has shown that the period after flower harvest, when the bulbs are increasing in size and initiating flowers, is particularly important to keep weed free. Where weeds are not controlled after picking, flower yields can be reduced by up to 25% the following year with a 13% reduction in bulb yield.

Changes in pesticide authorisation have had an impact on the availability of herbicides for use in narcissus crops, with a number of traditional herbicides being withdrawn and new limits on dose rates for others (for example those products containing linuron and metazachlor). With a reduced number of herbicides available there is a danger that the remaining herbicides will be overused with an increased risk of a build-up of weeds with tolerance or resistance to the active ingredients used.

The HDC has recently funded research to find alternative herbicides to fill the gaps left by those withdrawn, and has obtained EAMUs for promising new products. This will increase the choice available to narcissus growers. This factsheet draws on this research, describing the range of herbicides now available and the best way to make use of them.

Recommendations

Pre-planting

As with other long-term horticultural crops, perennial weeds need to be dealt with in the seasons before planting, as there are fewer control options when the crop is present. The choice of herbicide will depend on the weed species present and the time available between herbicide application and planting. In most cases glyphosate formulations will control the range of weeds present (Table 1), but for more resistant weeds such as creeping thistle, other alternative active ingredients such as clopyralid (for example Dow Shield 400 via EAMU 0514/13) will be more effective.

Post-planting

Herbicide treatments for narcissus crops are traditionally applied at three timings:

- **Dormant period:** glyphosate and a pre-crop emergence residual herbicide applied as late as possible before shoot emergence
- **Early post-emergence (leaf height 5 - 10 cm):** residual herbicide application to maintain weed control
- **Post-flower cropping:** residual herbicide application to maintain weed control following soil disturbance at flower picking.

Dormant period

Starting with the dormant period, any existing overwintered annual weed and grasses are normally effectively cleaned up with a glyphosate treatment. Before application, it is important to check that no dying bulb foliage is present, and that there are no cracks in the ridges – uptake of non-selective herbicides can cause damage to bulbs.

A residual herbicide is applied as late as possible, but before any bulb leaves emerge. The standard residual herbicide treatment for the dormant period is a tank-mix of Intruder (chlorpropham) + Afalon (linuron) or another product containing linuron. However, Intruder + Sencorex WG (metribuzin) provides an alternative safe treatment at a similar cost with improved control of both groundsel and willowherb. Devrinol (napropamide) is an alternative dormant season herbicide which controls willowherb but is more expensive.

Early post-emergence stage

If the dormant period residual herbicides have been sufficiently effective there may be no need to apply a further herbicide at the early post-emergence stage. The herbicide options at this stage are very limited because of the risk to pickers from dislodgeable residues and it can be difficult to judge the correct growth stage where the crop has emerged unevenly – late application of some herbicides can damage flower buds. This timing is usually when bulb leaves are about 5 - 10 cm tall, but before flower buds emerge.

If the main dormant period residual herbicides have been missed due to unfavourable weather, some residual herbicides are still safe to be applied at the early post-emergence stage (Table 2). For example options for this stage include: Flexidor 125 (isoxaben) + either Butisan S (metazachlor), Goltix WG (metamitron) or Stomp Aqua (pendimethalin).

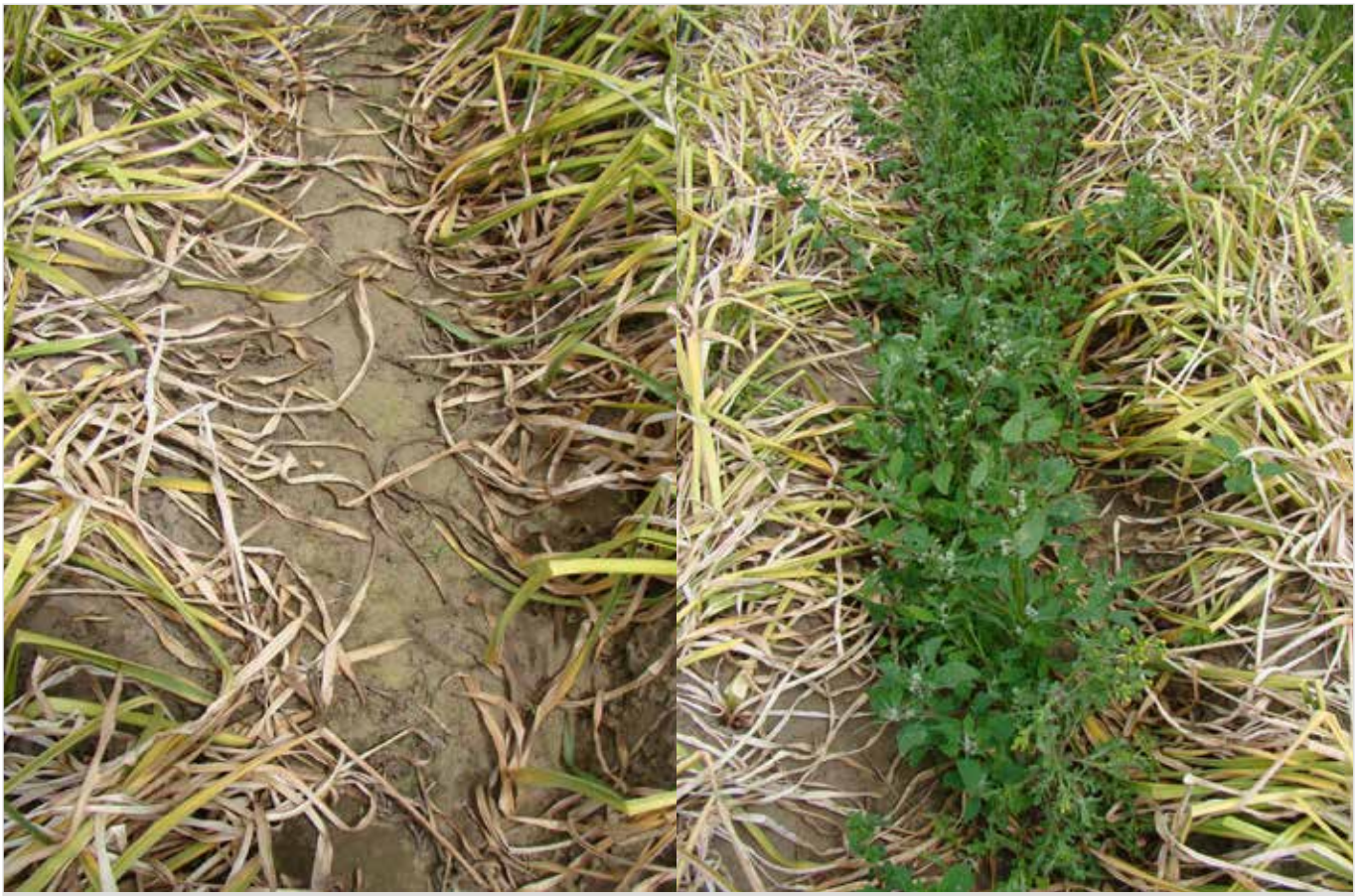
Where weeds have emerged, Boxer (florasulam) can be used, although care is required to avoid late application when buds are visible as damage will occur (Table 3).

2. Bulb foliage at the early post-emergence growth stage, leaf height 5 – 10 cm

Post-flower cropping

During flower harvesting the movement of pickers disturbs the herbicide seal on the soil surface and a new flush of weeds germinate. The post-flower cropping treatment is therefore crucial and usually residual soil- and foliar-acting herbicides are required. Application should be made as soon as possible after cropping before the foliage lodges and shields the ground between the ridges from the spray.

Stomp Aqua + Kerb Flo (propyzamide) is effective and safe at this stage but does not control groundsel and is relatively weak on mayweeds. Wing-P (pendimethalin + dimethenamid-P) is an alternative to Stomp Aqua that could be used at this stage to add control of groundsel. However Wing-P does not control emerged weeds in field situations. For the control of emerged weeds at this stage, selective foliar-acting herbicides such as Boxer and Butryflow (bromoxynil) are available as a post-flower treatment and could be added to a number of the residual treatments (for example Boxer + Wing-P and Butryflow + Stomp Aqua).



3. Good weed control from the use of Boxer + Wing-P applied post flower harvest (left) compared with untreated (right)

Crop desiccation

Mechanical defoliation (flailing) is slow and can damage bulbs, while burning-off foliage with propane requires slow tractor speeds to be effective and is not environmentally sensitive. Some desiccants lack crop safety, in that they reduce crop quality when the bulbs are lifted and forced.

Where the bulb crop is to be lifted and desiccation is required to facilitate early lifting, Spotlight Plus (carfentrazone-ethyl) can be used to 'burn-off' the narcissus foliage and some weeds. Spotlight Plus desiccates broad-leaved weeds but is not effective on grasses (Table 4). Where early lifting is required and the bulb foliage is still erect and green, weather conditions have a significant effect on treatment efficacy. Spotlight Plus acts faster under the ideal conditions of high light intensity in hot weather, than when the weather is cool and cloudy. However, once the foliage has begun to die off naturally desiccation is rapid and weather conditions have less effect on the speed of desiccation. One application of Spotlight Plus at 1.0 L/ha may be sufficient, but if the weather is not favourable, two applications of Spotlight Plus (1.0 L/ha followed by 0.6 L/ha seven days later) perform better.

4. Narcissus plot treated with Spotlight Plus for desiccation (right), untreated (left) is still green

Table 1. Herbicides – primarily contact-acting, non-selective

Typical product	Active ingredient	Rate/ha	Timing	Approval status	Notes
Harvest	Glufosinate-ammonium (150 g/L)	3.0 - 5.0 L/ha	Pre-emergence of bulbs	Label	
Reglone	Diquat (200 g/L)	2.0 L/ha	Pre-emergence of bulbs	Label	
Roundup Pro Biactive	Glyphosate (360 g/L)	5.0 L/ha	Pre-emergence of bulbs	EAMU 2877/08	

Table 2. Herbicides – primarily soil-acting, residual

Typical product	Active ingredient	Rate/ha	Timing	Approval status[1]	Notes
Afalon	Linuron (450 g/L)	1.35 L/ha	Pre-emergence of bulbs	EAMU 0877/09	Must **not** be applied to emerged crop
Butisan S	Metazachlor (500 g/L)	1.5 L/ha maximum dose but a total of no more than 1,000 g a.i./ha (equivalent to Butisan S 2.0 L/ha) to be applied over three years to the same site	Pre- or early post-emergence of bulbs or post-harvest of flowers	Label for ornamental plant production	A dose of 0.66 L/ha applied in each year for three years is permitted but would give poor weed control
Devrinol	Napropamide (450 g/L)	9.0 L/ha	1 November – 30 April	Label for ornamental plant production	Do not use on sands or on soils with >10% organic matter
Flexidor 125	Isoxaben (125 g/L)	2.0 L/ha two applications permitted	Pre- or early post-emergence of bulbs or post-harvest of flowers	Label for ornamental plant production	
Intruder	Chlorpropham (400 g/L)	2.0 L/ha	Pre-emergence of bulbs	Label for ornamental plant production	Two applications of 2 L/ha can be made
Kerb Flo	Propyzamide (400 g/L)	3.0 L/ha	Post-harvest of flowers	EAMU 0207/13	
Sencorex WG	Metribuzin (70% w/w)	0.75 kg/ha	Pre-emergence of bulbs	EAMU 2265/13	
Stomp Aqua	Pendimethalin (455 g/L)	2.9 L/ha	Pre-emergence of bulbs or post-harvest of flowers	EAMU 2919/09	
Venzar Flowable	Lenacil (440 g/L)	5.0 L/ha	Pre- or early post-emergence of bulbs	LTAEU	Not recommended on very light soils. Normally only used at low rates (1.5 - 3.0 L/ha) to reduce risk of damage
Wing-P	Pendimethalin + dimethenamid-P (250 : 212.5 g/L)	3.5 L/ha	Pre-emergence of bulbs or post-harvest of flowers	EAMU 0253/13	

[1]**Important notes - approval status**

- Some product labels state 'ornamental plant production' but unless narcissus is specified on the label this use is at grower's own risk. EAMUs (Extension of Authorisation and Consent for a Minor Use of a Plant Protection Product) and LTAEUs (Long Term Arrangements for Extension of Use) are also at grower's own risk.
- When each herbicide product is re-registered its status will be re-assessed and there may be changes or withdrawals. Until this phase has been completed a few herbicides may be permitted under the LTAEU. Keep up to date – visit the HDC/LIAISON website.
- Check tolerance of variety before treating the whole crop.

Table 3. Herbicides – primarily foliar-acting, selective

Typical product	Active ingredient	Rate/ha	Timing[2]	Approval status[1]	Notes
Aramo	Tepraloxydim (50 g/L)	1.5 L/ha one application per crop	Post-harvest of flowers	EAMU 2813/08	Must not be applied between 1 November and 1 March
Basagran SG	Bentazone (87% w/w)	Maximum rate 1.65 kg/ha. Maximum total dose 1.65 kg/ha	At any time except during flower bud formation	Label	Ineffective under cold conditions
Boxer	Florasulam (50 g/L)	0.1 L/ha	Early post-emergence of bulbs, post-harvest of flowers	EAMU 2826/08	
Butryflow	Bromoxynil (401.58 g/L)	1.0 L/ha	Post-harvest of flowers (March - July only)	EAMU 0517/13	Can also be used on crops with foliage >10 cm not flower cropped
Fusilade Max	Fluazifop-P-butyl (125 g/L)	1.5 – 3.0 L/ha one application per crop	Not specified	EAMU 1321/12	Must not be applied with hand-held equipment. Use higher rates for couch grass control
Goltix WG	Metamitron (70% w/w)	4.0 kg/ha	Early post-emergence of bulbs	LTAEU	Short term residual with some contact action on small weeds
Laser	Cycloxydim (200 g/L)	0.5 – 2.25 L/ha one application per crop	When crop is 5 - 10 cm tall	Label – for ornamental bulbs	Add an approved adjuvant oil. Use higher rates for couch grass control

[1]Important notes - approval status

- Some product labels state 'ornamental plant production' but unless narcissus is specified on the label this use is at grower's own risk. EAMUs (Extension of Authorisation and Consent for a Minor Use of a Plant Protection Product) and LTAEUs (Long Term Arrangements for Extension of Use) are also at grower's own risk.
- When each herbicide product is re-registered its status will be re-assessed and there may be changes or withdrawals. Until this phase has been completed a few herbicides may be permitted under the LTAEU. Keep up to date – visit the HDC/LIAISON website.
- Check tolerance of variety before treating the whole crop.

[2]Important notes - timing

- Early post-emergence timing usually when leaves are 5 - 10 cm in height, just before rapid bud growth.

Table 4. Desiccant treatment

Typical product	Active ingredient	Rate/ha	Timing	Approval status	Notes
Spotlight Plus	Carfentrazone-ethyl (60 g/L)	Maximum dose 1.0 L/ha followed by 0.6 L/ha. Maximum total dose 1.6 L/ha/crop	Up to seven days before bulb harvest	EAMU 1003/09	For desiccation prior to bulb lifting only

5. A pre-emergence application of Ronstar Liquid was found to cause damage to the emerging narcissus foliage. Treated (left) and untreated (right)

Table 5. Other herbicides with authorisation for use (label or EAMU) for ornamental plant protection but which are not recommended for narcissus

Typical product	Active ingredient	Approval status	Reason not recommended
Betanal Expert	Desmedipham + ethofumesate + phenmedipham	EAMU	Not tested
Betanal Flow	Phenmedipham	EAMU	Not tested
Cadou Star	Flufenacet + isoxaflutole	EAMU	Slight damage, poor control of black-bindweed
Defy	Prosufocarb	EAMU	Not tested. Approval restrictions make use impractical on narcissus crops
Dow Shield 400	Clopyralid	EAMU	Damaging
Dual Gold	S-metolachlor	EAMU	Not tested
Hurricane SC	Diflufenican	EAMU	Not tested
Jubilee SX	Metsulfuron-methyl	EAMU	Not tested
Nirvana	Imazamox + pendimethalin	EAMU	Not tested
Nortron Flo	Ethofumesate	EAMU	Not tested
Panarex	Quizalofop-P-tefuryl	EAMU	Grass weed control only, not tested
Ronstar Liquid	Oxadiazon	Label	Damaging
Starane 2	Fluroxypyr	EAMU	Damaging
Starane XL	Florasulam + fluroxypyr	EAMU	Damaging
Sumimax	Flumioxazine	EAMU	Damaging
Titus	Rimsulfuron	EAMU	Not tested

Table 6. Weed species susceptibility to primarily soil-acting residual herbicides authorised for use on narcissus crops. (See Table 2 for approved application timing)

Herbicide product / Weed species	Afalon	Butisan S	Devrinol	Flexidor 125	Intruder	Kerb Flo	Sencorex WG	Stomp Aqua	Venzar Flowable
Approval status	**EAMU**	**Label**	**Label**	**Label**	**Label**	**EAMU**	**LTAEU**	**EAMU**	**LTAEU**
Annual meadow-grass									
Bindweed, black									
Charlock									
Chickweed, common									
Cleavers									
Corn spurrey									
Crane's-bill, dove's-foot									
Dead-nettle, red									
Fat-hen									
Fleabane, Canadian									
Fumitory, common									
Groundsel									
Knotgrass									
Mayweeds									
Nettle, small									
Nightshade, black									
Orache, common									
Pansy, field									
Penny-cress, field									
Poppy, common									
Redshank									
Scarlet pimpernel									
Shepherd's purse									
Sow-thistle, smooth									
Speedwell, common field									
Speedwell, ivy-leaved									
Volunteer cereals									
Wild oats									
Willowherbs									

Table 7. Weed species susceptibility to primarily foliar-acting herbicides authorised for use on narcissus crops. (See Table 3 for approved application timing)

Weed species / Herbicide product	Aramo	Basagran SG	Boxer	Butryflow	Fusilade Max	Goltix WG	Laser
Approval status	**EAMU**	**Label**	**EAMU**	**EAMU**	**EAMU**	**LTEAU**	**Label**
Annual meadow-grass							
Bindweed, black							
Charlock							
Chickweed, common							
Cleavers							
Corn spurrey							
Crane's-bill, dove's-foot							
Dead-nettle, red							
Fat-hen							
Fleabane, Canadian							
Fumitory, common							
Groundsel							
Knotgrass							
Mayweeds							
Nettle, small							
Nightshade, black							
Orache, common							
Pansy, field							
Penny-cress, field							
Poppy, common							
Redshank							
Scarlet pimpernel							
Shepherd's purse							
Sow-thistle, smooth							
Speedwell, common field							
Speedwell, ivy-leaved							
Volunteer cereals							
Wild oats							
Willowherbs							

Key to Tables 6 and 7

EAMU Extension of Authorisation and Consent for a Minor Use of a Plant Protection Product (grower's own risk)

Label Label approval

LTAEU Off-label approval under the Long Term Arrangements for Extension of Use (grower's own risk use)

	Susceptible
	Moderately susceptible
	Moderately resistant
	Resistant

Further information

HDC Grower summaries and reports

HDC Grower summary BOF 073: ‘Evaluation of potential alternative herbicides for narcissus following the loss of active ingredients’.

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