



Horticultural
Development
Company

Grower summary

BOF 65

Outdoor Flowers: Evaluation of
a herbicide to replace Dosaflo
for volunteer potato control in
Gladiolus

Final Report 2009

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Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

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

- Potential alternative herbicides screened to control volunteer potatoes in gladiolus crops were not as effective or crop-safe as Dosaflo (metoxuron), which is no longer available.
- Sumimax (flumioxazin) at 100 ml/ha killed small volunteer potato shoots and gave some suppression of larger plants however it caused slight damage to gladiolus leaves.

Background and expected deliverables

Crops of gladiolus are often grown in the same rotation as potatoes. In the past Dosaflo (metoxuron) was used for suppression of volunteer potatoes in gladiolus (and carrots) but it was not supported in EC 91/414 Review of pesticides- it can no longer be used. If potato volunteers are not controlled they are a reservoir for potato blight infection. The cost of removal by hand-pulling or with selective application of glyphosate by hand could be prohibitive. Potato volunteers in crops of gladiolus reduce yields. Importantly, flower quality is affected because the stem becomes weak by excessive elongation, trying to outgrow potatoes. Some herbicides can cause damage and also affect quality. Sumimax (flumioxazin) applied post-emergence appeared to have potential for suppression of volunteer potatoes in vegetable trials but it caused some damage to lilies in project BOF 58. Sumimax controls other broad-leaved weeds (e.g. mayweeds) but not knotgrass. It has foliar contact and soil residual activity and is less effective on weeds in dry conditions. The objective of the project is:

- To find a post-emergence herbicide that controls volunteer potatoes to replace Dosaflo.
- To evaluate in one trial post-emergence application timing and dose rates of Sumimax for safety to gladiolus.
- To evaluate a tank-mix of Defy (prosulfocarb) + Linuron that has proved useful for volunteer potato control in carrots.

Summary of the project and main conclusions

Herbicide treatments: a '+' denotes a tank-mix, '&' followed by

<i>Herbicide</i>	<i>g a.i./ha</i>	<i>L or ml/ha</i>
1. untreated		-
<i>Applied when Gladiolus at 2 leaf stage#</i>		
2. Sumimax	15	50ml
3. Sumimax	30	100ml
4. Defy + Alpha Linuron 50SC	2000 + 325	2.5 L + 0.65 L
<i>Applied 20 days after Gladiolus at 2 leaf stages</i>		
5. Sumimax	30	100ml
<i>Applied when Gladiolus at 2 leaf stage and 20 days after 2 leaf stage</i>		
6. Sumimax & Sumimax	15 & 15	50ml & 50ml
# most volunteer potatoes emerged at this stage		

The trial was in a commercial crop of gladiolus cv. Velvet Moon at Surfleet near Boston, South Lincolnshire, on light silt loam soil. Potatoes were grown in rotation with gladiolus at this site. The gladiolus corms were planted 15cm below the soil surface in double ridges. The trial treatments were not replicated. Standard herbicide tank-mix Jupiter 40 CIPC (chlorpropham 400 g/L EC) + Alpha Linuron 50SC (linuron 500g/L SC) at 6.0 + 1.0 L/ha applied after planting and pre-emergence of the crop, controlled all weeds except potato volunteers. Windy weather delayed the spraying date for the second applications until 19 June.

Crop safety

Crop tolerance of gladiolus to herbicides assessed on several dates; score:0 plant death, 7 acceptable damage, 10 no damage ; (.percentage damage on total leaf area of the plant)

Herbicide	L or ml/ha	13 June	30 June	16 July	29 July#
			(% damage)*	(%damage)	
	Gladiolus 2-3 L		5 L	6-7 L	9L
	GS:				
1. untreated	-	10	10	10	10
<i>Applied when Gladiolus at 2 leaf stage (31 May)</i>					
2. Sumimax	50ml	8 sc sp	9 (1%)	9.5 (0.5%)	10
3. Sumimax	100ml	6 sc sp	7 (10%)	8 (8%)	10
4. Defy + Linuron	2.5 L + 0.65 L	4 severe bl	5 (30%)	6 (15%) st	9 st
50SC					
<i>Applied 20 days after Gladiolus at 2 leaf stages (19 June)</i>					
5. Sumimax	100ml	-	5 (25%)	4 (30%)	4
<i>Applied when Gladiolus at 2 leaf stage and 20 days after 2 leaf stage</i>					
6. Sumimax	&50ml & 50ml	8 sc, sp	6 (10%)	5 (20%)	5

bl bleaching; sc scorch; sp white spotting; st stunting, GS growth stage, L leaves

*. #On 29 July scores excluded leaves 1 and 2

Assessments made on the 13th of June showed that damage from Defy + Linuron was unacceptable. Sumimax 100 ml/ha caused white spotting mainly on the second leaf and the leaf margins were scorched. Damage was less severe from the 50 ml dose of Sumimax (treatments 2 and 5).

On the 30th of June new growth, i.e. leaves 3, 4 and 5, appeared normal and unaffected by previous herbicide applications (treatments 2, 3, 4 and 6) hence the % area affected decreased. Defy + Linuron caused the most severe damage and the bleached ends of leaf 2 died, Sumimax spotting and slight scorch was less severe.

On the 16th and 29th of July Defy + Linuron appeared to cause slight stunting. There was slight yellowing of leaf tips and margins on L4 and L5 on 21 August – perhaps from soil leaching after heavy rainfall and root uptake of Linuron.

Herbicide effects on the first 2 leaves do not reduce quality because leaves at the base of the plant are never included in the cropped stem.

Gladioli were at 3-4 leaf stage on 19 June when the later applications of Sumimax (treatments 5, 6) were made. Visible damage to the larger leaf area was more severe than from early sprays and was unacceptable (30 June assessment). Leaves that were erect caught less spray than those that were horizontal. On 16 July damage had increased on the second leaf, and leaves 3 and 4 were also affected by the follow-up application of Sumimax 50 ml/ha. Damage from Sumimax 100 ml/ha applied late was more severe than the earlier application because a larger leaf area suffered white leaf spotting/streaking on leaves 2, 3 and 4. Assessments on 29 July showed that leaves that emerged after herbicides were applied were undamaged but leaf spotting, streaking and leaf tipping effects from all herbicide treatments were still visible and remained until cropping on 21 August.



Sumimax 100 ml/ha applied on 31 May at 2-leaf stage of the crop, 13 days after treatment



Defy + Alpha Linuron 50 SC (2.5 + 0.65) L/ha applied on 31 May at 2-leaf stage of the crop, 13 days after treatment



Sumimax 100 ml/ha applied at 4-leaf stage of the crop, damage 11 days after treatment

Volunteer potato control

Volunteer potatoes were at an advanced growth stage when the first herbicide treatments were applied on 31 May. Most potatoes were large: 5-7 shoots per plant, c. 40 cm tall, 60 cm across with flower buds.

All of the herbicide treatment killed 100% of the foliage on small potatoes. Only the Defy and Linuron treatment gave >90% control of potato foliage of large potatoes but even with this treatment 4 weeks after application re-growth was noted. None of the herbicide treatments prevented tuber formation.

Percentage foliage killed of small (S) or large (L) volunteer potato shoots; score for control (0 no control as untreated, 7 acceptable control, 10 complete control)

Herbicide	L or ml/ha	8 June		13 June		30 June		score
		S	L	S	L	S	L	
1. untreated	0	0	0	0	0	0	0	0
<i>Applied when Gladiolus at 2 leaf stage Applied 20 days after Gladiolus at 2 leaf stages (31 May)</i>								
2. Sumimax	50ml	80	25	100	50	100	st	3
3. Sumimax	100ml	90	50	100	80	100	st	6
4. Defy + Linuron 50SC	2.5 L + 0.65 L100	90	100	90	100	100	re-gr	9
<i>Applied 20 days after Gladiolus at 2 leaf stages (19 June)</i>								
5. Sumimax	100ml	-	-	-	-	100	50	5
<i>Applied when Gladiolus at 2 leaf stage and 20 days after 2 leaf stage</i>								
6. Sumimax & Sumimax	50ml & 50ml	80	25	100	60	100	80	6

st stunted; re-gr regrowth

Cropping: maturity, harvestability, quality and vase-life

It is possible that the early, most damaging treatments (3 and 4) Defy + Linuron and Sumimax 100 ml/ha caused slight delay of flowering. The most damaging herbicide, Defy + Linuron, appeared to reduce crop height in comparison with other treatments.

The length of cropped gladiolus stems was 80 – 85 cm according to the market specification. Velvet Moon was a late-maturing very tall variety, and seven lower leaves remained on the plant after cropping. This meant that for this cultivar any damage from application of herbicide at growth stages 4-leaf stage (treatments 5 and 6) did not spoil quality but this may not apply to short early varieties. The two bottom leaves are not included in the cropped

stem of gladiolus thus leaf damage from the early applications when the gladioli were at 2-leaf stage would not affect quality.

There was negligible difference in vase-life and quality between samples of treated and untreated gladiolus.

Herbicide treatments did not appear to affect the gladiolus corms. No grow-on experiments were done but no defects were observed on samples from plots.

Conclusion

- Gladioli have an erect growth habit and are poor competitors with volunteer potatoes. Early removal of competition from potatoes will increase yield and quality. All herbicides caused some damage in the form of leaf scorch, bleaching or spotting to the gladiolus crop and all killed small potato shoots.
- An early application of Sumimax at 100 ml/ha applied at 2-leaf stage of gladiolus was the safest treatment and would remove competition early although some hand-pulling may be needed where the control of large potatoes is incomplete. The lower dose was inadequate.
- Defy + Linuron (2.5 + 0.65) L/ha caused very severe damage initially, and was not safe to gladiolus although it gave the best foliar suppression of volunteer potatoes damaging 90% of the leaf area of large potatoes.. The weed control programme with Linuron pre-emergence used on this crop (total 1.65 L/ha) would exceed the 1.2 L/ha dose rate permitted on any crop after December 2008. Linuron products have now been revoked for use in ornamental plant production.
- There will be a SOLA approval for Sumimax for use in ornamental plant production. Defy can be used in ornamentals under the Long Term Arrangements for Extension of Use for non-edibles. These arrangements are under review and in future a SOLA will be needed. Use of Linuron in ornamental plant production has been revoked there is no SOLA or LTAEU. A SOLA is being re-assessed, but hand-held applications will still be excluded. Defy alone will not control volunteer potatoes.

Status of the herbicides used in this project in 2008 (as at November 2008)

<i>Product name</i>	<i>a.i. and formulation</i>	<i>Marketing company</i>	<i>EC Review</i>	<i>UK Approval</i>
Sumimax	Flumioxazin 300 g/L EC	Interfarm	Annex 1	Ornamental plant production SOLA
Defy	Prosulfocarb 800 g/L EC	Syngenta	Annex 1	LTAEU
Alpha Linuron 50SC	Linuron 500 g/L SC	Makhteshim	Annex 1	No SOLA#, no LTAEU. Revoked for ornamental plant production

to be re-assessed; LTAEU Long Term Arrangements for Extension of Use; SOLA Specific Off-label Approval

Financial benefits

Weeds, including volunteer potatoes, in gladiolus crops reduce yields and interfere with picking. Importantly, flower quality is reduced because the stem becomes weak by excessive elongation, trying to outgrow the weed.

If volunteer potatoes are not controlled they can act as a reservoir of potato blight infection posing a risk to potato crops on the farm and gladiolus crops will be unpopular on rented land. The cost of removal by either hand pulling or using selective application of glyphosate by hand is expensive. Some herbicides can cause damage and also affect quality.

This trial aimed to maintain or improve the cost-effectiveness of producing cut-flowers of gladiolus in UK crops by identification of a crop-safe, effective herbicide alternative to Dosaflor used by growers of gladiolus but lost in the EC Pesticide Review.

Sumimax could be useful to remove competition from potatoes early but it may not be as effective or as safe as Dosaflor. Some hand labour may be needed as well.

Action points for growers

- Sumimax applied at 100 ml/ha no later than 2-leaf stage of gladioli caused acceptable damage (white spotting and scorch) and did not reduce quality because the bottom leaves will be discarded from the cropped stem. It will kill small shoots of potatoes and cause severe damage to large ones. It could be useful to remove competition early but it may not be as effective as Dosafla and some hand labour may still be needed.
- Defy + Linuron (2.5 + 0.65) L/ha was more effective on potatoes in this trial but was too damaging to gladiolus.
- There are no on-label approvals for Sumimax in flowers or ornamentals but there will be a SOLA for ornamental crop production.