

Silverleaf Nightshade Best Management Practice Guide

Introduction

Silverleaf nightshade (*Solanum elaeagnifolium* Cav.) originates from central or southern America and was first reported in Australia in the early 1900s.

Silverleaf nightshade is a deep rooted, summer active perennial closely related to horticultural crops such as tomatoes and eggplants, making biological control problematic. The extensive root system, up to several metres in width and depth, poses a large problem for control.

Silverleaf nightshade is a declared noxious weed in New South Wales, Victoria and South Australia.

Prioritising a control program

Preventing a new infestation:

Due to the difficulty in eradicating silverleaf nightshade, good hygiene strategies should be followed to reduce the risk of a new infestation starting.

Ensure all equipment and machinery is clean and free of root fragments and berries.

Ensure all livestock do not have any berries attached to their coat or feet. If there is a chance the livestock have been grazing where berries were present, or consumed fodder containing berries, quarantine stock in a small area for 10-14 days to allow any ingested seed to be excreted.



Silverleaf nightshade – photo courtesy of Rex Stanton, EH Graham Centre

Small infestations may not appear to be a major concern, but once established, silverleaf nightshade is difficult to remove.

Managing an existing infestation:

Where silverleaf nightshade is already present, the ultimate goal will be to eradicate the infestation over time by reducing the density and the size of the infestation.

There is no single silver bullet that will easily control silverleaf nightshade, therefore a medium to long term strategy needs to be developed using a range of chemical and non-chemical tactics appropriate to specific situations.

- Step 1 - map the infested areas, together with the estimated density.
- Step 2 - consider the land use of each area, as this can impact on the range of control tactics that can be economically employed.
- Step 3 - assess what control options are appropriate for each area you need to manage.

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A successful management program should include a range of tactics, aimed to control the seedbank and/or the rootbank.

Chemical control

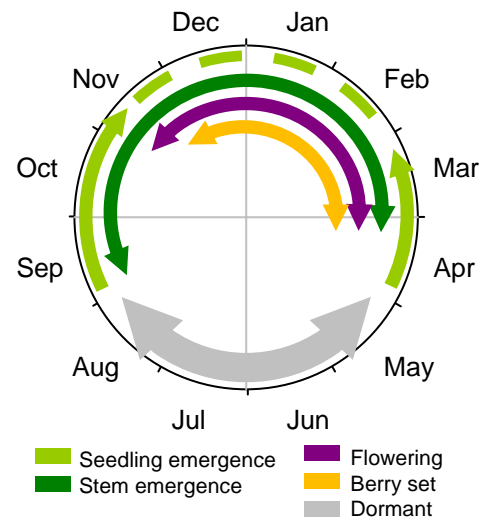
Silverleaf nightshade infestations can not be successfully eradicated with a single herbicide application. Aerial growth can be controlled in-season, however regrowth can occur later in the same season or in the next season from the same rootbank.

Diligence in maintaining a herbicide program over several years is required to run down an established infestation due to the extremely persistent seeds and roots in soil.

Three herbicides (Tordon 75-D®, Starane Advanced® and glyphosate under various trade names) are registered for control by spot spraying or boom application (Ensbeay, 2009). Use of 2,4-D amine up to 8th March 2012 for control is also allowed under the APVMA permit PER9786 (www.apvma.gov.au). Consult with your local agronomist for information on spray rates and adjuvants.

Seedbank control

Seed is the start of a new infestation. Seed production should be minimised wherever possible, as seed can persist for up to five years in the soil. Herbicide treatment at flowering provides better seedbank control than after berry formation, as viable seed can be present 28 days after flowering. Attention should be paid to silverleaf nightshade growth stage to ensure herbicides are applied before berries are too advanced.



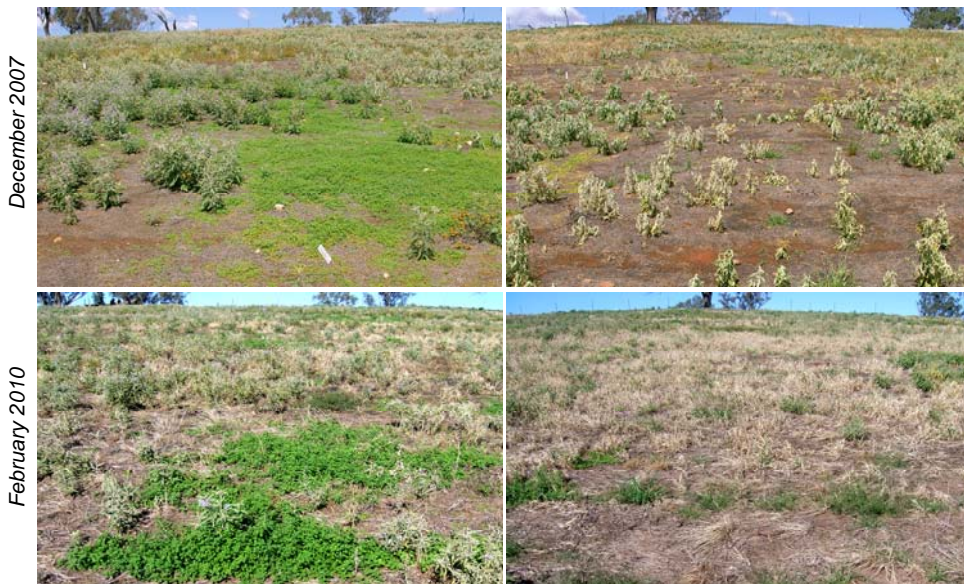
Typical silverleaf nightshade growth cycle

Rootbank control

The rootbank is the main source of new stems each season in established infestations. Effective long term control programs need to include tactics that deplete the rootbank.

Herbicide absorption and translocation is lowest during the middle of summer when silverleaf is in the reproductive phase. The greatest amount of herbicide translocation occurs in spring and autumn.

Where foliar growth is present in autumn, opportunity exists for a late season herbicide application for rootbank control. Herbicides applied late in the season can significantly decrease stem emergence the following season. Late season application of glyphosate or picloram (eg., Tordon 75-D®) is more effective than application of 2,4-D amine or fluroxypyr (eg., Starane®).



Field trials indicate that two well timed spray applications can reduce long term infestation levels.

Photos: Rex Stanton, EH Graham Centre

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Glyphosate herbicides are less expensive than picloram herbicides, however they are non-selective and will therefore remove any desirable species from a non-crop situation. If robust rates are being used, a glyphosate application in autumn can be combined with normal pre-sowing weed control operations, as long as the silverleaf nightshade is active.

Picloram is an expensive herbicide, but is highly effective for controlling the rootbank. While picloram has limited impact on the establishment of cereal crops and pasture grasses, it restricts the planting of broadleaf crops the following winter. Picloram may also cause grain yield losses due to its residual effects. Picloram could also have potential impact on trees and shrubs nearby.

When to spray

Spray application can be undertaken at several times during the silverleaf nightshade growing season, depending on what outcome is being sought.

Currently, herbicides are generally recommended to be applied at flowering, which for most stems is mid summer. Herbicide application at this growth stage will prevent berry formation and viable seed production.

Spraying silverleaf nightshade when it is in a vegetative growth stage, either in spring or autumn, provides the best opportunity for herbicide translocation into the roots. The extensive root system is the major source of new stems each season and should be actively targeted whenever possible.

Dual-spray strategies:

As part of a BMP, it is recommended that:

- **Seedbank** targeted with summer sprays when the majority of stems have flowers but before berries appear
- **Rootbank** targeted with autumn application to live stems.

Spray application

When treating infestations using a boom, it is important to use at least 50 L/ha of clean water to ensure an adequate coverage.

Herbicide efficacy can be assisted by the use of some spray adjuvants. Spray oils can reduce spray droplet evaporation. Penetrants (polysiloxanes) can increase wetting of the leaf surface and aid uptake.

When controlling scattered populations, it may not be practical to hand spray individual plants, and using a boom over the whole area may become expensive or counter-productive. Technology such as wick wipers or WeedSeeker booms may be viable options target herbicide applications, leading to considerable cost-savings.

Wick wipers require the weeds to be taller than the pasture to work effectively, so may not be suitable for all situations.

WeedSeeker booms operate by solenoids switching on whenever something green passes underneath the nozzle, therefore are best suited to fallow situations.



Weed activated spray boom – photo courtesy of Rex Stanton, EH Graham Centre

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Competitive crops and pastures

Silverleaf nightshade is poor competitor and can be effectively suppressed by crop and pasture competition.

Competitive winter crops and their stubble can delay emergence, however silverleaf nightshade will emerge during summer if there is no active competition for summer rainfall. Delaying emergence will promote uniform flowering, making seedbank management operations more efficient.

The choice of summer active crop or pasture species should be driven by what will grow well in your paddock and what will fit into your long term planning for that infested paddock.

Aim to maintain pasture biomass above 1.5 t/ha. Manage stocking rates so that grazing occurs for short periods (several days to weeks) to utilise pastures quickly, but then give the pastures time to regenerate (one or two months) before grazing again.

Grazing

Cattle and sheep will graze on silverleaf nightshade, particularly in the absence of more desirable pasture species. Silverleaf nightshade contains alkaloid glycosides, which may be hydrolyzed to form toxins that cause diarrhoea and nervous disorders, however no livestock deaths have been reported in Australia.



Silverleaf nightshade movement by cultivation – photo Rex Stanton, EH Graham Centre



Competitive pasture trials, Wellington NSW – photo Rex Stanton, EH Graham Centre

Cattle are most sensitive to these alkaloids, with sheep less affected and goats most tolerant. Goats can consume silverleaf nightshade as 25% of their daily dry matter intake without adverse affects.

Grazing silverleaf nightshade after berry formation poses risks of moving seed. Seed can be retained in the ruminant for up to 14 days. Livestock that has grazed on berries should be quarantined for 14 days to ensure seed is not inadvertently spread to new areas.

Mechanical control

The predominant source of new stems each season is the rootbank, rather than recruitment of new seedlings from the seedbank. Cultivation will damage the upper portion of a mature root system, however even fragments as small as 1 cm are capable of forming a new plant.

In areas where cropping or pasture renovation will occur, cultivation should be kept to a minimum to avoid fragmenting the root system. To avoid unintentionally spreading root fragments, ensure that machinery is thoroughly cleaned prior to moving away from the infested area.

Allelopathy

Several Eucalypt species have been identified to have an impact on silverleaf nightshade. In appropriate areas, tree belts could be established and used for long term control of small infestations. As well as providing natural control of weeds, tree belts also provide refuge for native fauna and shelter for livestock.

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Prioritising and planning

A successful BMP will take several years to achieve maximum results as the large root system of this perennial weed is depleted.

Very small infestations can feasibly be eradicated in a few seasons as the total material and labour costs are not large.

Determining the size and density of an infestation will provide a guide as to what sort of outcome, or level of control, may be feasible (Table 1).

Control of large, dense infestations will potentially require more costs than returned income, at least for the first few seasons.

However, reducing the size or the density of the infestation will allow for more profitable production in subsequent years.

Managing smaller or less dense infestations will lead to a decline in the rootbank and the seedbank to the point where eradication may become practical.

Table 1. Prioritising management of silverleaf nightshade infestations.

		Density		
		Light (< 1 stem/m ²) <10% ground cover	Medium (1-5 stems/m ²) 10 - 50% ground cover	Heavy (>5 stems/m ²) >50% ground cover
Area				
Localised	(< 0.25 ha) small patch	Eradicate	Eradicate	Eradicate
Small	(0.25 - 1 ha) part of paddock	Eradicate	Control	Control
Medium	(1 - 10 ha) small paddock	Control	Control	Contain
Large	(>10 ha) large paddock(s)	Control	Contain	Contain

Eradicate –

- Localised impact on production
- Intensively monitor for and control any stems
- Continue monitoring program for up to 5 years to ensure no reinfestation

Control –

- Some reduction in productivity is present
- Adapt paddock use for 2-3 years to include as many control tactics as possible while maintaining production
- Aim to reduce the infestation to an Eradicate level

Contain –

- The size and density of the infestation is affecting production
- Seed and root sources for reinfestation are widely present
- Focus for 1-2 years on reducing the extent or density of the infestation
- Aim to reduce the infestation to a Control level

Once a BMP program has been developed and implemented, it is important to:

- Monitor and record the level of success achieved with each tactic used.
- Review progress against your BMP.
- Re-assess your BMP based on the silverleaf nightshade infestation size/density.
- Monitor for new infestations or re-infestations.

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Silverleaf nightshade BMP objectives and tactics.

Objective	When	Cropping	Grazing / non-arable land
Minimise emergence	Spring	Maintain competitive crop Stop seed set previous season	Maximise ground cover Stop viable seed set previous season
Synchronise flowering	Early summer	Maintain stubble loads Herbicides in late spring if required Slashing Grazing	Maintain ground cover Herbicides in late spring if required Slashing Grazing
Stop seed set	Mid summer	Herbicides at flowering Slashing Grazing stubble Summer cropping	Herbicides at flowering Slashing Grazing pastures C4 pastures
Deplete roots	Autumn	Summer cropping Herbicides in mid to late autumn	Competitive pastures Herbicides in mid to late autumn
Minimise spread	All year	Minimise cultivation to avoid burying seed or fragmenting the root system	Don't graze when berries present Quarantine animals for 10-14 days if seed ingestion is suspected
Alternative competition	Various	Opportunistic use of summer crops	Tree belts using allelopathic <i>Eucalyptus</i> species
Monitor for infestations	Spring to Autumn	Vigilance in spring and autumn when emergence is likely to occur	
Review progress against BMP	Annually	Monitor and record infestation size and density annually	

Note:

- It is critical to apply treatments at the correct growth stage, therefore timings mentioned are a general guide only, and the timing should be adjusted based on seasonal conditions and your knowledge of growth stages in your area.
- Always read chemical labels.

For more information, contact your local advisor or email:
wagga.weeds@industry.nsw.gov.au

