STATICE SEEDBANK PERSISTENCE

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TAKE HOME MESSAGES

- Statice seedbanks reduced with targeted management options in three years, providing no new seeds are allowed to set.
- Crop competition and crop-topping to prevent seed set can help to control statice.
- Statice can be hard to control, so good farm biosecurity is important to prevent the introduction of statice. This includes controlling statice in non-crops areas, such as laneways and fence-lines.

BACKGROUND

Statice, or winged sea lavender (*Limonium lobatum*), is a winter annual weed. The plants are erect, have broadly winged leafless stems, and produce one-sided clusters of purple and white flowers. Statice is most prevalent in areas with low to moderate annual rainfall on sandy to loamy, often sodic or saline soils of neutral to high pH. Severe yield losses (20-30%) have been seen in crops with dense infestations of statice (Kleemann *et al*. 2017).

Statice has been found to be tolerant of glyphosate and synthetic auxin herbicides (Group I, such as 2,4-D and dicamba), which may mean that statice may not be controlled in some spray programs. Light is needed to stimulate the germination of statice, which may explain the increase of statice seen in no-till farming systems, as the seedbank is located at or near the soil surface (Kleemann *et al*. 2017). Statice seeds have a short period of dormancy (two months) and are able to germinate and grow at relatively low temperatures, which allows for germination and emergence to occur over several months over winter and autumn following rainfall events. Most of the seedbank emerges in the first year following seed set (Gill *et al*.). Futhermore, statice seeds have also been shown to decay at slower rates in soils with low organic carbon and microbial activity in areas with low annual rainfall, which could lead to longer persistence in sandy soils with low organic matter, such as those across the Mallee.

While previous research conducted by BCG (2010 and 2014) has established herbicide control options for statice, there is a need to understand more about how cropping rotations effect the seedbank persistence of statice in the Mallee.

A better understanding of statice persistence in the Mallee under differing rotations will help to better manage statice. The objective of the study reported here was to determine the influence of (1) crop competition; (2) chemical fallow; and (3) worked fallow on the seedbank persistence of statice.

The herbicides used in this trial did not have a label registration for statice, due to its emerging weed status, and were tested for experimental purposes only. Always read the label and adhere to directions when using herbicides.

AIM

To determine how long statice persists in the seedbank and to investigate the effect of crop and fallow rotations on statice control.

PADDOCK AND TRIAL DETAILS

Location: Marlbed

Soil type: Clay

Paddock history: Barley (2015)

Table 1. Trial details from 2016-2018.

Trial details	2016	2017	2018
Crop year (Nov-Oct)	474mm	295mm	198mm
GSR (April-Oct)	378mm	225mm	138mm
Sowing date	15 June 2016	8 May 2017	28 May 2018
Crop type	Mace wheat*	Kord wheat	Spartacus barley

*Only sown in the crop treatment plots, fallow treatment plots left unsown.

Treatments: Cropped, chemical fallow, worked fallow (applied in 2016)

Target plant density: 130 plants/m^2

Seeding equipment: Knife points, press wheels, 30cm row spacing

Replicates: Four

TRIAL INPUTS

Table 2. Fertiliser and herbicide inputs from 2016-2018.

Trial inputs	2016	2017	2018
Fertiliser	**At sowing** Granulock® Z @ 50kg/ha + flutriafol @ 200mL/100kg	**At sowing** Granulock® Z @ 60kg/ha + flutriafol @ 200mL/100kg	**At sowing** Granulock® Z @ 60kg/ha + flutriafol @ 200mL/100kg
Herbicide	**15 June** Roundup® @ 2L/ha + Hammer® @ 50mL/ha **15 June** Treflan @ 1.5L/ha + Avadex® Xtra @ 1.5L/ha* **7 October** Roundup @ 2L/ha + Precept® 1L/ha **16 November** Sharpen® @ 26g/ha + Gramoxone® @ 2L/ha + Hasten® @ 1%	**8 May** Treflan® @ 1.5L/ha + Avadex Xtra @ 2L/ha + Amicide® 700 @ 1L/ha + Roundup® PowerMax @ 2L/ha **20 September** Roundup® PowerMax @ 2L/ha **25 September** Spray.Seed® @ 2.5L/ha	**28 May** Treflan® @ 1.5L/ha + Avadex® Xtra @ 2L/ha + Amicide® 700 1L/ha + Roundup® PowerMax @ 2L/ha **17 October** Roundup® PowerMax @ 2.5L/ha + Sharpen® @ 34g/ha

*Applied to the crop treatment only.

METHOD

A field experiment was established at the same site over three successive years. Treatments were assigned to a randomised block design. There were three different treatments including cropped, chemical fallow and worked fallow. Each treatment was replicated four times. In the first year (2016), the cropped treatment was sown to Mace wheat. All plots were then sown with Kord CL wheat in 2017, followed by Spartacus barley in 2018. All plots were terminated before the statice set seed in the spring. Statice density was assessed at two separate intervals, before sowing and prior to termination, by counting the number of plants in four 50cm^2 quadrats placed at random in each plot.

RESULTS AND INTERPRETATION

This trial found it took three years with further no seed set to deplete the seedbank from an overall average of 34 statice plants per m^2 in May 2016, to zero statice plants per m^2 in October 2018. There was a large reduction in statice plants present in the first two years of the trial, however the third year resulted in the population of statice reaching zero plants.

Table 3. Average number of statice plants/m² in each treatment. Pre-sowing counts were conducted 0-10 days before sowing (15/6/16, 4/5/17 and 18/5/2018). Pre-termination counts were conducted 4-13 days before termination (12/9/16, 15/9/2017, 4/7/2018).

	Average number of statice plants/m²					
	2016		2017		2018	
	Pre-sowing	Pre-termination	Pre-sowing	Pre-termination	Pre-sowing	Pre-termination
Chem fallow	33.2	8.6	17.6	0.3	0.3	0.0
Crop	23.5	1.4	6.2	0.7	0.6	0.0
Worked fallow	44.3	7.2	23.6	0.2	0.7	0.0

In the first year of the trial, the cropped treatment had the fewest statice plants germinate and the largest percentage reduction in the number of statice present between sowing and termination. Worked fallow was better at reducing the number of statice than chemical fallow, possibly due to the worked fallow burying the seed resulting in reduced access to light for the seed, which has been shown to reduce germination in lab trials. The two fallow treatments saw a greater percentage reduction in the second year of the trial, when sown to wheat. All treatments had a 100% reduction in plants in 2018, when the small initial numbers of statice were reduced to zero.

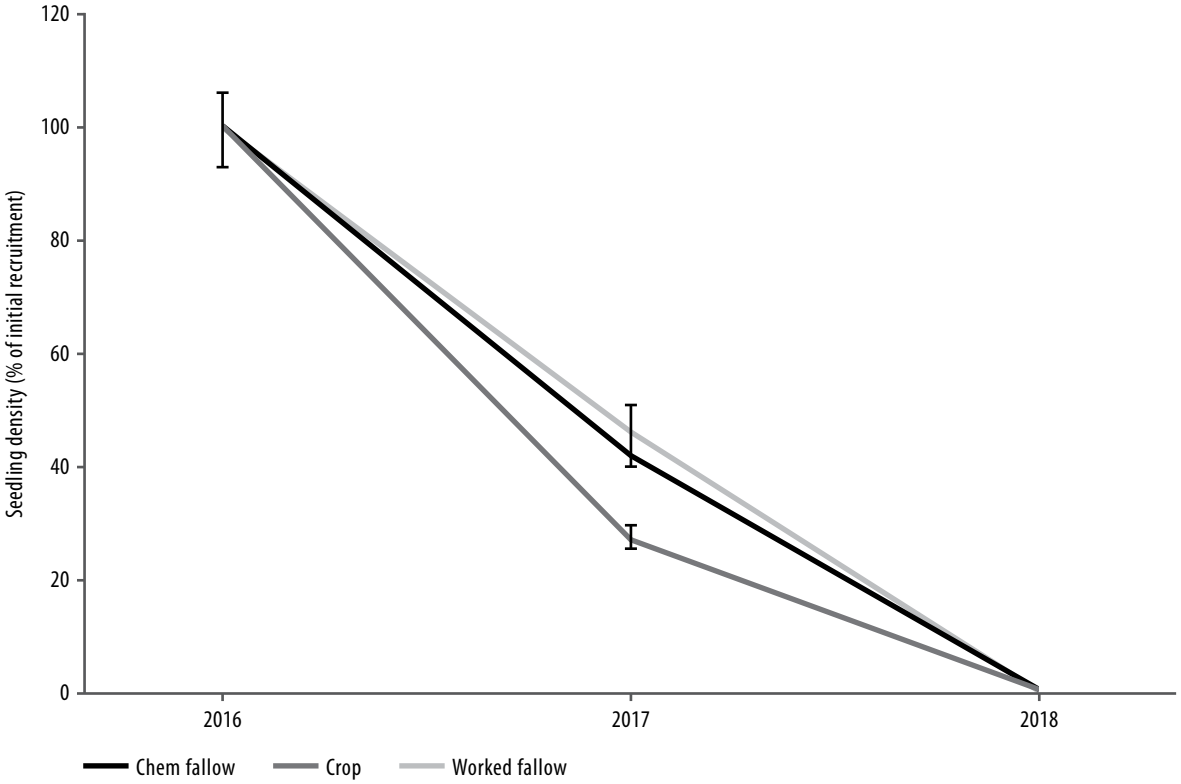

Figure 1. Average percentage reduction in the number of statice plants/m² (density) across each year (pre-sowing plus pre-termination) with standard errors. Significant differences in statice density between treatments were seen in 2016 (P=0.034, LSD=18.7, CV=16), however no significant differnces in statice density due to treatments were seen in 2017 and 2018.

COMMERCIAL PRACTICE

It is difficult to control statice, so the best method is to prevent statice seeds from entering the farm and establishing/germinating. Ensure that statice doesn't enter through contaminated grain or hay, vehicles or equipment. Statice is also commonly found on roadsides, along fence-lines and pastures, so keeping fence-lines and pastures free of statice can help to prevent it from becoming established in the crop. Sheep can also carry seeds in their wool, so stock movements should be considered to prevent introducing statice to new areas. Harvest and post-harvest control over the summer should also be considered to reduce recruitment.

If you do have statice present, consider cereal rotations to allow for greater broadleaf herbicide flexibility and greater crop competition. Previous research found that Velocity®, Igran®, Precept® and Lexone® provided the best control of statice in the Southern Mallee (Taylor and Brown 2014); while other research found that Precept, Diuron® and MCPA® (750), and Igran® and MCPA Amine was effective at controlling statice (Kleeman *et al*. 2017). For best results, statice should be sprayed early, before flowering, according to label directions.

Crop competition has been shown in this trail to help control statice, as opposed to fallowing. As a result, if statice is present sowing a competitive crop, such as barley, may help to reduce statice numbers.

As it takes three years to fully deplete the seedbank, it is important to control statice in the third year, even if plant densities are low. It is important to continually monitor areas in the years following the spraying or removal of statice, as germination could occur from seeds set in previous years.

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