Management of common sowthistle

Fact Sheet

Why is this weed a problem?

Common sowthistle (*Sonchus oleraceus*), also known as milk thistle, is widespread across the grain-growing regions of Queensland and northern New South Wales. Sowthistle uses stored soil water during fallows and interferes with crop harvest, adding green matter to harvested grain.

Common sowthistle is ranked as the 5th most difficult weed to control in winter crops. It is one of the most widespread weeds in the northern grain region, with several populations having resistance to Group B herbicides including chlorsulfuron.

Sowthistle has become more common over the past 10-15 years. The weed was once considered to be winter-dominant; however, it is now found all year round. The increase in common sowthistle is thought to be related to a trend for growers to reduce the number of tillage operations and rely more on herbicides for weed control.

Know the culprit

Identification

Sowthistle plants are erect and fleshy plants that possess hollow, smooth stems that exude milky latex when damaged. Plants can grow from 20 to 150cm in height. Sowthistle plants can be either present as a rosette or upright in their growth form. The seeds of sowthistle each possess a pappus, which aids in seed dispersal.

Common sowthistle can be easily confused with the similar spiny sowthistle (*Sonchus asper*), but can be distinguished by its leaves and seeds. The leaves of spiny sowthistle have

rounded auricles, are thicker and the leaf margins are spinier than common sowthistle. The seeds of spiny sowthistle are broader and are less wrinkled.

Common sowthistle (*S. oleraceus*) (left) and spiny sowthistle (*S. asper*) (right)

When they emerge

Germination of sowthistle is more dependent on soil water than temperature. Seeds are able to germinate between 5° and 35°C, but the majority will only germinate when water availability is close to field capacity for several days. Hence, germination in the field usually follows significant rainfall events at any time of the year. Seeds germinate in both the light and dark, although germination is 50% less in a dark environment. Freshly shed seeds display no innate dormancy and therefore readily germinate following dispersal.

The majority of seedlings emerge from seed on the soil surface or to a depth of 1cm (Figure 1). A very small number emerge from 2cm while none emerge from depths of 5cm or greater. A larger number of seedlings emerge in zero till systems where seeds remain on or near the soil surface.

If these seedlings are effectively controlled, the seed bank will be greatly reduced. Any burial of seed via tillage below 2cm will reduce emergence but increase seed persistence.

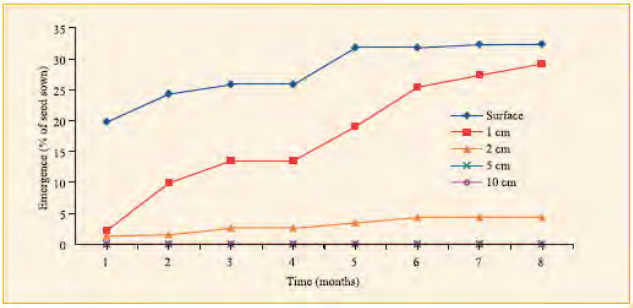

Figure 1. Common sowthistle emergence from seed buried at different depths

Sowthistle is a prolific seed producer

A single plant in a fallow can produce up to 25 000 seeds. Each seed possesses a pappus that aids in dispersal by wind. The majority of seeds fall within 2-3 metres of the parent plant, although a small number of seeds may be dispersed much greater distances. Seeds of sowthistle possess no innate dormancy meaning they are able to germinate straight after dispersal if the environment is suitable. Stopping plants from setting seed is an important component of managing this weed. Even if there are only a small number of plants surviving after an initial treatment, a follow-up treatment using a different control tactic should be applied to stop seed set.

How long do seed persist in the soil?

Seeds of common sowthistle persist for up to one year in the top 1cm of soil. The number of viable seeds is reduced by germination, emergence, insect predation and microbial decay. Seed buried between 2-10cm can persist for more than two years, and develop some degree of induced dormancy. Although tillage may reduce the number of emergences, tillage also buries seed which are able to persist. Subsequent tillage events will bring a portion of the seed close to the soil surface where they are able to emerge, resulting in an ongoing problem.

Strategic approach to better management

Improved management of sowthistle and a reduced risk of herbicide resistance is based upon integrated weed management principles with the ultimate goal to deplete the seedbank and stop its replenishment.

- Keep accurate paddock records of herbicide application and regularly monitor paddocks for levels of weed control achieved.
- Use a variety of chemical and non-chemical tactics to avoid weeds escaping treatment, changes in weed flora, and potential development of herbicide resistance.
- Rotate between the different herbicide groups, and / or tank mix with an effective herbicide from another mode of action group. It is important to use robust rates for both herbicides in the mix.
- Aim for maximum herbicide effectiveness to keep weed numbers low. The primary aim of weed control is to minimise their impact on productivity, and resistance is much less likely to develop in paddocks with fewer weeds than in heavily infested paddocks.
- Use a selection of cultural weed control tools. Sowing different crops and cultivars provide opportunities to use different weed management options on key weeds. Tillage is useful when it targets a major weed flush and minimises soil inversion, as buried weed seed persist longer than on the soil surface. Competitive crops will reduce seed production on weed survivors.
- Ensure survivors do not set seed and replenish the soil seed-bank.
- Avoid introduction or spread of weeds by contaminated seed, grain, hay or machinery. Also, manage weeds in surrounding non-crop areas to minimise risk of pollen and seeds moving into adjacent paddocks.
- Review the control of weeds achieved, and adjust future management strategies accordingly.

Control tactics

Since the weed emerges all year, rotation of crops is a less useful tactic than for weeds that grow predominantly in winter or summer, and management should focus on all phases of the rotation to keep weed numbers low.

To deplete the seed bank

- Tillage is best implemented after a flush of emergence. Delaying tillage until after a flush of emergence will reduce the number of seeds persisting in the seedbank by up to 30%.
- If using tillage, don't bury seeds below a depth of 2cm. Seeds buried below this depth will persist.
- Apply atrazine (Group C) in late winter or spring fallow prior to sorghum after treatment with a knockdown herbicide. Local research: Atrazine at 3.6L/ha controlled common sowthistle for several months.

To control seedlings in wheat

- Rotate to Group I herbicides, such as Tordon™242, MCPA, 2,4-D, Tordon™75D, Hotshot®, Starane™ and Starane™Advanced and/or apply mixes of Group B and I herbicides. Local research: Ally® + MCPA gave 100% control of small seedlings.
- Avoid using Group B herbicides in fallows, if applying Group B herbicides in the preceding or following crop.
- In-crop weed control is important in keeping weed numbers low using a combination of selective herbicides and crop competition. This reduces the selection pressure for glyphosate resistance in the following fallows.
- Control late flushes in winter crops with selective herbicides or pre-harvest sprays instead of waiting for the first fallow spray after harvest.
- Cultivate between wide row crops, or apply paraquat or Spray.Seed® with a shielded sprayer.

To control seedlings in fallow

- Spray small seedlings (2-5 leaves)
- Mix glyphosate with Starane™, Grazon™DS, or Cadence® (Group I) (Table 1).
- Rotate with Spray.Seed® or paraquat (Group L).
- Double knock with glyphosate followed by Spray.Seed® or paraquat on survivors anytime in fallow.
- Double knock with glyphosate followed by full cut cultivation at sowing. Local research: Cultivation was much more effective on common sowthistle less than 10cm diameter.
- Do not mix glyphosate with 2,4-D or metsulfuron (eg Ally®) due to potential antagonism. Other options are in Table 1.
- Use higher water volumes for atrazine, paraquat and Spray.Seed®, such as 100L

Table 1. Control of sowthistle in winter fallow on the Darling Downs

Treatments	MOA	Rate (product/ha)	Weed size	Control (%)
Glyphosate 450 g/L	M	0.8 L	3-leaf	95
Glyphosate 450 g/L	M	0.8 L	7-leaf	91
Glyphosate 450 g/L	M	1.6 L	3-leaf	98
Glyphosate 450 g/L	M	1.6 L	7-leaf	98
Spray.Seed®	L	1.6 L	3-leaf	98
Spray.Seed®	L	2.4 L	7-leaf	99
Glyphosate 450 g/L + Starane™	M+I	0.8 L + 1 L	3-leaf	95
Glyphosate 450 g/L + Cadence®	M+I	0.6 L + 115 g	3-leaf	97
Glyphosate 450 g/L + Grazon™DS	M+I	1.2 L + 0.4 L	7-leaf	100
Glyphosate 450 g/L + Atrazine 500 g/L	M+C	0.8 L + 3.6 L	3-leaf	97
Glyphosate 450 g/L⇨Spray.Seed®	M⇨L	0.8 L & 2.4 L	Double-knock	100

Glyphosate treatments were applied in 60L/ha and Spray.Seed® in 100L/ha. For the double knock treatment, glyphosate was applied to weeds with 3 leaves, and Spray.Seed® was applied 1 week later when untreated weeds had 7 leaves

To stop seed production and seed rain

- A competitive crop reduces common sowthistle growth and seed production. Barley has an 8-fold competitive advantage over wheat in suppressing common sowthistle plant numbers. The competitiveness of wheat is greatly influenced by row spacing and to a lesser extent by crop density. Weed biomass increases by up to 90% under wheat grown at a row spacing of 50cm compared with 25cm. Common sowthistle biomass production is greatly reduced under dense wheat populations of 100 and 150 plants/m2 (Figure 2).
- Double-knock with glyphosate followed by Spray.Seed® or paraquat on survivors anytime in fallow.
- Use tillage, grazing, chipping, or detector sprayer with alternative mode of action herbicide to control and stop survivors setting seed.

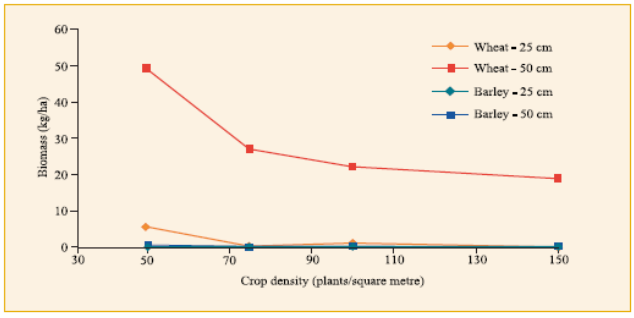

Figure 2. Common sowthistle biomass in wheat and barley crops of different row spacing and plant density.

A competitive crop (left) out competes common sowthistle compared to it thriving in a fallow (right).

Reducing the risk for herbicide resistance

Sowthistle is at high risk of developing glyphosate resistance, particularly for growers practicing zero tillage and relying predominantly on glyphosate alone for fallow control. This risk is minimised greatly when IWM is used to keep weed numbers low. In addition, a glyphosate alternative, glyphosate mix or non-chemical approach should be used to prevent survivors of a glyphosate treatment setting seed.

Conclusion

The success of sowthistle is attributed to its prolific seeding and ability to emerge in different seasons. Although a problem in zero tillage systems, the weed is best managed in these systems. An IWM program needs to be implemented to reduce weed numbers and to prevent sowthistle resistance to herbicides. It is important to closely monitor flushes to ensure timely application and to maximise herbicide performance. The best long-term management strategy for sowthistle control is to treat weeds early and to reduce the soil seed-bank by effective control of weed survivors. Crop rotations and planting configurations should be managed to maximise competition against sowthistle. Sowthistle can be effectively managed in the long-term by using IWM practice and by attacking each stage of its lifecycle.

For further information

- Integrated Weed Management in Australian cropping systems – a training resource for farm advisers. CRC for Australian Weed Management, Adelaide, South Australia www.weedscrc.org.au/publications
- Stopping herbicide resistance in southern Queensland www.dpi.qld.gov.au/fieldcrops

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