

Northern IWM factsheet

Common Sowthistle

(*Sonchus oleraceus* L.): Ecology and Management

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Key Points

- Common sowthistle is a problematic weed across the grain growing regions of Queensland and New South Wales.
- Several populations have been confirmed to have resistance to Group B (e.g., chlorsulfuron) and Group M (e.g., glyphosate) herbicides.
- Common sowthistle is a prolific seed producer and seeds have a low level of dormancy at maturity, enabling them to readily germinate following dispersal.
- Common sowthistle seeds are able to germinate over a broad range of temperatures and are able to emerge throughout the year in the northern region.
- Germination of common sowthistle seeds is stimulated by light; however, seeds can germinate in the dark as well.
- Germination of common sowthistle is favoured by a moist environment.
- Greatest seedling emergence is observed from seeds present on or near the soil surface.
- No-till systems have greater seedling emergence compared to minimum tillage systems.
- Buried seeds of common sowthistle persist more than seeds present on the soil surface.
- Integrated use of cultural and chemical weed control methods can provide effective control of common sowthistle.
- Apply herbicides to small, non-stressed, and actively growing plants of common sowthistle to improve control.
- The double-knock tactic can provide very effective control of common sowthistle and achieve high levels of seed set control.
- Glyphosate-resistant common sowthistle requires treating before the 10 cm diameter rosette stage with a Group I herbicide followed by paraquat.

Introduction

Common sowthistle (*Sonchus oleraceus* L.), also known as milk thistle, is a dicotyledonous annual weed. The plants are erect and fleshy, and possess hollow, smooth stems that exude milky latex when damaged. The weed can grow up to 1.5 m in height. Plants of common sowthistle can be either present as a rosette or upright in their growth form. Its leaves may vary in colour and the amount of serration on their margins (Figure 1). Common sowthistle seeds possess a pappus, which helps in seed dispersal through wind.

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Figure 1. Different leaf characteristics of common sowthistle.

It is easy to confuse common sowthistle with the similar spiny sowthistle (*Sonchus asper* L.), but these two species can be distinguished by their leaves and seeds. The leaves of spiny sowthistle are thicker and have spinier margins than common sowthistle (Figure 2). The seeds of common sowthistle are narrower and are more wrinkled than those of spiny sowthistle.

Spiny sowthistle Common sowthistle

Figure 2. Comparison of a leaf from spiny sowthistle and common sowthistle.

Common sowthistle is a problematic weed across the grain growing regions of Queensland and New South Wales with several populations having resistance to chlorsulfuron (Group B) and glyphosate (Group M). Group M resistance was first confirmed in 2014 with elongating common sowthistle surviving field rates of up to 4 L/ha of glyphosate 450 formulations. This weed has been recognised as a problem in conservation tillage systems in the northern region of Australia. The increase in the abundance of this weed species could be related to the adoption of no-till systems and increased reliance on herbicides for its control. In fallows, common sowthistle uses stored soil moisture. In crop, in addition to reducing crop yield, it interferes with crop harvest and contaminates harvested grain with its green matter. Common sowthistle is a prolific seed producer and a single plant in a fallow can produce up to 25,000 seeds. Furthermore, it is an alternate host for insects, which can transmit virus diseases to commercial crops.

Ecology of Common Sowthistle

Freshly shed seeds of common sowthistle can have more than 90% germination, suggesting a low level of dormancy in this weed species. Seeds are able to germinate over a broad range of temperatures (between 5 and 35 °C). In southern Australia, maximum germination was obtained at alternating day/night temperatures of 20/12 °C (vs. 25/15 and 15/9 °C day/night temperatures). The ability to germinate over a broad range of temperatures is one of the reasons why common sowthistle emerges throughout the year in the northern region. However, germination of this weed species is more dependent on soil moisture than temperature. Common sowthistle is a weed favoured by a moist environment, and therefore, germination in the field usually follows significant rainfall events at any time of the year (Figure 3).

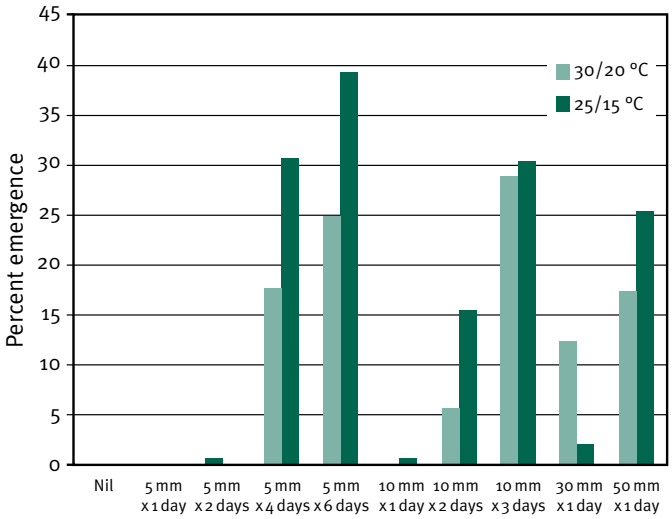

Figure 3. Effect of rainfall events (single and accumulated) on sowthistle emergence under two different temperature regimes.

Light is not an absolute requirement for germination of common sowthistle seeds; however, the presence of light stimulates its germination. At alternating temperature regimes ranging from 15/9 to 25/15 °C, germination ranged from 80 to 93% in light/dark and 40 to 47% in darkness. Such observations explain why its germination and subsequent emergence in the field will be favoured by the presence of seeds at, or near, the soil surface.

Common sowthistle seeds can germinate even at high soil salinity and such soil types are common in some parts of the northern region. Seed germination over a pH range of 5 to 10 indicates that pH should not be a limiting factor for its germination in most soils ranging from slightly acidic to alkaline.

Greatest seedling emergence of common sowthistle occurs when its seeds are present on or near the soil surface but declines with burial depth, and no seedlings emerge from soil depths of 5 cm or greater (Figure 4). A greater number of common sowthistle seedlings emerge under no-till systems compared to minimum tillage systems as most of the weed seeds are present on or near the soil surface in no-till systems, where conditions are favourable for germination.

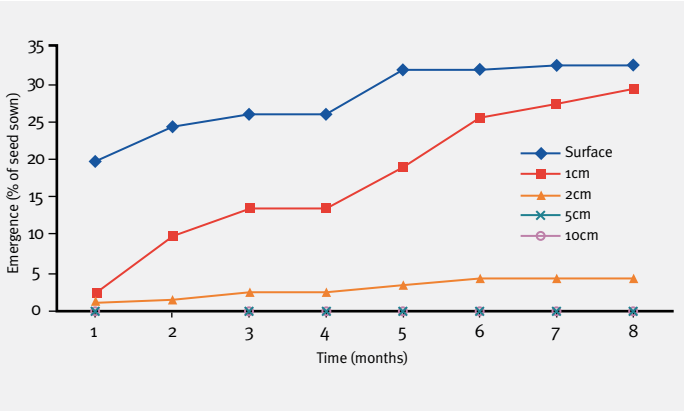

Figure 4. Effect of seed burial depth on seedling emergence of common sowthistle.

The size of the common sowthistle seed bank in the soil is reduced by germination, insect predation, and decay. Seeds of this species can persist for up to one year in the top soil layer. Seed decay of common sowthistle occurs more on the soil surface than at deeper depths. In a study, only 25 and 45% of viable seeds remained at 1 and 2 cm depths, respectively, after a period of 6 months. On the other hand, after a period of 18 months, 30 and 50% seeds were still viable at 5 and 10 cm depths, respectively. Buried seeds show greater persistence than seeds present on the soil surface. Such observations suggest that the farming practices that allow a large proportion of seeds to remain on or near the soil surface will promote quicker depletion of the seed bank in the absence of seed replenishment. Seeds present on or near the soil surface not only face greater risk of loss through predation by micro-organisms and pathogens, but they also age more rapidly.

Management of Common Sowthistle

Weed control tactics should aim to stop seed-set and run down the weed seed bank. No single weed control method will provide total control and therefore, cultural and chemical control methods are needed in combination to achieve effective and sustainable control of common sowthistle. The use of weed-competitive crop and cultivar, narrow crop rows, and high crop density helps in suppressing common sowthistle. In a study, common sowthistle biomass was found to be increased by up to 90% under wheat grown at a row spacing of 50 cm compared with 25 cm (Figure 5). In addition, growing different crops provide opportunities to use different weed management options on common sowthistle and other weed species.

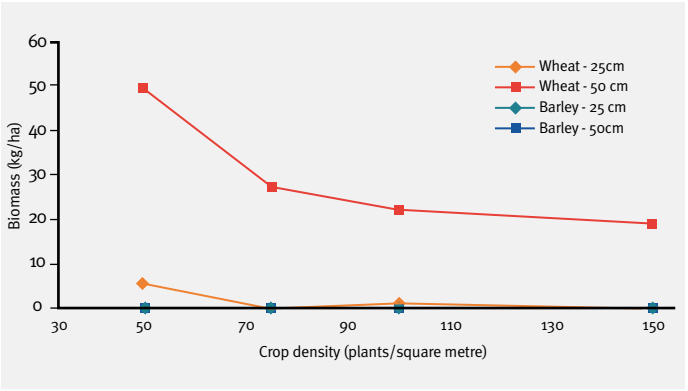

Figure 5. Effect of row spacing and plant density of wheat and barley on common sowthistle biomass.

There may be an option for a one-off tillage operation if common sowthistle becomes difficult-to-control. Most forms of tillage greatly reduce the emergence of common sowthistle compared to zero-tillage, with the greatest reduction observed with a one-way disc operation (vs. harrows, chisel plough, and off-set discs) (Figure 6).

Adopting appropriate herbicide application techniques (i.e., full label rates, appropriate nozzles, boom heights, water volumes, etc.) helps to maximise plant coverage. In addition, target small, non-stressed, and actively growing plants to improve the control of common sowthistle.

Recent field experiments have compared the efficacy of single knockdown and double-knock treatments on sowthistle at two ages (1 and 2 months). Rates for non-glyphosate components were increased for the second time of application. Efficacy of all double-knock treatments remained very high at 95-100% for both weed ages. However, the delay in herbicide application significantly reduced efficacy of single knockdown treatments overall by 13%.

The following treatments gave either 100% control or did not differ significantly from 100% control for both weed ages:

- Glyphosate + 24D fb Sprayseed;
- Glyphosate + Tordon 75-D fb Sprayseed;
- Glyphosate + Starane Advance fb Sprayseed;
- Paraquat fb paraquat;
- Glyphosate + Tordon 75-D fb Sprayseed mixed with a residual herbicide (diuron or atrazine).

Choosing appropriate components and timings of double-knock herbicides is very important to manage common sowthistle in fallows. Glyphosate (Group M) alone may not provide very effective control of common sowthistle, especially if resistant individuals are present; however, if paraquat (Group L) is applied sequentially in a double-knock, control is improved. The optimum time between knocks is 7-10 days for best results. Mixing glyphosate with 2,4-D or metsulfuron may result in potential antagonism and ineffective control of common sowthistle. As there is a risk of developing resistance in common sowthistle to these double-knock herbicides, it is important to control any survivors of a double-knock treatment, ensuring seed-set is prevented.

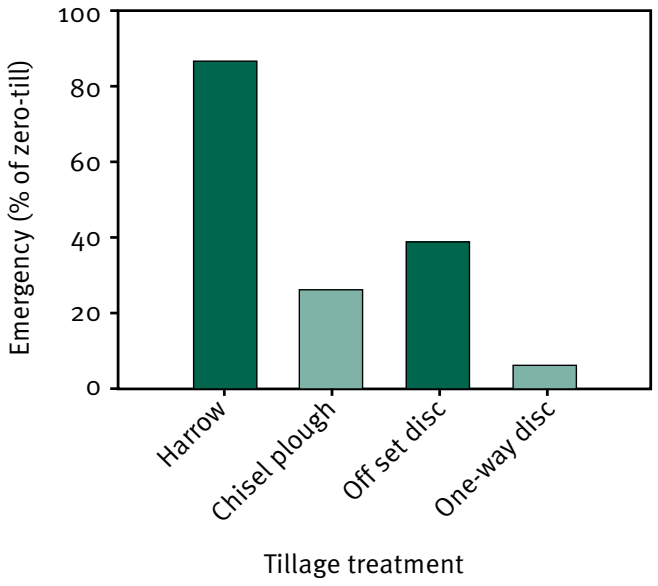

Figure 6. Effect of tillage treatment on seedling emergence (percent of zero-till) of common sowthistle.

Useful Resources

Chauhan, B.S., Gill, G. and Preston, C. (2006) Factors affecting seed germination of annual sowthistle (*Sonchus oleraceus*) in southern Australia. Weed Science 54, 854-860.

Chauhan, B.S., Gill, G. and Preston, C. (2006) Seedling recruitment pattern and depth of recruitment of 10 weed species in minimum tillage and no-till seeding systems. Weed Science 54, 658-668.

Chauhan, B.S., Gill, G. and Preston, C. (2006) Tillage system effects on weed ecology, herbicide activity and persistence: a review. Australian Journal of Experimental Agriculture 46, 1557-1570.

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Widderick, M., Sindel, B. and Walker, S. (2002) Emergence of *Sonchus oleraceus* (common sowthistle) is favoured under zero tillage farming systems. Jacob, H.S., Dodd, J. and Moore, J. (eds), pp. 91-92, Plant Protection Society of Western Australia, Perth.

Widderick, M., Walker, S. and Sindel, B. (2004) Better management of *Sonchus oleraceus* L. (common sowthistle) based on the weed's ecology. In Proceedings of the 14th Australian Weeds Conference. 6–9 September 2004, Wagga Wagga, New South Wales, Australia. Sindel, B.M. and Johnson, S.B. (eds), pp. 535-537, Weed Society of New South Wales, Sydney, New South Wales.

Widderick, M.J., Walker, S.R., Sindel, B.M. and Bell, K.L. (2010) Germination, emergence, and persistence of *Sonchus oleraceus*, a major crop weed in subtropical Australia. Weed Biology and Management 10, 102-112.

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