How do I use hay and silage production to remove annual grasses?

The issue:	Annual grasses with short seed viability compete with pastures, reducing productivity and quality. One control technique is cutting pastures for hay and silage, but it needs to be correctly managed to optimise effectiveness.
The impact:	Cutting hay and silage can reduce seed set in annual grasses and increase the percentage of desirable grasses and clovers, making the pasture more productive and improving livestock enterprise performance.
The opportunity:	If hay and silage production are optimised, it can extend the productive life of an established pasture.

Why consider making hay and silage to reduce weeds?

Fodder conservation can reduce carryover weed seeds in a pasture. While the primary reason for making hay or silage is usually to conserve fodder, attention to annual weed seed production in the lead-up to and during hay or silage making can help 'clean up' a pasture.

Disrupting viable seed production is effective on annual plants with a short seed life such as silver, brome and barley grasses, annual ryegrass and capeweed. Disrupting seed set for just one year can dramatically reduce their presence in the following year.

Key considerations

Two broad approaches are used. The first, and most desirable, is to prevent viable seed from forming. This may be achieved by disrupting the maturing process of the seed by depriving it of water, nutrients or oxygen through the conservation process (such as cutting it) or by using herbicides.

The second is to physically trap and remove the seed in the conserved fodder, even if it is still capable of germinating. This is only effective if the captured seed is fed in a location where the spread of any germinating seeds can be adequately controlled, such as in containment feeding and feedlots.

Preventing viable seed development

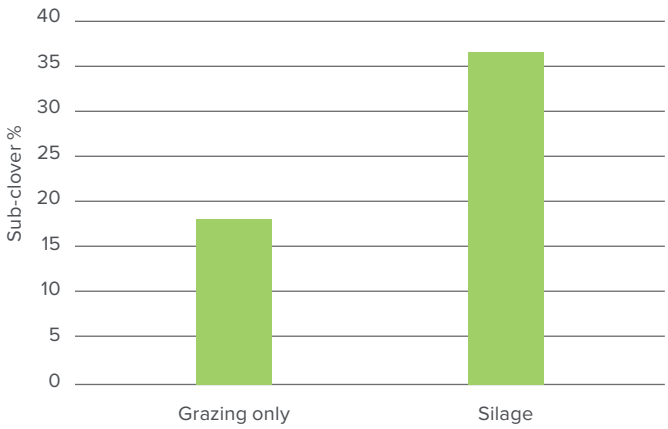
Three techniques can be used. These are:

1. Silage production

Cutting pasture for silage can be effective in reducing viable seed production, especially on early maturing weeds such as silver grass (*Vulpia* spp.). The process of ensiling fodder creates acetic and lactic acid, two products that disrupt viable seed formation.[1]

NSW Department of Primary Industries research found silage reduced silver grass regeneration the following year by approximately 80%[2] and barley grass was reduced by 49% in early cut silage (8 October), in comparison to a grazing-only treatment.[3] Silage production can also encourage sub-clover production as a result of getting more light to the plant while seed set is underway (Figure 1).[3, 4]

Figure 1. The percentage of sub-clover in a mixed perennial ryegrass pasture in the third spring following either grazing with wethers (10 DSE/ha) or silage production. Cut late October in the previous two springs.[4]



2. Spray-topping and hay production

This approach uses herbicides (glyphosate or paraquat) at rates to sterilise the seed while it is forming, followed by cutting after the withholding period is observed (usually two days). This allows the fodder to be cut later, enabling more quantity to be grown. Without the herbicide to sterilise the seed, the seed would remain viable. For more details on this method see the MLA fact sheet: *How do I spray-top to reduce annual weeds in pastures?*

3. Cutting plants in the early phase of maturity

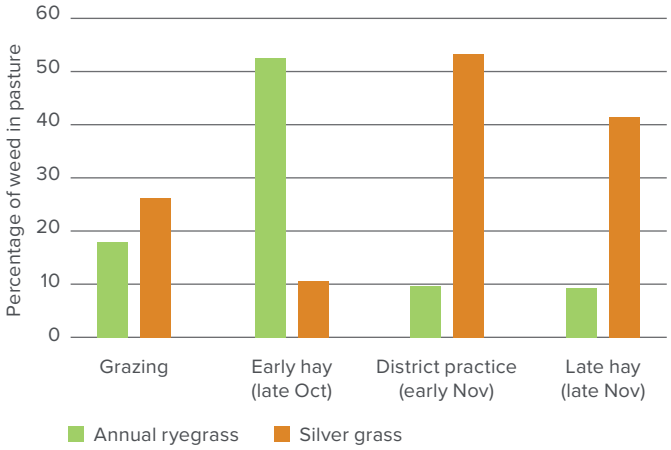
This is a less commonly used method that aims to disrupt the formation of viable seed heads.

Cutting in the early phase of maturity means the seed will not form adequately and there is insufficient time for the materials in the cut plant to translocate to the seed before the plant dries out. If cutting is delayed, seed heads mature and form viable seed even after being cut.

Stages of maturity in barley grass indicating seed viability.

A ‘time of cutting’ experiment at Wagga Wagga, NSW, showed a modest reduction in silver grass composition, compared to grazing, when the silver grass was cut early. However, later cutting times resulted in poor reduction due to large amounts of viable seed production and shedding prior to November cutting. Annual ryegrass was opposite and required later cutting (November) to affect viable seed maturity and set (Figure 2).

Figure 2. The percentage of silver grass or annual ryegrass in a mixed perennial ryegrass pasture in the third spring following either grazing with wethers (10 DSE/ha) or differing hay cutting times applied in the previous two springs.[4]



There are several challenges in adopting this technique.

1. The most significant is the reduction in the quantity of fodder grown because of cutting. Reductions in hay production were recorded at Wagga Wagga, NSW, of 1t/ha, or 33%, from cutting early hay compared to hay cut as per normal district practice.
2. The second is the potential formation of new reproductive tillers from the cut plants if there is residual soil moisture or rain. New seed heads are produced with little leaf material.
3. Finally, the maturity times of weeds vary so it is difficult to impact multiple species.

Paddock cut for silage on 14 October showing barley grass forming new reproductive tillers (top and bottom) by late November.

Capturing viable seed

Hay will remain a re-infestation risk as seed may have matured sufficiently before cutting, enabling viable seed formation during curing. The baling process may not capture all the seed and often leaves mature heads due to shattering or not being picked up in the baling process. Seed contained in the hay remains more viable than if it was naturally shed in the paddock because of the reduced exposure to climatic conditions, ingestion by stock and predation from insects.

Animals consuming hay will render most ingested weed seeds unviable, however, the material that drops, is trampled or left uneaten will have seed that will germinate.

This has occurred in baled hay, where silver grass seed matured after cutting and subsequently resulted in silver grass regeneration when hay was returned to the paddock after storage over summer.[5]

What is the best timing for seed set control?

The pattern of seed head emergence has a major impact on the choice and effectiveness of silage, hay or cutting as a weed control option.

The timing of seed head emergence is influenced by a combination of the species present, environmental conditions and grazing history.

Common pasture grasses have different maturity patterns (Figure 3).

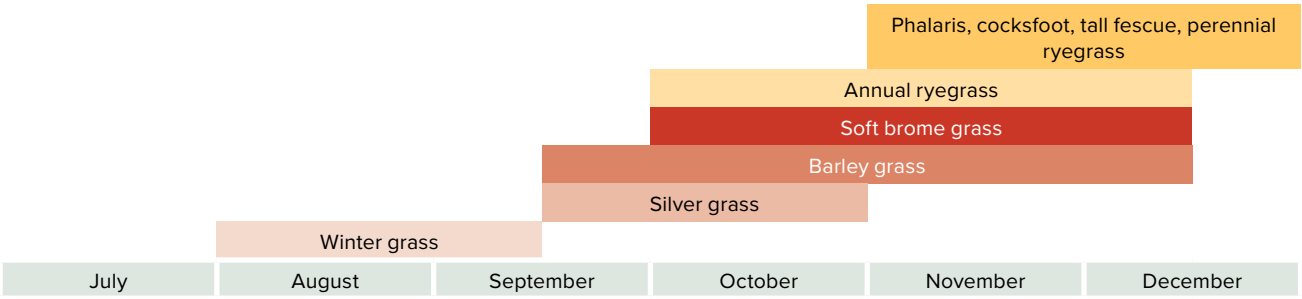
While this general pattern holds, plants will also respond to different climatic conditions. A short spring will result in earlier seed head production, whereas a long, cool finish will contribute to later, more staggered seed head formation.

The finish to the season will also affect the dormancy within the seed set. As a general rule, a 'hard' finish to a season will result in less dormancy and a 'soft' finish will lead to a more staggered level of dormancy in the carryover seed.

Grazing will delay maturity and the later the grazing, the later seed emergence will be. If a pasture is unevenly grazed, some plants will reach maturity before others. This staggered seed emergence results in uneven formation of viable seed, with some seed surviving when cutting occurs.

Even grazing of the pasture before livestock are removed is essential to achieve synchronous seed head emergence. This improves the chances of getting more effective weed seed control. Even grazing can be achieved by running heavy stocking rates in winter and early spring.

Figure 3. The timing of seed head emergence of common grasses (example for south-west Victoria).



Even seed head emergence (left) and uneven seed head emergence (right) from selective, or patch, grazing.

References and more information

1. Blackshaw RE and Rode LM (1991) Effect of ensiling and rumen digestion by cattle on weed seed viability. *Weed Science* 39, 104-108.
2. Michalk DL and Dowling PM (1996) Cultural weed management of vulpia. *Plant Protection Quarterly* 11, 207-210.
3. Piltz JW, Flinn SJ and Weston LA (2019) Comparative effects of grazing, herbicide or forage conservation on barley grass content in *Trifolium subterraneum* L. clover-based pasture. *Crop and Pasture Science* 70, 800-806.
4. Bowcher A (2006) Timing pasture cutting for weed management. In: *The Grassland Society of NSW 21st annual conference proceedings*, Wagga Wagga, pp. 67-70. Online (verified Dec 2020) grasslandnsw.com.au/news/wp-content/uploads/2010/08/Bowcher-2006.pdf
5. Dowling PM, Pickering DI and Nicol HI (1996) A comparison of methods for reducing seed-set and regeneration of *Vulpia* spp. in perennial pastures. In: *Proceedings of the Second International Weed Control Congress*, pp. 975-980, Copenhagen.

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