

How do I maximise sub-clover establishment in existing pastures?

The issue:	Sub-clover is the basis of Australia's southern feedbase but it can fail to reach optimum establishment in existing pastures without good management of the seed bank and germination.
The impact:	If sub-clover fails to persist or it diminishes, less-productive species can dominate.
The opportunity:	Producers can maximise the returns from sub-clover by better managing the establishment and persistence of the species to grow more kilograms of meat or wool.

Sub-clover is an annual plant that needs to germinate from seed and establish at the break each year. The germination and survival of those seeds and seedlings are closely related to grazing management over summer and after germination.

Outlined here are grazing strategies that impact burr survival, seed softening and germination to help make every year a good sub-clover year.

The effect of dry material over summer

Sub-clover produces a coating on the outside of the seed that prevents false germination over summer – this is called hardseededness. This coating is broken down during the hotter months from seed experiencing fluctuations in temperature.

Reducing the amount of litter will increase variation in temperature and increase sub-clover germination. However, removal of too much dry material exposes the soil to wind and water erosion, as well as removing surface burr and creating a more hostile environment for sub-clover to establish.

Dry material or litter on the soil surface acts as insulation and reduces fluctuations in soil temperature. Excessive amounts of litter or dry material can be very effective at preventing seed coating breakdown, leading to low sub-clover germination.

Excess dry material is also detrimental to sub-clover germination due to toxins that leach into the soil from dry perennial grasses (phalaris, perennial ryegrass, cocksfoot and tall fescue) and annual weeds, especially silver grass (*Vulpia spp*). These toxins are a 'natural herbicide' for the grasses to reduce potential competition.

A compromise between protecting the soil, achieving hard seed breakdown and reducing the toxic effects is



Dry silver grass will release a natural toxin that reduces the germination of sub-clover.

to leave approximately 1,000kg of dry matter (DM)/ha in the paddock at the autumn break. Scraping up loose dry material from a known area into handfuls is an easy way to assess the amount of litter.

Drought conditions, where pastures have reduced ground cover even if spelled, commonly have an above-average sub-clover germination when the season breaks (assuming there is still some seed in the seed bank).

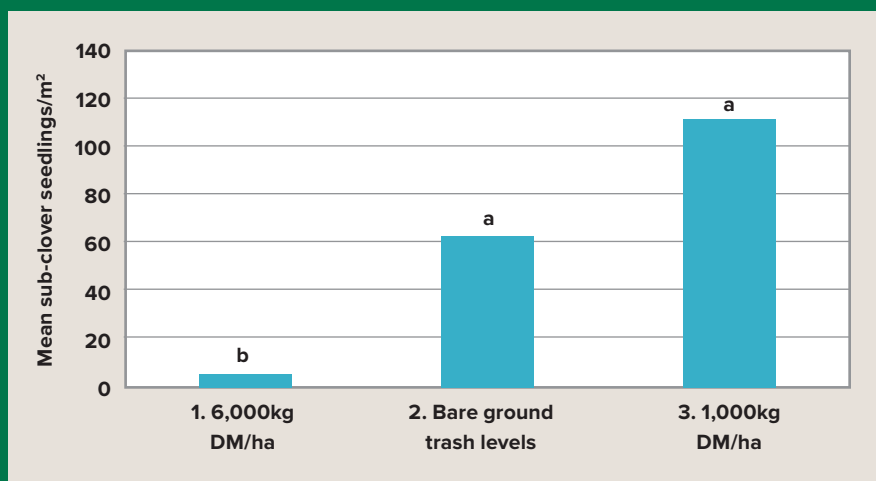
Pasture trash affects sub-clover germination

Three amounts of dry material were imposed and monitored from late March to late May in a cocksfoot pasture near Geelong, Victoria. The three treatments were:

- excessive trash of approximately 6,000kg DM/ha
- 'ideal' cover with residual trash of approximately 1,000kg DM/ha
- bare ground to simulate overgrazing.

Temperatures under different treatments were recorded hourly and sub-clover seedling counts taken on 19 May 2018. Maximum and minimum temperatures in the excessive trash treatment were on average 6°C lower than the ideal or bare ground trash treatments. The impact on sub-clover germination was dramatic (Figure 1).

Figure 1: Mean sub-clover germination from different amounts of trash treatments. Error bars represent the standard error of the mean. Means followed by the same letter do not significantly differ ($p=0.05$).



Source: Brogden, J (2019) The effect of trash on sub-clover germination. In '60th Annual Conference Proceedings'. Grassland Society of Southern Australia Inc. pp 86.



Grazing helps remove excess pasture litter to prepare the paddocks for sub-clover germination.

Grazing management in summer and early autumn

Sub-clover can be grazed for long periods over summer, however this approach can be damaging to the sown perennial grasses, especially perennial ryegrass. Summer and early autumn grazing should, ideally, involve short intensive periods of stocking (three to seven days) followed by long periods of rest (up to 70 days).

To achieve the desired grazing usually involves high stock numbers (50–100 DSE/ha). This helps reduce selective grazing, encouraging animals to eat the dry material. While sub-clover trash is present, there should be adequate protein, however when this is grazed out supplements may be required to provide additional protein, e.g. lupins or dry feed blocks.

Grazing the dry material over summer should aim to reduce most plant residue but not to the extent that animals start consuming any surface burr. Aim for the 'two handfuls of litter' measure in a 0.1m² area as an indicator of the ideal level of trash to leave.

The challenge is getting as many paddocks as possible into the 'two handfuls of litter' condition when the timing of the autumn break is unknown. It is not an easy task,



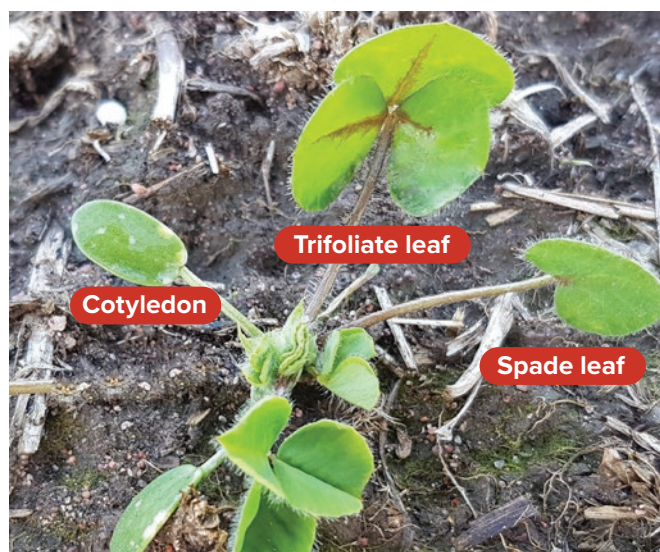
It is easy to estimate the density of sub-clover germination. Simply count the number of seedlings in an area the size of the palm of your hand. Three plants per palm area is equivalent to 200 seedlings/m².

so it is suggested paddocks that require an increase in sub-clover are prioritised.

The management of spring production obviously has a carryover effect on the quantity of summer trash. In years of excessive growth, fodder conservation, spray topping and hay freezing can be used to help control the amount of dry feed to manage over summer and early autumn.

Managing seedling establishment

There are three development stages seen in germinating sub-clover – cotyledons, a spade leaf and trifoliolate (true) leaves.¹



Young sub-clover seedling: cotyledon, spade leaf, trifoliolate leaves.

Measuring trash levels

Using a reference area of 0.1m², simply done by making a square with your feet at right angles or using a quadrat, scrape up the loose material. One large handful of loose litter is equivalent to approximately 1,000kg DM/ha.





Regular inspections should be made for pests, especially redlegged earth mite (RLEM) which hatch when there has been at least 25mm rainfall and average daily temperatures fall below 21°C.



Redlegged earth mite damage on sub-clover seedlings.

Seedlings are susceptible to grazing, insect attack and herbicides until they start producing trifoliate (true) leaves. Ideally, grazing should be avoided until the plant has a minimum of three trifoliate leaves, although this is not always possible. Therefore, prioritise spelling of target paddocks.

The time to reach the three trifoliate leaf stage is regulated by temperature and soil moisture. The appearance of three trifoliate leaves may take only three weeks if germination occurs in early autumn. However if the autumn break is late (May) and soil temperature has declined, the three trifoliate leaf stage may not be reached for six weeks.

Establishment numbers needed

Paddocks where trash management is ideal will optimise the germination of residual sub-clover seed. Between 200–300 seedlings/m² will germinate if the seed bank is adequate, resulting in a mixed pasture with at least 40% sub-clover content over winter. Pure sub-clover stands will be achieved with a minimum germination of 500 seedlings/m².

Key actions

- Start preparing paddocks for sub-clover establishment in late spring and summer by grazing down litter.
- Having 1,000kg DM/ha at the autumn break is ideal for sub-clover establishment.
- Allow seedlings to grow three to five leaves before grazing them following germination.

More information

MLA technote: *How do I... optimise sub-clover based pastures?* Available at www.mla.com.au/how-do-i-optimize-sub-clover-based-pastures

MLA technote: *How do I... manage grazing to maximise sub-clover seed set?* Available at www.mla.com.au/how-do-i-manage-grazing-to-maximise-sub-clover-seed-set

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