How do I replace outclassed or troublesome sub-clover cultivars?

The issue:	Outdated sub-clover cultivars can cost autumn and winter pasture production due to growth habit, soil-borne diseases, insect attack or the fact they are oestrogenic, which affects livestock fertility.
The impact:	Reduced winter feed production of up to 30% and, if oestrogenic clovers are present, long and short-term infertility lowering lambing percentages to 25–70%.
The opportunity:	More recently bred cultivars offer better disease and insect resistance and low oestrogen content. This means improved long-term winter pasture production and animal performance.

What are outclassed or troublesome sub-clover cultivars?

They are cultivars which result in significant pasture and/or animal underperformance. The most common losses occur because the sub-clover contains oestrogen, resulting in ewe fertility issues* and/or are susceptible to plant diseases, resulting in lower annual production.

Improvements in growth characteristics, pest and disease resistance also contribute to the widening gap between older and newer cultivars.

Two mid-maturing black-seeded cultivars. On the left is the older Seaton Park cultivar, versus the newer Campeda on the right, showing additional biomass production

* Cattle are less likely to be affected, although international studies report cows fed hay containing oestrogenic clovers suffered from short-term infertility.

Oestrogenic clovers

Pastures containing oestrogenic clovers are thought to be widespread throughout Australia, especially in pastures sown prior to the 1970s. Surveys in the medium to high-rainfall areas found oestrogenic clovers were common.[1] Often they have persisted because of their hard seed or tolerance to waterlogging.

The main oestrogenic cultivars originated in WA in the 1940s to 1960s (Dwalganup, Dinninup, Yarloop and Geraldton) and there are two naturalised cultivars (Tallarook and Howard) with higher levels of oestrogen. These cultivars became commercially available and were widely sown in the 1960s (before the link with oestrogenic sub-clover disease was established). These cultivars may have also been inadvertently sown due to seed contamination before the introduction of seed certification programs in the 1970s, or afterwards from uncertified seed. Some locally evolved sub-clover variants may be present at Eden Valley in SA and Book Book in NSW.[1]

The main indicator of excessive oestrogenic clover is repeatedly low lambing percentages (less than 70%), even though ewe condition, feed on offer and ram health are adequate. It can also be evident in an unusual number of difficult births and prolapses. Wethers may also die from urethral blockages.

Oestrogenic sub-clovers are considered detrimental when they comprise more than 20% of the total pasture biomass.[1, 2]

Identification of oestrogenic sub-clovers is possible with practice,[1] however with more than 80 registered cultivars and additional field crosses this can be difficult. Resources are available[2] or seek advice from agronomists and advisors skilled in oestrogenic sub-clover identification.

The level of oestrogens can be confirmed by testing sub-clover samples, or a veterinarian can conduct a post-mortem to check for signs of clover disease. Regardless, the percentage of oestrogenic sub-clover in the pasture needs to be confirmed to inform paddock management decisions.

Assessing oestrogenic sub-clover biomass

To assess if the total oestrogenic sub-clover content exceeds 20%, identify and record pasture species along a paddock transect.

Use a 1cm thick piece of dowel about 50cm in length with a nail sticking out of each end or with the ends shaved to a sharp point.

Oestrogenic rod assessment

In early spring, walk diagonally across a paddock, throwing the stick 50 times at 10-pace intervals. Collect 100 measurements by recording the oestrogenic clover touching each end of the stick.

If oestrogenic clover is recorded more than 20 times, sheep grazing that paddock are at risk.

Oestrogen levels of pasture samples can be tested by contacting either:

- Dr Kevin Foster
  University of Western Australia (UWA)
  T: 08 6488 2220
  E: kevin.foster@uwa.edu.au
- Larry Walker
  Southern Scientific Services, Hamilton
  T: 0408 363 061
  E: southern3300scientific@gmail.com
- Your local veterinarian.

Learn how to identify potentially oestrogenic cultivars with the MLA oestrogenic clover fact sheet: mla.com.au/globalassets/mla-corporate/p.psh.1138_oestrogenic_clovers_factsheet-1.pdf

Clovers with poor disease and pest resistance

There are many foliar and root diseases which can result in significant production loss or plant death in sub-clover. Often these problems occur in the roots, so the damage is hidden. Some cultivars may have evolved local tolerance, but the majority of older sub-clover cultivars will have little resistance.

The main indication of disease impact is poor autumn to winter growth, with a reduction in the density and vigour of plants even when soil nutrient conditions are not limiting and few insects are present.

The impact of a disease outbreak varies depending on when it occurs and the severity of the infection. Plant death early in the season has a much greater effect on animal production than later in the year, when other feed is plentiful. Plants only hampered by disease early in the season often recover in spring, but autumn–winter production is lost.

It could be expected susceptible cultivars would die out due to disease. However, the intermittent presence of these diseases means if even susceptible cultivars will die in high disease years, they can still have enough seed left in the seed bank to regenerate in following years.

PREDICTA® B testing of soil can be used to confirm the presence of disease. Alternatively, confirmation of fungal diseases and their impact can be achieved through applying fungicides (see Figure 1).

Healthy clover plants with healthy white root systems (left) compared with diseased plants with pruning of the tap roots with brown lesions (right)

Figure 1: Test strips showing the sub-clover response (healthy green, denser clover with longer and better-branching roots) to the treatment containing fungicide (Metalaxyl) where an additional 800kg DM/ha was grown through winter (Warn, 2017)

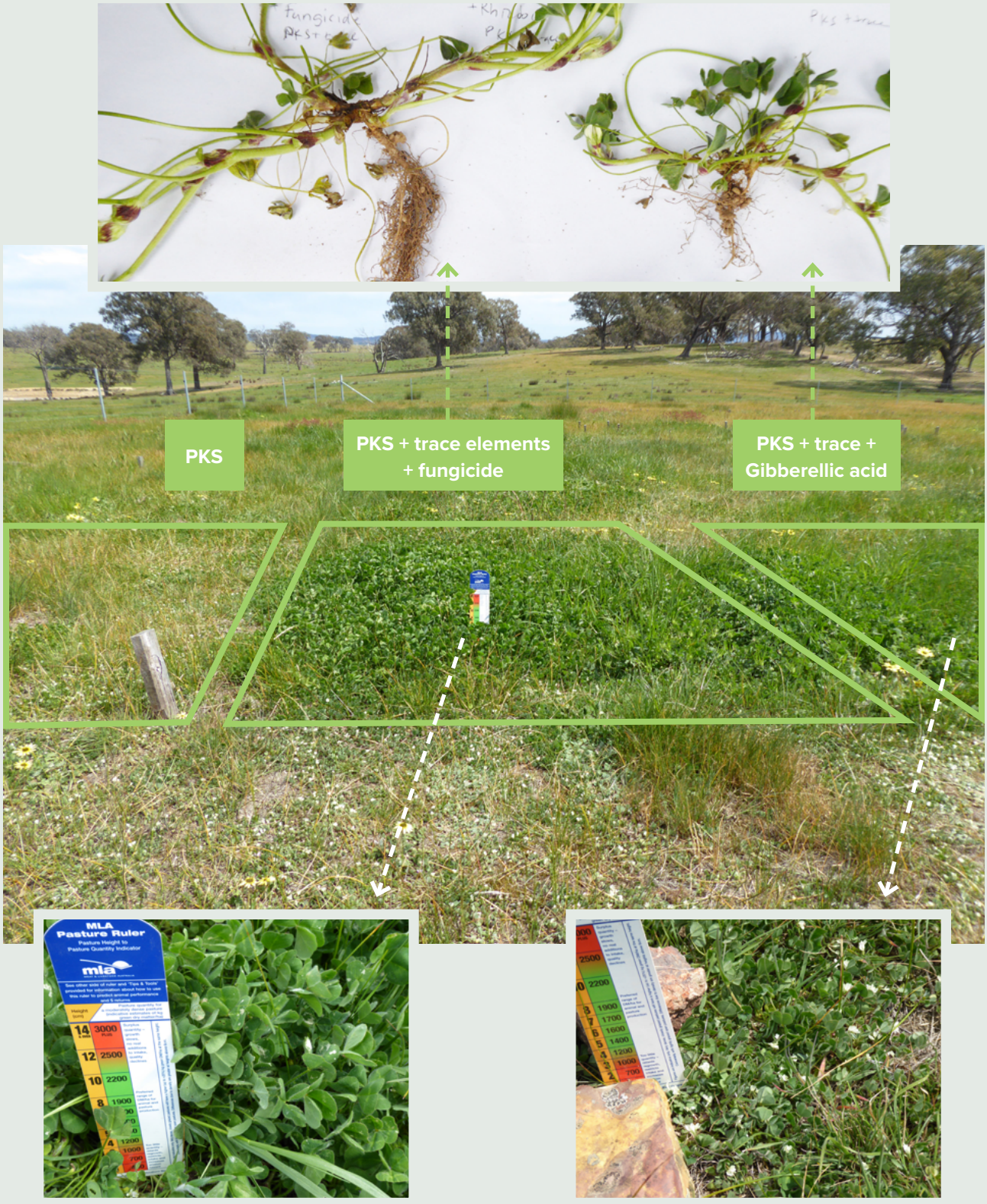

Image: Lisa Warn Ag Consulting

How do I replace outclassed cultivars?

Two complementary strategies are required to replace outclassed cultivars. The first is to deplete the existing seed bank so competition against newer cultivars is reduced. The second is to rapidly establish the seed bank of the newly introduced cultivar.

1. Seed bank depletion

Success in depleting the sub-clover seed bank is determined by the level of hardseededness, along with the ability to break seed dormancy and prevent reseeding. If this can be achieved in three consecutive years, the seed bank of most outclassed cultivars will be greatly reduced or eliminated.

The level of hardseededness in outclassed and oestrogenic cultivars varies (Table 1). Cultivars with low hardseededness can be reduced in just two years, but this can take twice as long for harder-seeded cultivars.

Table 1: Hardseededness of the most common outclassed sub-clover cultivars[4]

Levels of hardseededness	Examples of outclassed cultivars
Low	Bacchus Marsh, Enfield, Green Range, Howard (O), Larisa, Mount Barker, Nangeela, Tallarook (O), Yarloop (O)
High	Daliak, Dinninup (O), Geraldton (O), Dwalganup (O)

(O) = Oestrogenic cultivar

While sub-clover has a natural level of hardseededness, this rate of breakdown and therefore germination can be increased. Deliberately increasing the rate of natural germination depletes the seed bank quicker if subsequent seed set can be prevented.

Hardseededness is broken down by fluctuations in soil temperature over summer and into late autumn. Removal of dry material along with cultivation, which cracks the seed coating allowing moisture to be absorbed, will increase germination.

Preventing flowering is a crucial step and can be achieved by removing the sub-clover in winter with herbicides, creating a grass-dominant pasture, grazing hard in spring to remove flowers and burrs, or applying herbicides in spring to disrupt seed set.[5] Silage or hay is ineffective as burrs are usually below cutting height and oestrogenic compounds will remain in the conserved fodder.

A cropping or grass fodder phase, with herbicides to prevent seed set, are alternative approaches to achieve seed bank depletion.

2. Introducing new cultivars

The rapid establishment of new cultivars is essential to compete against any residual outclassed sub-clovers. It is important to remember most mixed species pastures are only sown at 5–10kg/ha of clover seed and the pasture needs to produce around 200kg/ha as soon as possible. Through careful management this can be achieved in one to two seasons.

Consideration should be given to:

- correcting any underlying soil conditions.
- selecting cultivars that suit the growing season and likelihood of false breaks, have desirable pest and disease characteristics, and suit soil and climatic conditions
- using certified seed
- applying seed coating treatments to inoculate seed and protect against insects and disease at germination
- increasing the sowing rate, to combat any residual sub-clover seed remaining
- using direct placement of seed into the soil in preference to aerial sowing
- managing grazing to maximise flowering and seed set.

More information

Nichols P (2020) Subterranean clover, Government of Western Australia. Available online at: agric.wa.gov.au/pasture-species/subterranean-clover

NSW DPI (2020) Choosing the right sub clover variety. Available online at: dpi.nsw.gov.au/agriculture/pastures-and-rangelands/establishment-mgmt/establishment/clover/choosing-the-right-sub-clover

References

1. Foster K (2020) *Oestrogenic sub-clover pastures: identification and remediation,* MLA fact sheet. Available online at: mla.com.au/globalassets/mla-corporate/p.psh.1138_oestrogenic_clovers_factsheet-1.pdf
2. Woodard D, McFarland I and Bennett T (2017) *Good clover bad clover* fact sheet, MacKillop Farm Management Group. Available online at: sheepconnectsa.com.au/factsheets/Mackillop_Fact_Sheet_Good%20Clover_Bad%20Clover.pdf
3. Warn L (2017) B.FDP.0047 *Final Report – Grassland Society of Southern Australia – Central Ranges branch – Phosphorus use efficiency*, Meat & Livestock Australia, North Sydney.
4. Nichols PGH, Collins WJ and Barbetti MJ (1996) *Registered cultivars of subterranean clover their characteristics, origin and identification*, Bulletin 4083, DPIRD, WA.
5. Douglas A and Ferris D (2020) Effect of spray-topping on pasture legumes, DPIRD, WA. Available online at: agric.wa.gov.au/pasture-management/effect-spray-topping-pasture-legumes

Herbicide and fungicide labels provide all the critical comments and precautions for the safe and responsible use of herbicides and fungicides in pasture. Always read the label and only use as directed.

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