



Department of
Primary Industries and
Regional Development

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Old cultivars of subterranean clover high in the isoflavone formononetin persist in pastures across southern Australia

“Maximising the reproductive potential of the sheep industry by eliminating high-oestrogen clovers, more live lambs on the ground”



THE UNIVERSITY OF
WESTERN
AUSTRALIA

Institute of Agriculture

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Introduction

- Subclovers have known oestrogenic activity (1940s)
- Formononetin (F) in green leaves of subclover (other legumes)
- High F clovers released commercially before screening (four)
- Can cause temp or perm infertility & other reproductive disorders in grazing animals
- Clover disease in sheep (includes dystocia and prolapse)
- New low F cv's released in the 1970's (ie Trikkala)
- Clover disease thought by many to be resolved and extension declined
- 10-15 M sheep of national flock likely affected to varying degree (Adams 1995)
- Recent report low lambing % (<30) despite excellent CS
- Increased dry ewe % reported by producers and some commercial scanners
- Critically, no cost-effective lab testing method available for industry for 20 years

Methods

- Free isoflavone test kits distributed in 2018-20
- Visited farms across southern Australia
- Bio-chemically analysed hundreds of plant samples and cultivar ID by morphology
- Leaf P and S concentrations also measured



Pasture sample returned with high oestrogenic clover (Dinninup)

Results

- The survey found high prevalence of highly oestrogenic clover
- 577 samples analysed, 60% contained F above the current 'safe' conc (0.20%)
- Most common cv was Dinninup, particularly from SA and WA
- Highest average F (0.90%) in samples from SA and KI
- Conc of F varied greatly among cvs (Dinninup 0.50% too 3%)
- F testing of genotypes not reflective of the field (ie waterlogging)
- F not related to leaf P and S concentrations (despite previous findings)
- Possibly sampling bias
- Oestrogenic clover as contaminants in uncertified seed lots (>40%)
- Most farmers were unaware of cv's in pastures or links to clover disease

Discussion

- High oestrogenic clovers remain in pastures and dominant (very persistent)
- Few agronomists, researchers or consultants able to identify high oestrogenic clovers
- Cv's released with safe F levels were found higher in field (50% of Trikkala)
- Understanding of clover disease in sheep & cattle health based on research 1950-70's
- Ram reproduction found compromised by high oestrogenic clover (Pool et al. 2023)
- Now developed new oestrogenic clover identification guide and as a seedling
- However, need a simple in-field test to determine F in pastures (isoflavone lab closed)
- Ongoing research (DPIRD / UWA) on cattle fertility with USDA & Universities in USA

Thank you

dpird.wa.gov.au    

Important disclaimer

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All four of the high-oestrogen subclovers are well adapted in the right rainfall zone



Very similar to Dalkeith

Dwalganup



Adapted from registered sub clover guide 1996

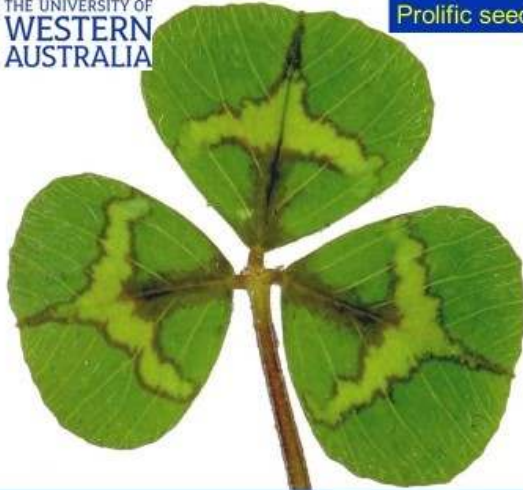


(Distinctive Features. Crescent with white arms, leaf often has a fold, hairy runner, slight pink calyx, brown flush in winter, early flowering)



Prolific seed setter

Dinninup



Adapted from registered sub clover guide 1996



(Distinctive Features. Crescent with white arms, leaf often has a fold, hairy runner, slight pink calyx, brown flush in winter, early flowering)



Adapted to waterlogging

Yarloop



(Distinctive Features. No crescent only white arms, green calyx to 1/4 tube, long calyx fringe, brown flush midrib, hairless runner and leaf, cream to amber seed)

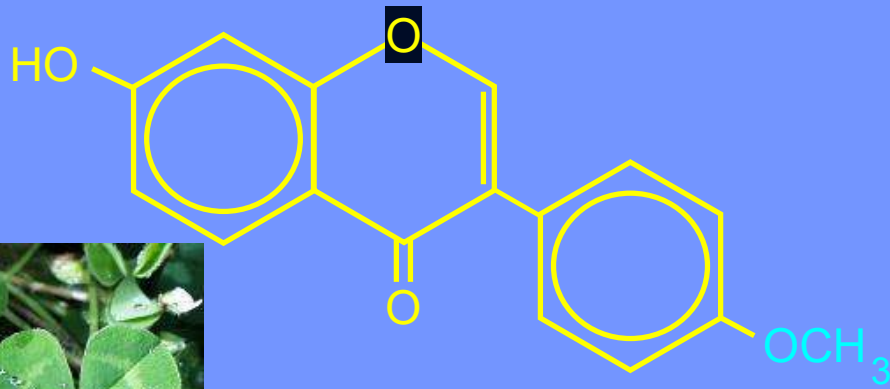


Adapted to lower rainfall

Geraldton



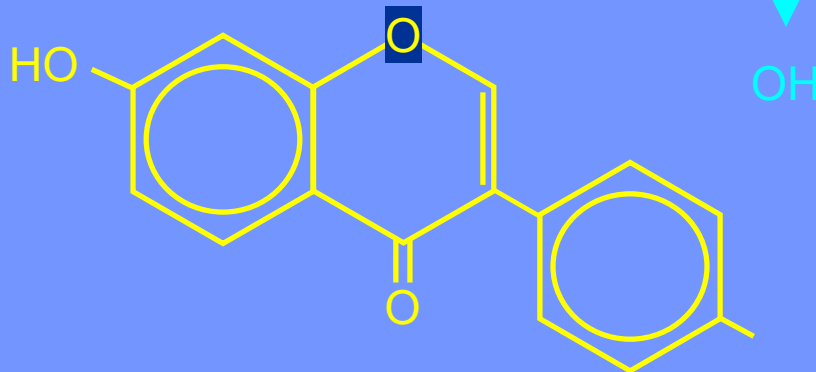
(Distinctive Features. Narrow, triangular, distinctly spaced leaflets, hairy runner, red calyx, band leaf mark and often brown flush midrib) generally lower rainfall



Isoflavones

Formononetin

Demethylation in the rumen



Equol



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OESTROGENIC SUBTERRANEAN CLOVER GUIDE

IDENTIFICATION AND REMEDIATION

<https://www.agric.wa.gov.au/pastures/oestrogenic-subterranean-clover-pastures-identification-and-management>

https://www.mla.com.au/globalassets/mla-corporate/p.psh.1138_oestrogenic_clovers_factsheet-1.pdf