

# 27. 'Good Clover, Bad Clover' MLA Producer Demonstration Site

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## KEY MESSAGES

- Four oestrogenic sub clover varieties (Yarloop, Dinninup, Geraldton and Dwalganup) have been found in South East SA and Kangaroo Island pastures.
- Oestrogenic clovers can be responsible for reduced ewe fertility, difficult births, prolapse of the uterus, urethral blockages in wethers and udder development in maiden ewes and wethers.
- Growers are encouraged to assess their own paddocks for the presence of problem species, potential impact on their flock and the development of appropriate management strategies

## Background

Some varieties of sub clovers, sown from the 1930s up until the late 1980s, cause infertility issues in sheep, resulting in lower lambing percentages. The disorder, commonly referred to as clover disease was a result of oestrogenic clovers. The varieties responsible include Dinninup, Dwalganup, Yarloop and Geraldton. Substances in these clovers, known as isoflavones, have an effect on sheep similar to that of natural oestrogen. The isoflavones are responsible for a variety of symptoms in sheep including lowered ewe infertility, increased difficult births, and prolapse of the uterus, udder development in maiden ewes and wethers and urethral blockages in wethers. Isoflavones are potent

to sheep when the plant material is green. As the plant senesces or 'dies off' the isoflavones break down and the plant material is safe. Hay and silage cut from paddocks containing high levels of oestrogenic clover can also be problematic, particularly if it has been cut and cured at the ideal time, and the plant material has kept its color.

Isoflavones can be measured in a laboratory test. The threshold level, at which fertility issues are likely to occur is 1,000mg/kg. A 2016 silage sample obtained from one of the producers involved in this project resulted in an isoflavone level of 6,280mg/kg.

## Project Outline

The 'Good Clover, Bad Clover' project commenced in April 2017 with the aim of increasing producer awareness of the potential issues and management strategies to deal with oestrogenic clover. The project is funded by Meat & Livestock Australia with additional support from Sheep Connect SA, Natural Resources South East and is managed by the MacKillop Farm Management Group (in partnership with Agriculture KI). The project involves

coaching producers from 10 focus farms (on Kangaroo Island and the South East of SA) in the identification of the clovers and the development of management plans for their properties. Paddocks on the focus farms will be assessed using visual and laboratory analysis. Project deliverables includes field days to train other producers in identification and management of oestrogenic clovers.

## Oestrogenic Sub-Clover Cultivars



Geraldton



Dwalganup



Dinninup



Yarloop

## Management of Oestrogenic Clovers

There is no cure for the permanent infertility in ewes that have had repeated exposure to large amounts of oestrogenic clovers over a long period of time. These ewes should be culled. The cumulative effect may occur over a two to three year period of exposure. Pastures with greater than 20% oestrogenic clovers are considered problematic.

Paddocks that have been identified as having greater than 20% oestrogenic clover should not be grazed with ewes whilst the clover is green. Paddocks that have high amounts of oestrogenic clover can be grazed with cattle or terminal lambs. Drilling in winter feed to dilute the clover content and avoiding grass cleaning of highly oestrogenic pastures is also recommended.

Long term renovation of pastures with low oestrogenic cultivars will improve productivity. Seed reserves in the soil often mean that renovation does not completely remove the oestrogenic clovers from a pasture. Ensuring new varieties can dominate through adequate soil nutrition, weed and insect control is important. In the years prior to renovation reducing seed set of oestrogenic cultivars should be considered. In paddocks which can be cropped, encouraging germination via shallow tillage helps maximise germination and effectiveness of herbicide applications to reduce seed banks. Cutting clover hay or silage can reduce seed set in a paddock and this can be done the year before a paddock is renovated which will help reduce the seed bank and reduce competition for the establishment of new cultivars.

## Results

As part of the project, 160 producers have been surveyed to provide a benchmark on awareness of oestrogenic clover. The majority of producers were unaware of the presence of oestrogenic clover, and most were not confident in identifying the oestrogenic clovers. 85% of producers have never undertaken a visual assessment or laboratory analysis of their clover pastures.

The laboratory test for isoflavones is currently provided by only one laboratory in Australia. Critical levels of the isoflavones, Diadzein and Formononetin, is believed to be less than 1,000 mg/kg. There is however little detail available on sampling technique and the interpretation of results. This project has undertaken both a visual assessment of clover content and laboratory analysis of pastures for oestrogenic content. Initial laboratory results have been somewhat inconsistent with the visual paddock assessments undertaken. This is thought to be due to sampling method and time of the year that the clovers were collected. Initial recommendations from the laboratory indicated that leaf only or the whole plant were both suitable. The project has found

differences between samples that included stems versus samples with leaf only. Concentrations of the isoflavones were higher in the leaf only samples. It was also found that plants that had started to senesce had lower isoflavone levels. Further monitoring and assessment will be undertaken as the project continues.

Visual assessments and laboratory tests have been undertaken from 25 paddocks across 10 properties in the South East of SA and Kangaroo Island. Of the 25 paddocks, 20 paddocks had greater than 20% oestrogenic clovers present in the clover proportion of the paddock. Of those paddocks, 50% have the potential to cause fertility issues in ewes, with visual assessments ranking them moderate to high.

Laboratory and visual assessment results are summarised in Table 1 and Table 2. The critical level of Diadzein and Formononetin isoflavones is 1000mg/kg (dry weight) as consumed by the ewe. Greater than this level ewe fertility is likely to be affected.

**Table 1.** South East Results.

Location	Visual Paddock Assessments					Laboratory Analysis	Laboratory and Visual Assessment Combined
	Grass %	Weed %	Clover %	% of Oestrogenic Clover in the total amount of clover	Pasture Oestrogen Score*	Isoflavones Dia and Form (mg/kg)	Estimated Isoflavones as consumed by animal in total pasture consumption
Binnun 1	8	17	75	75	56 (H)	333	249
Binnun 2	55	5	40	55	22 (M)	815	326
Frances 1	17	0	83	5	4 (L)	3750	3113**
Frances 2	63	4	33	71	23 (M)	384	127
VIC 1	21	0	79	17	13 (L)	584	461
VIC 2	57	0	43	46	20 (L)	975	419
Lucindale 1	54	0	46	42	19 (L)ow	3320	1481*
Furner 1	12	7	81	35	28 (M)	5570	4500**
Furner 2	6	0	94	28	26 (M)	686	644

\* Pasture Oestrogen score – visual assessment 1-20% Low; 21-40% Moderate; > 40% High

\*\* Toxic levels of isoflavones (as consumed by animal in total pasture consumed)



**Figure 1:** David Woodard, Rural Solutions SA, technical advisor for the 'Good Clover, Bad Clover' project at the field day held in October at Furner, training producers and advisors in the identification and assessment of paddocks for oestrogenic clover.

**Table 2.** Kangaroo Island Results.

Location	Visual Paddock Assessments					Laboratory Analysis	Laboratory and Visual Assessment Combined
	Grass %	Weed %	Clover %	% of Oestrogenic Clover in the total amount of clover	Pasture Oestrogen Score*	Isoflavones Dia and Form (mg/kg)	Estimated Isoflavones as consumed by animal in total pasture consumption
MacGillivray 1	44	0	56	92	52 (H)	1810	1014**
MacGillivray 2	69	6	25	25	6 (L)	na	na
MacGillivray 3	na	na	na	na	na	750	150
Ritchie 1	10	49	41	53	22 (M)	2640	1082**
Ritchie 2	46	10	42	28	12 (L)	1170	491
Ritchie 3	34	16	38	16	6 (L)	nt	na
Ritchie 4	58	20	22	32	7 (L)	nt	na
Ritchie 5	39	22	29	30	12 (L)	nt	na
Ritchie 6	68	10	22	6	1 (L)	nt	na
MacGillivray 4	34	40	26	68	18 (L)	2840	738
MacGillivray 5	46	18	36	18	7 (L)	628	226
MacGillivray 6	18	18	64	18	12 (L)	1220	780
MacGillivray 7	58	32	10	90	9 (L)	2580	258
MacGillivray 8	10	50	42	88	37 (M)	5190	2179**
MacGillivray 9	10	44	46	78	36 (M)	5710	2627**
MacGillivray 10	14	52	34	60	21 (M)	1130	384

na – not assessed; nt – not tested

\* Pasture Oestrogen score – visual assessment 1-20% Low; 21-40% Moderate; > 40% High

\*\* Toxic levels of isoflavones (as consumed by animal in total pasture consumed)

## Results

The results are from year one of a three year project. Over the next two years there will be further work on whole farm risk analysis and the development of management plans with key focus farms. Additional field days and case studies will also be developed to assist in updating and educating the broader producer network.

Producers need to be aware of the potential for oestrogenic clover to cause issues in their flocks and undertake assessments of their properties. Identification of the presence of oestrogenic

species should be undertaken using the sub clover identification chart. If oestrogenic clover species are found producers need to determine the risk profile of the paddock. Conducting a laboratory test to determine isoflavone levels may also be useful. For more information please contact the project manager Tiffany Bennett on [tiffany.bennett@sa.gov.au](mailto:tiffany.bennett@sa.gov.au) or 0887629126 if you suspect oestrogenic clover may be a problem on your property.

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