

Good clover bad clover MLA producer demonstration site

Background

Some varieties of sub clovers, clovers sown from the 1930s up until the late 1980s, caused infertility issues in sheep, resulting in lower lambing percentages. The clover varieties responsible include Dinninup, Dwalganup, Yarloop and Gerladton. The infertility issues, commonly referred to as clover disease are a result of oestrogenic clovers. The substances 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, prolapse of the uterus, urethral blockages in wethers and udder development in maiden ewes and wethers. Isoflavones are potent to sheep when the plant material is green. As the plant senescences, 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 often be problematic, particularly if it has been cut, and cured, at the ideal times and the plant material has kept its color. Isoflavones are measured via a laboratory test and 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.

There is no cure for the permanent infertility in ewes who have had repeated exposure to large amounts of oestrogenic clovers over a long period, and these ewes should be culled. This cumulative effect may occur over a two to three year period. Pastures with greater than 20% oestrogenic clovers are deemed toxic.

Oestrogenic sub-clover cultivars



Gerladton



Dwalganup



Dinninup



Yarloop

Management of oestrogenic clovers on properties where they may pose issues to fertility includes a variety of strategies. Paddocks that have been identified as having greater than 20% oestrogenic clover should not be grazed with ewes during periods when the clover is green. Drilling in winter feed to dilute the clover and avoid grass cleaning highly oestrogenic pastures is also recommended.

In the long term, renovating pastures with low oestrogenic cultivars will improve productivity. Clover seed reserves in the soil often mean that renovation does not completely remove the oestrogenic clovers from a pasture. In the years prior to renovation, reducing seed set of oestrogenic cultivars should be considered. In paddocks that can be cropped, encouraging germination to maximise kills of the sub clovers in problem paddocks, can help reduce seed banks. Ensure new clover varieties can dominate, through adequate soil nutrition and adequate weed and insect control.

What was done

The 'Good Clover Bad Clover' project is a three-year project that commenced in April 2017 and aims to increase awareness of the potential issues and improve 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 Agriculture KI (in partnership with MacKillop Farm Management Group). It involves surveying producers then establishing 10 focus farms on Kangaroo Island and in the South East of SA. The focus farms will be educated in the identification of oestrogenic clovers and development of management plans for their properties. Paddocks on the focus farms will be assessed using visual and laboratory analysis. The project will also include field days to train producers in identification and management of oestrogenic clovers.

Results

As part of the project, 160 producers in SA completed a survey on the issue of oestrogenic clover. The majority of these producers were unaware of the presence of oestrogenic clover and not confident in identifying oestrogenic clover species; 85% of these producers have never undertaken a visual assessment or laboratory analysis.

Only one Australian commercial laboratory can test for isoflavones. There is little detail available to date on the sampling technique and interpretation of results.

This project has undertaken visual and laboratory analysis of paddocks and has looked at the correlation. Initial results have been inconsistent with the visual assessments. This is likely to be due to the sampling method and the timing of when the plant sample was taken.

The laboratory initially recommended that leaf only or the whole plant is suitable for testing. However, this project has found differences in isoflavone levels when including stems in a sample versus leaf only samples, with concentrations of the isoflavones higher in the leaf than in the stem. Plant samples taken through the growing season and at different growth stages, will also impact test results, i.e. plants that have started to senesce show a decline in isoflavone levels. Further assessment and sampling work will be carried out as the project continues.

The project involved visual assessments and laboratory tests of 25 paddocks from 10 properties across the South East and Kangaroo Island. Of these 25 paddocks, 20 paddocks had greater than 20% oestrogenic clovers present in the clover proportion of the paddock. Of these paddocks, there was potential for 10 paddocks to cause fertility issues in ewes with visual assessments ranking them as moderate to high oestrogenic clover levels.

Laboratory and visual assessment results for Kangaroo Island are summarised in TABLE 1. Critical level of Diadzein and Formononetin isoflavones is 1000mg/kg (dry weight) as consumed by the ewe. At this level ewe fertility is likely to be affected.

What's Next?

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.

Good clover bad clover MLA producer demonstration site (cont.)

TABLE 1.

Location area - Hundred	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 Diadzein & Formononetin mg/kg	Estimated Isoflavones as consumed by animal in total pasture consumption
MacGillivray 1	44	0	56	92	52 High	1810	1014**
MacGillivray 2	69	6	25	25	6 Low	N/A	N/A
MacGillivray 3	N/A	N/A	N/A	N/A	N/A	750	150
Ritchie 1	10	49	41	53	22 Moderate	2640	1082**
Ritchie 2	46	10	42	28	12 Low	1170	491
Ritchie 3	34	16	38	16	6 Low	N/A	
Ritchie 4	58	20	22	32	7 Low	N/A	
Ritchie 5	39	22	29	30	12 Low	N/A	
Ritchie 6	68	10	22	6	1 Low	N/A	
MacGillivray 4	34	40	26	68	18 Low	2840	738
MacGillivray 5	46	18	36	18	7 Low	628	226
MacGillivray 6	18	18	64	18	12 Low	1220	780
MacGillivray 7	58	32	10	90	9 Low	2580	258
MacGillivray 8	10	50	42	88	37 Moderate	5190	2179**
MacGillivray 9	10	44	46	78	36 Moderate	5710	2627**
MacGillivray 10	14	52	34	60	21 Moderate	1130	384

* 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)

Take home messages

- Four problem sub-clover species Yarloop, Dinninup, Geraldton and Dwalgenup.
- Oestrogenic clovers are responsible for a variety of symptoms in sheep including reduced ewe fertility, difficult births, prolapse of the uterus, urethral blockages in wethers and udder development in maiden ewes and wethers.
- Paddock assessments have confirmed the widespread presence of oestrogenic clovers in the South East and Kangaroo Island.
- Growers are encouraged to assess their own paddocks for the presence of problem species and their potential impact on their flock.

Funding/Sponsors

- Meat & Livestock Australia
- KI NRM Board's Science Hub

For further information contact

Lyn Dohle, PIRSA, Kingscote
Phone: 8553 4999 or email lyn.dohle@sa.gov.au