

# Sheep fertility issues when grazing medic pastures

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## Key messages

- **Medicago legume pasture species play a major role in low rainfall mixed farming systems on Eyre Peninsula, however, may lower livestock fertility due to hormones (phytoestrogens) produced when exposed to stressors (pests or diseases).**
- **More research is needed to quantify the affect phytoestrogens have on reproduction in livestock, in particular the extent of plant damage, timing and duration of grazing Medicago legume pastures required to induce oestrogenicity.**

## What is the issue?

Poor reproductive performance in sheep can be caused by consumption of oestrogenic hormones (oestrogens), which can be produced by pasture legumes (phytoestrogens); or by soil-borne fungi that live on growing pasture plants; or on decomposing or dead organic matter at the base of legume plants (mycoestrogens). In *Medicago* pasture species (medic and lucerne), phytoestrogen compounds known as coumestans are produced in response to stress, such as the impact of pests

or diseases. Livestock sufficiently exposed to coumestans, which can be from pasture, hay, silage, pellets or meal sources produced from *Medicago* species, prior to conception have been associated with reduced fertility.

Medic pastures on Eyre Peninsula (EP) have been quite productive in recent years after a series of above average seasons in low rainfall mixed farming regions. A combination of significant rainfall and warm temperatures during the growing season has resulted in substantial growth in medic pastures, which has attracted more diseases and pests than usual in the legume stands, including powdery mildew and aphids. Anecdotal evidence of poorer than usual lamb marking percentages on EP have coincided with medic pastures that have been affected by pests or diseases. This indicates that oestrogenic hormones, such as coumestans, may be of concern for livestock producers and the reproductive potential of their flocks.

## Why is this important?

Legume pastures, such as medic, are a vital element of mixed farming system on EP and make up a substantial component of the feedbase for livestock over the growing season. Most self-replacing sheep enterprises rely on this type of grazing system at key times in the reproductive calendar of their animals and the timing of pre-conception and joining generally occurs during, or not long after the growing season and pasture senescence.

Stage of plant growth and environmental factors (stressors) influence the concentration of phytoestrogens in *Medicago* pastures. Coumestans are often not detected in healthy, vegetative plants, however the concentration of hormones that may be produced in these legumes has the potential to increase when the plant is stressed. In medic pastures, coumestans usually accumulate during senescence and death of the plant, so concentrations are generally higher in dry pastures.

The production of these oestrogenic hormones is associated with the suppression of oestrus (the period in the sexual cycle of ewes during which they are cycling i.e. when they are 'on heat') and inhibition of ovulation. Phytoestrogens can mimic the biological activity of oestrogens, which means that they can compete with these hormones that are vital for healthy reproductive cycling in ewes and negatively influence the oestrous cycle in animals that ingest medic pastures containing coumestans (Reed 2016). This means that ewes grazing these pastures immediately prior to or during joining may exhibit a lowered frequency of multiple births, and in extreme cases they can become temporarily infertile, depending on the dose and timing of exposure to these phytoestrogens.

## What can be done?

Coumestan infertility has not attracted as much attention as isoflavone infertility (hormones that affect the *Trifolium* species, namely clovers), which has been greatly reduced by genetic improvement and by the de-commercialisation of 'highly oestrogenic' cultivars of *Trifolium* species (Reed 2016). This could be due to the widespread reliance on clover as the preferred pasture legume compared to areas where *Medicago* species dominate, and may also be associated with resources allocated to different legume plant genetic breeding programs. The new strand medic cultivar PM250 is the exception to this statement, as due to its resistance to powdery mildew, it has low levels of phytoestrogens (up to a 10-fold reduction in coumestrol levels (Howie *et al.* 2015), compared to powdery mildew susceptible cultivars), which may have a positive influence on ewe fertility.

Coumestans have been reported as producing only sporadic outbreaks of infertility and there is currently no evidence to suggest permanent effects of these phytoestrogens on fertility in sheep (Reed 2016). The extent of reduction in reproductive efficiency in livestock exposed to coumestans produced in *Medicago species* is yet to be determined, in particular the level of this damaging phytoestrogen that is required to cause significant fertility issues. Additional research needs to be undertaken to gain a greater understanding of the effect these hormones are having on sheep reproduction in predominantly medic-based pasture mixed farming areas, such as EP, before any recommendations can be given to livestock producers.

## What does this mean?

More research needs to be undertaken to separate the phytoestrogenic effect of legume pastures on fertility from the

beneficial effects on reproduction, improvements in live weight gain and wool growth, and the efficiency of feed conversion due to the legumes' nutritive value. With high value animals or significantly stressed legume pastures, there may be a case to maximise fertility by removing or avoiding phytoestrogens, however more investigations to determine concentrations of coumestans in *Medicago species* at different growth stages and exposed to a range of stressors, to understand the extent of plant damage required to induce oestrogenicity in livestock is required.

## References

- Howie J. (2015) Barrel Medic, *Medicago truncatula* "Sultan-SU". IP Australia Plant Varieties Journal 28, 132-135.
- Reed K. (2016) Fertility of Herbivores Consuming Phytoestrogen-Containing *Medicago* and *Trifolium* species. MDPI Agriculture Journal 2016, 6, 35.