# Understanding photosensitisation in sheep grazing biserrula pastures

## Background

Biserrula (*Biserrula pelecinus*) is an annual pasture legume native to Europe and North Africa (Figure 1). In its native environment, biserrula grows in association with other annual legumes such as subterranean clover (*Trifolium subterraneum*) and serradella (*Ornithopus* spp.). The first cultivar of biserrula, Casbah, was released in 1997, followed by Mauro in 2002. Biserrula is used mainly in low-to-medium rainfall (325–650 mm) zones of southern Australia as a break pasture in a cropping rotation, generally planted as a monoculture, and can be very weed suppressive.

Sheep growth rates on biserrula can exceed 350 g/head/day; however, livestock of all ages grazing biserrula can be affected by mild to severe photosensitisation.

A number of grazing experiments were undertaken at Charles Sturt University (CSU) in Wagga Wagga New South Wales (NSW) to better understand factors contributing to photosensitisation in sheep grazing biserrula and investigate options to reduce the incidence and severity of the disorder.

*Figure 1. Biserrula (cv. Casbah) leaf, flower and pod.*

## Tips and tools for managing sheep grazing biserrula pastures

### Tip 1: Understand the different types of photosensitisation.

**Tool 1:** There are different types of photosensitisation. Primary photosensitisation occurs when animals ingest plants that cause direct damage to skin in the presence of sunlight. This is the type of photosensitisation caused by biserrula. Removal of animals from pastures containing these plants results in resolution of the problem.

Secondary photosensitisation occurs when ingested compounds contained in plants such as witch grass (*Panicum capillare*) and caltrop (*Tribulus terrestris*) affect liver function, which then causes photoreactive compounds to circulate under the skin where they react with sunlight to cause tissue damage. Photosensitisation can also occur through direct contact with plants such as parthenium weed (*Parthenium hysterophorus*) that produce exudates which react with sunlight.

**Biserrula causes primary photosensitisation.**

### Tip 2: Photosensitisation can occur in sheep grazing biserrula-dominant pastures (both Casbah and Mauro) throughout the active growth phase of the plant, with variation in the number of animals affected and the severity of the outbreak.

**Tool 2:** It is important to observe livestock grazing biserrula-dominant pastures at regular intervals during the active growth (green) phase of the plant in order to detect early signs of photosensitisation. This can occur as soon as Day 3 on pasture.

One winter and three spring grazing studies have now been completed at CSU. The outbreak experienced in winter was more severe than in spring. The reason for this is as yet unclear but colder-than-average winter temperatures at the time of this experiment may have influenced increased biserrula intake through environmental effects on plant palatability.

### Tip 3: The initial signs of photosensitisation can arise quickly (48–72 hours).

**Tool 3:** Become familiar with the range and severity of symptoms exhibited by affected animals (Figure 2) so you can act quickly to minimise the number of animals affected and the severity of symptoms.

*Figure 2. Lambs showing mild (top left), moderate (top right) and severe acute (bottom left) photosensitisation after grazing biserrula-dominant pasture. Fleece loss is also commonly observed in severe cases (bottom right).*

### Tip 4: The sooner you recognise the symptoms and take management action, the more rapidly affected animals will recover.

**Tool 4:** Promptly remove animals from biserrula-dominant pasture as soon as mild signs appear (Figure 2). Provision of an alternative feed source (e.g. hay or grass pasture) reduces the intensity of injury and improves recovery time. Remove animals to shaded areas where possible.

### Tip 5: If animals have other underlying health issues (e.g. worms, liver fluke), they may be more rapidly and severely affected by photosensitisation.

**Tool 5:** Ensure health disorders such as parasites are controlled, regardless of pasture to be grazed, and be particularly vigilant in ensuring animals grazing biserrula are in good condition. Underlying health issues may increase the likelihood and severity of photosensitisation.

### Tip 6: Presence of other species in the pasture sward reduces the incidence and severity of photosensitisaton.

**Tool 6:** In CSU studies, having 10–30% annual ryegrass in the pasture at the commencement of grazing reduced the severity of photosensitisation. Higher levels of ryegrass were required with the cultivar Mauro compared to Casbah. Mauro is less bitter in taste than Casbah and sheep tend to consume it more readily.

*Figure 3. Pigmented (background) and non-pigmented (foreground) lambs grazing biserrula-dominant (> 90% biserrula) pasture. Note the lack of tissue damage in the pigmented animal.*

### Tip 7: Sheep breed and genotype affect both the incidence and severity of photosensitisation.

**Tool 7:** Use of less susceptible breeds/genotypes can reduce the incidence and severity of photosensitisation. Pigmented sheep generally do not exhibit visible signs of photosensitisation (Figure 3). Merino sheep appear to be less affected by photosensitisation than cross-bred sheep. This is most likely due to merinos having better wool coverage around the ears and face. Keep in mind that shearing time may affect susceptibility. Non-pigmented (white) shedding sheep are most susceptible to photosensitisation.

### Tip 8: Dried (senescent) biserrula does not cause photosensitisation.

**Tool 8:** Photosensitisation has not been recorded in sheep in CSU trials when grazing fully senesced (dried) biserrula pasture, regardless of the percentage of biserrula in the sward (Figure 4). As a dried forage, biserrula has a high protein content (14% or higher) and a maintenance energy level for mature dry sheep (7 MJ ME/kg DM). Rainfall received over summer can affect the quality of senesced pasture. It is important to observe pasture over the summer period and particularly after rain for summer weeds, such as witch grass and caltrop, which can cause secondary photosensitisation.

*Figure 4. Dried or senescent biserrula pasture.*

## Other strategies used in industry

Some producers have reported success in using low-quality hay as a supplement in biserrula paddocks to reduce photosensitisation. Some producers also use rapid rotational grazing (7 days or less on pasture) incorporating biserrula paddocks with non-biserrula containing paddocks, as this may mitigate severe outbreaks. However, rotational grazing or supplementation does not prevent photosensitisation in all animals in the mob, particularly in older or younger stock.

**If you are interested in reading more see:**

Kessell, A., Ladmore, G., & Quinn, J. (2015). An outbreak of primary photosensitisation in lambs secondary to consumption of Biserrula pelecinus (biserrula). *Aust. J. Vet. Sci.* **93:**174–178.

Quinn, J.C., Kessell, A., & Weston, L.A. (2014). Secondary plant products causing photosensitisation in grazing herbivores: their structure, activity and regulation. *Intl. J. Mol. Sci.* **15:**1441–1465.

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