



Native shrubs could offer a natural alternative

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ABOVE: Dr Zoey Durmic (left) doing impact tests of plant extracts on rumen bacteria in the anaerobic chamber. (Photo: Zoey Durmic)

Unique chemicals found in many native shrubs could provide new benefits to livestock producers and satisfy consumer demand according to rumen microbiologist Dr Zoey Durmic.

Dr Durmic is working with other researchers as part of the FFI CRCs *Enrich* project to develop new forage shrubs. Her work is part of activities led by Dr Phil Vercoe (UWA) to investigate the potential for new plants to improve rumen function. The project is currently investigating many characteristics of these shrubs – from agronomic properties, nutritive values, to their ‘bioactivity potential’ to modulate rumen function.

“As a survival and defence mechanism, native plants have evolved to produce Plant Secondary Compounds (PSC),” said Dr Durmic.

i key points

- As part of an adaptive process native shrubs have evolved to produce plant secondary compounds in response to stress
- These compounds could prove a viable and natural alternative to synthetic feed additives used in livestock production.

“These are commonly produced in response to stress, such as during defoliation (grazing), low soil fertility, lack of water or high temperatures, microbial and insect attack.

“Traditionally, Australian native plants, perennial shrubs in particular, have not been considered as valuable livestock fodder, not only because of their low biomass productivity and nutritive value when compared to crops, but also because of anti-nutritive effects of PSCs.

“However, trends in consumer demands could be about to change our opinion and shift the way we perceive our native shrubs.”

Taking an inside look

Dr Durmic’s focus is largely on the potential effects of these shrubs on rumen microbiology. This area of research, within the broader *Enrich* project, builds on results from a large European research project, *Replace*, that investigated plant extracts that could improve rumen microbial fermentation.

While the Europeans were looking into something that can be potentially ‘bottled’, *Enrich* is taking different approach.

“Our project looks into an on-farm approach, and includes bioactive species as a grazing fodder rather than a feed additive,” Dr Durmic said.

In addition to their potential livestock benefits, native shrubs are well adapted to

our soils and climate conditions because of their tolerance to environmental stresses (for example, drought and salinity) and are less impacted by variation in rainfall and temperature. They are important as ecosystems stabilisers reducing soil erosion, carbon build-up and providing shelter. Some shrubs also have relatively high nutritive value, and average to good palatability.

As the management of dryland salinity moves towards including more resilient native species as forages, the interest and value of shrubs may rise further.

Better for animal production

Ruminants consume large quantities of fibre, which is broken down in the rumen by microbes, providing energy for the animal.

However, there are some negative consequences of this and moderating rumen microbial fermentation by antimicrobials can have positive effects on feed efficiency and promote animal growth.

“Shrubs containing PSC with antimicrobial properties may provide a solution,” Dr Durmic said. “So far we have found that many shrub species have good fermentability and therefore the potential to be considered as fodder, but some also have those specific and desirable rumen-modulating properties.” Properties include better gas profile (less methane), more favourable end-products

(propionate), and less dietary protein breakdown in the rumen (see Figure 1).

Better for the environment

With increased concern about climate change and global warming, consumers also are demanding animal production methods that have less impact on the environment.

“Large amounts of gas are normally produced in the rumen during fermentation of feedstuff and is then eliminated by belching,” Dr Durmic said. “Eructated methane represents a loss of 2-12 per cent of the gross energy consumed by ruminants, but it is also a potent greenhouse gas.”

“There are some synthetic antimicrobials that can be fed to animals to control this, but plants that can reduce or inhibit rumen methanogenesis could prove beneficial, and provide a more ‘natural’ alternative.”

Among the shrubs that have been examined in the *Enrich* project, nearly half inhibited methanogene concentrations, with one fifth reducing it more than 50% (see Figure 2).

Better for the livestock

Antibiotics are commonly used to control ruminal disorders such as lactic acidosis and bloat, and to inhibit gut pathogens. Withdrawal of in-feed antibiotics from livestock production due to consumer demands is expected to have an instant and severe impact on animal health and welfare – something that has already happened in Europe.

Researchers at UWA and CSIRO investigated another set of Australian plants for the specific antimicrobial properties that control these disorders. Several plants (including some shrubs represented in *Enrich*) were capable of preventing growth of the bacteria responsible for ruminant lactic acidosis, while others were potent inhibitors of gut pathogenic bacteria (see Figure 3).

FIGURE 2. Distribution of plants capable of reducing methane production during rumen fermentation

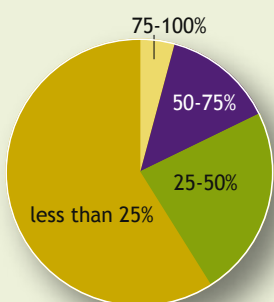


FIGURE 1. Shrubs that can potentially improve animal production.

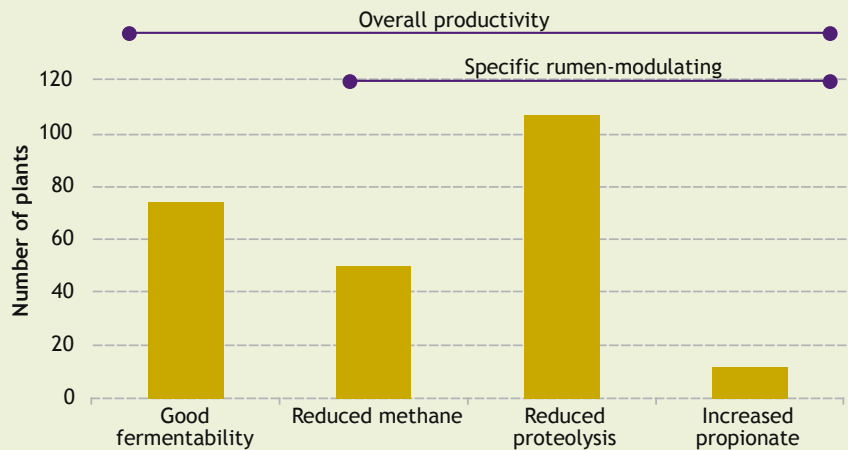
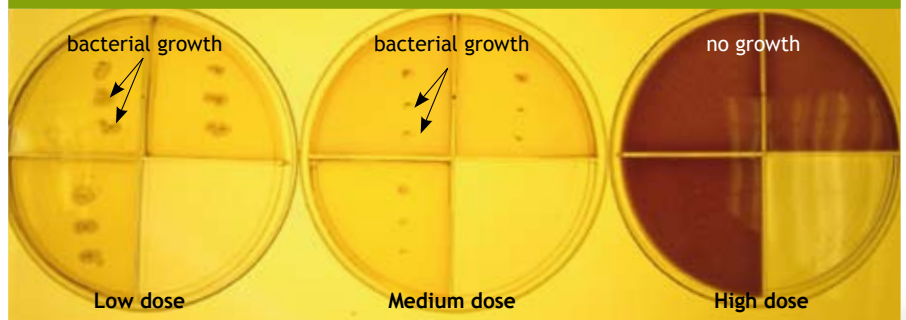


FIGURE 3. Test demonstrating inhibitory effect of plant extracts on three gut pathogens.



Test tube to paddock

So far these preliminary results were only obtained in test tubes and they need to be translated into animals and validated in vivo.

“Although preliminary studies in sheep show some encouraging results,” Dr Durmic said, “there is more work to be done before we can start ‘prescribing shrubs’ for better production and health.”

Managing microbial activity in the rumen to enhance productivity and animal welfare while meeting consumer demands remains a task, but plants containing PSCs are already high on the list to meet all these requirements.

A strong need to find safer rumen-modulating antimicrobials, while providing sustainable farming solutions could see, for example, livestock producers combining native shrubs along with other pasture species (complementary feeding), to reach the full potential of production, health and environmental benefits. ⬇

More information

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