Trials at The University of Western Australia's Ridgefield Farm have indicated that grazing ryegrass can lead to lower methane emissions. Photo: Peter Hutton.

Grazing ryegrass reduces methane emissions

With pressure mounting on producers to minimise methane emissions from livestock, help may be as close as the nearest ryegrass pasture. By **Jill Griffiths**

Accidental findings from a Western Australian methane emissions experiment appear to support the claims of ryegrass seed merchants – sheep grazing high sugar ryegrass emit less methane than those grazing legume pastures.

Animal scientist Dr Peter Hutton and colleagues from the University of Western Australia and Murdoch University set out to investigate the methane emitted when sheep were fed novel and commercial legumes in an animal house.

The Novel Pastures and Feeding Systems to Reduce Methane Emissions project is a collaboration between UWA, Murdoch University and the Department of Primary Industries Victoria, and is funded by the Department of Agriculture Fisheries and Food.

"We expected the sheep that were offered commercial legumes including biserrula, serradella sub-clover and bladder clover would have lower methane emissions than those fed ryegrass, and set out to quantify whether or not the difference was significant," Hutton said.

"In our experiment, we included an annual ryegrass pasture as a control, thinking that it would provide us with a baseline of high emissions."

Table 1. Methane emissions and nutritive values of pasture fed at maintenance levels to sheep as fresh pasture in the CSIRO animal house at Floreat, Perth, 2013 (Unpublished data courtesy Peter Hutton.)

Pasture	Methane g/dry matter intake	Metabolisable energy MJ/Kg DM	Crude protein %	Water soluble carbohydrate %
Biserrula	10.8	11.6	23	8
Annual ryegrass	10.9	12.3	14	21
Serradella	13.5	10.2	23	6
Sub-clover	13.5	10.4	18	9
Bladder clover	14.3	9.6	19	7

UNEXPECTED FINDINGS

"We expected the sheep's methane emissions to be much higher on the ryegrass than the legumes, but we were wrong. The sheep eating the ryegrass emitted significantly less methane than three out of four legumes used in our animal house experiment."

This finding (Table 1) flew in the face of what the researchers had expected to find; the ryegrass was only included as a control against which to compare the legumes.

In a subsequent grazing experiment using the same pastures, a 'free choice' paddock was also set up in which ryegrass and sub-clover were both freely available as separate monocultures.

This free choice paddock produced the highest live weight gains and the lowest methane intensity (methane produced per unit of animal productivity) of all the pastures. The answer as to why this

was happening lies in the way different feedstuffs are metabolised in sheep.

"The ryegrass we used in our experiment was a tetrapoloid annual called Robust," Hutton said.

A nutritive analysis showed that it had a very high sugar content (Table 1). Sheep (and other ruminants) metabolise high sugar intake in a similar way to how they metabolise grain.

Technically speaking, it goes down the metabolic pathway that leads to the formation of propionic fatty acids rather than acetate.

The higher levels of propionate favour energy production that can be used better for animal growth and milk production. It also produces less methane.

On the other hand, when acetate is formed, it favours methane formation in the rumen and as a result, sheep emit methane.

"It would therefore be useful to include tetraploid ryegrasses in whole farm grazing systems to improve animal productivity relative to perennial ryegrasses and to lower methane emissions relative to perennial ryegrass and some commercial legumes," Hutton said.

David Lockhart, national manager of Upper Murray Seeds, is enthusiastic about the potential contribution of the Germinal range of Aber high sugar ryegrass his company distributes.

He said the varieties have been independently assessed as providing improved productivity and lower methane emissions.

He draws attention to independent New Zealand research that studied methane emissions in sheep fed a range of annual and perennial ryegrass varieties.

"The New Zealand research found that less methane was produced when sheep ate the high sugar tetraploid perennial ryegrasses than when they ate the lower sugar diploid perennial ryegrasses," he said.

"The New Zealanders concluded that high sugar ryegrass had a role to play in reducing methane emissions from livestock industries."

Lockhart said one of the main reasons Upper Murray Seeds has aligned itself with Germinal Seeds is the opportunity to access Germinal's sophisticated and significant research capacity.

"While Upper Murray Seeds can rely on this rigorously produced R&D material, Sheldon Agri (which undertakes Upper Murray Seeds' R&D) has also carried out dry matter (DM) trials of high sugar grass in Australia over a three-year period," he said.

"While Aber perennial rye grasses do not produce quite as much DM as some others in its category, this is more than counterbalanced by the fact that HSGs are digested more efficiently and therefore less DM is required to produce an improved outcome.

"Sheldon Agri ensures varieties are suitable to grow in Australia by assessing the suitability of a variety to the Australian climate and measuring DM production in comparison to competing products."

INDUSTRY OPPORTUNITY

Lockhart said that high sugar ryegrass varieties present the farming industry with a significant opportunity to respond positively to one of the key issues debated at the United Nations COP21 conference, which was to cut red meat consumption.

Paul Billings, MD of Germinal Great Britain, said the company's range of Aber high sugar ryegrasses are bred with higher water soluble carbohydrate content and reduce the environmental impact of ruminant livestock.

"Studies have demonstrated that lambs grazing Aber High Sugar Grass released 20% less methane per kilogram of liveweight gain than lambs on a standard ryegrass," he said.

"This is significant, not least because livestock are believed to account for approximately 37% of all methane emissions."

Billings also said that independent UK-based trials with cattle showed the amount of feed lost in urine was reduced by up to 24% from animals fed the Aber High Sugar Grass variety.

"This lost nitrogen has the potential to convert to nitrous oxide, which is a greenhouse gas with at least 250 times the global warming potential of carbon dioxide.

"So, by grazing or ensiling these modern ryegrasses with higher water soluble carbohydrate content, rumen efficiency can be improved in a completely natural way. This results in a significant reduction in greenhouse gas emissions.

"As an industry, we have a real opportunity to cut greenhouse gas emissions and at the same time improve the efficiency and productivity of ruminant livestock businesses.

"The technology is available now and there is huge potential simply by reseeding with the best available grass varieties." FA

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