Birdsfoot ready for the climate challenge

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ABOVE: Graeme Sandral (far right) with Chris Mitchell (Executive Director Corporate Development of CO_2 Group Limited) and Kay Hull (Federal Member for Riverina, NSW) after one of his birdsfoot trefoil presentations in the Riverina. (Photo: MSS Media)

New pasture varieties will provide greater perennial options for Australian producers, but they also could protect them from the impacts of climate change — all while reducing livestock greenhouse gas emissions to boot.

One of the shining lights of the Future Farm Industries CRC (FFI CRC)-funded research into new perennial options is birdsfoot trefoil (*Lotus corniculatus*) and according to New South Wales Department of Primary Industries (NSW DPI) pasture ecologist Graeme Sandral, recent results suggest it is capable of tackling many of the current challenges head on.

"Our new birdsfoot trefoil cultivars are a more robust choice for producers where white clover fails due to drought or where soils are too acid or waterlogged for lucerne," Graeme explained.

Results from south-east South Australia show clearly that birdsfoot trefoil is more drought tolerant after a summer drought stress than white clover (see Figure 1).

"The new cultivars are targeted at the tablelands and slopes of New South Wales and Victoria through to south-east SA and south-west Western Australia, where average rainfall is greater than 600 millimetres. Further field testing will show whether it has a role in drier environments," Graeme said.

"This encompasses about eight million hectares where currently no perennial legume options exist."

Graeme suggested that in these landscapes, significant production advantages will be possible where producers can grow the new cultivars for the first time.

Economic alternative

The ability of birdsfoot trefoil to better cope with drought periods could reduce the cost of pasture investment for many producers. It will survive more frequent and prolonged droughts and will not require re-sowing. Whereas, white clover often requires re-sowing after drought events, due to plant death, which increases long-term costs.

"This positive impact on pasture investment is an important success factor for our new cultivars," Graeme said.

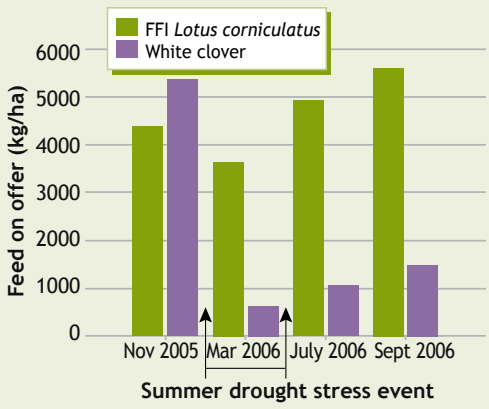
"As one of the predicted impacts of climate change is 20 per cent more droughts for southern Australia, plants that can withstand these droughts will reduce any re-investment costs for new pastures after drought.

"This is an important component of helping producers cope with the effects of climate change."

key points

- New birdsfoot trefoil (*Lotus corniculatus*) varieties provide options for many producers in areas unable to support lucerne or white clover pastures
- The varieties are tolerant of both summer drought stress and waterlogging
- High levels of condensed tannins also make birdsfoot trefoil a methane-reducing pasture option for ruminant livestock.

FIGURE 1. Productivity of birdsfoot trefoil compared with white clover after summer drought stress



LEFT: Producers can consider birdsfoot trefoil as a species adapted to environments unsuitable for white clover and lucerne. (Photo: Graeme Sandral)

And there's more

Ironically, while birdsfoot trefoil can withstand drought, it also can tolerate significant levels of waterlogging.

Studies of waterlogging tolerance have shown that birdsfoot trefoil dry matter production was reduced by only 7% after 19 weeks of waterlogging while lucerne dry matter was reduced by 89% over the same period.

In another study testing low pH and aluminium tolerance, lucerne showed a 50% reduction in growth at pH 4.5 while birdsfoot trefoil showed no reduction.

"Although it can outperform lucerne and white clover across a number of criteria, it is important producers see birdsfoot trefoil not as a competitor, but as a species adapted to environments that are unsuitable for lucerne and white clover.

Reducing emissions

As well as being a productive perennial option in challenging environments, birdsfoot trefoil may also help reduce greenhouse gas emissions from livestock.

"Currently agriculture contributes about 17% of Australia's greenhouse gas emissions and of that about 62% is methane," Graeme said.

"Any methane reductions that can be established in livestock will reduce the carbon footprint of Australian agriculture."

Graeme explained that the condensed tannins in birdsfoot trefoil reduce methane production in ruminants. For example, when a birdsfoot trefoil diet was compared with ryegrass, cattle grazing birdsfoot trefoil produced 32% less methane per kilogram of milk solids.

"The levels of condensed tannins in birdsfoot trefoil (2-4%) are also sufficient to protect livestock against bloat," Graeme said.

Birdsfoot trefoil can also impact on parasite survival outside the gut. In an experiment examining the survival of parasite larvae (*Cooperia curticei*) on birdsfoot trefoil and ryegrass, it was found that birdsfoot trefoil had 31% and 58% fewer parasites in two separate experiments.

The FFI CRC has produced four birdsfoot trefoil cultivars that will be commercialised via a tender process during the second half of 2009.

"To date, a number of field days have generated significant interest from seed companies with strong interest from domestic and international companies," Graeme said.

More information

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Tedera retains composure under stress

Another promising species being developed by the FFI CRC is Tedera (*Bituminaria bituminosa* var. *albomarginata* and var. *crassiuscula*).

Native to the Canary Islands, Tedera is drought tolerant and is set to help Australian producers cope with the additional and extended droughts expected with climate change.

"One of the unique features of this plant is its capacity to retain green leaves over prolonged periods of drought and heat stress," NSW DPI pasture ecologist, Graeme Sandral said.

This green leafage is effectively feed conserved on the plant and is a unique feature not present in most other plants, such as lucerne.

Figure 1 shows Tedera with 70 to 80 per cent of leaf retained while lucerne retained only 5% of leaf.

During January, this translated to an organic matter digestibility of 41% in lucerne and 60% in Tedera.

This effectively means that Tedera can provide high-quality feed in the field at a time when other species such as lucerne cannot.

It also has a significant impact on methane output and translates to Tedera producing at least 28% less methane during summer than lucerne where these plants are the complete diet.

These reductions in methane output are important as one unit of methane is equivalent to 20 units of carbon dioxide.

More information

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FIGURE 1. Leaf retention and digestibility of Tedera versus lucerne