



Island safari finds tough perennials with local possibilities

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ABOVE: *Tedera's ability to survive the hostile environment of the Canary Islands could see it adapt easily to Western Australia's wheatbelt.*

Department of Agriculture and Food Western Australia's (DAFWA) senior plant breeder Dr Daniel Real is, along with his Spanish collaborators, are developing a perennial plant that has been left alone for thousands of years.

Bituminaria bituminosa var albomarginata, or Tedera, as it is more commonly known by Canary Island farmers, has the potential to offer a solution to lucerne's shortcomings in Australian farming systems. Dr Real is determined to develop the perennial to its full potential even if it means battling the unforgiving land of the Canary Islands.

Most people visit Spain's Canary Islands with a holiday in mind, but not Dr Real. Rest and relaxation were not on the agenda when he set out in search of the rare legume. The trip, which was funded by the Australian Academy of Science, was Dr Real's second Canary Island expedition. This time he combined plant collecting with a chance to

chat with Spanish farmers and spend time studying Spanish breeding plots.

The Canary Islands are the only place in the world where the plant in its many varieties, albeit in small quantities, is found. During his trip, he spoke with Spanish researchers who have been working with the plant for the past 15 years. Daniel was excited to learn that the legume had withstood 2000 years of goat grazing and more than 500 years subject to rabbits, all while battling the arid climate of the Canary Islands.

As a result, a fruitful collaborative project began between Spain's Murcian Institute of Agriculture (IMIDA) and Australia's FFI CRC and DAFWA. The project has seen Dr Real work closely with IMIDA plant breeder Enrique Correál and Pilar Mendez and Arnoldo Santos from Canarian Institute of Agricultural Research (ICIA).

"It has so far been a very successful partnership with Spain providing us with the germplasm and the previous breeding and agronomy experience to develop a joint breeding program," Dr Real said.

Dr Real has had exciting test results in Australia with two Tedera varieties, *albomarginata* and *crassiuscula*. The results have seen Tedera become a star student in the FFI CRC's plant breeding program.

"The thing about these plants is their remarkable ability to maintain green foliage throughout a tough summer and withstand heavy grazing," Dr Real said.

Trial plots in south-west WA have demonstrated Tedera's willingness to survive in areas that had, during the past two seasons, an annual rainfall of 200 mm.

"The plants are both drought tolerant and productive," Dr Real said.

Tough going

It is no surprise Tedera has excelled in WA's wheatbelt – it's homeland is a much more hostile environment.

The Canary Islands cluster is made up of seven islands each with their own distinct climate. The islands are characterised by volcanic activity, rocky, poor-quality soils, low rainfall and extreme temperatures – both hot and cold.

Islands, Lanzarote and Fuerteventura, are the closest to Africa and the warmest of the islands. It is on these islands that *albomarginata* or Albo Tedera is found.

Lanzarote, is of volcanic origin, and is characterised by a surface smothered with volcanic rock. It was on inspection of the island, with his Spanish counterparts, that Dr Real began his hunt for the promising perennial.

"I was joined by the Canary Islands main botanist, Arnoldo Santos, and forage researcher from ICIA, Pilar Mendez," Dr Real said.

"Without these two colleagues I could not have found what I was looking for."

The trio's plant collecting endeavours were carried out at the end of June this year – in the middle of Spain's summer and when the landscape was at its most barren. After some careful searching Albo Tedera was located – looking green and healthy despite the toughest of conditions.

At home in the desert

Next stop was the island of Fuerteventura. The island is relatively flat, by Spanish standards, and the countryside resembles the Sahara desert with an annual rainfall of just 150-200 mm. Goat farming, for cheese production is the main rural industry and

key points

- A collaborative plant breeding project between Australia and Spain saw breeder, Daniel Real travel to the Canary Islands to investigate *Bituminaria bituminosa var. albomarginata*, or Tedera as it is better known
- The plant has impressed with its drought tolerance and hardiness against grazing, particularly when pitted against lucerne
- Farmers in the Canary Islands are endeavouring to graze their goats more heavily on Tedera as they highly rate its nutritional value.

while the goats require supplementary feed they spend much of their day grazing native forage – mainly Tedera.

"We walked four hours over very difficult-to-negotiate rocks into to a group of cacti, where the plant was growing, protected from goats by the cacti," Dr Real said.

"Every plant outside the cacti had long ago been eaten but the protected ones were thriving, even flowering, during the middle of summer."

High on the mount

The island of Tenerife is home to Spain's highest peak, Teide Mountain. The mountain is home to the variety *crassiuscula* or Teide Tedera.

"Here this variety of Tedera spends six months under snow, which demonstrates it is very cold tolerant and would be most suited to our colder climate farming areas," Dr Real said.

Fact finding from farmers

Canary Island farmers are struggling with input costs, mainly that of corn and grain needed to feed their goats.

On the small island of La Palma, farmers are returning to what they believe is their best source of native forage, Tedera. Dr Real spoke with farmers who reported about the excellent nutritional value of Tedera and

how they believed their goats did better, and were healthier, when grazed on the native forage alone. But with an increasing number of goats, there is not enough Tedera to sustain the whole flock.

"One innovative young farmer has collected seeds and is attempting to replant Tedera in a more coordinated manner to allow him to obtain a sustainable mix of native forage and supplementary feed for his flock," Dr Real said.

"The farmers were able to afford corn and grain when they became part of European Union, but lately subsidies have been going down and the price of grain, especially, has been going up."

Trial plot investigation

Returning to Murcia and Alicante in the extremely dry south-east corner of Spain, Daniel caught up with his Spanish research partners to check out their latest Tedera breeding plots. Where Tedera was compared with lucerne, the results were startling. Lucerne, a deep-rooted perennial, had completely dropped its leaves as a survival mechanism while the Tedera was still covered in green foliage. After he had selected the promising Tedera varieties, Dr Real made sure they passed Biosecurity Australia's vigorous Weed Risk Assessment before bringing them into Australia.

Dr Real says he continues to be impressed by Tedera hardiness, ability to withstand drought and palatability and is excited about the role it could play in Australian farming in the future. 🌱

More information

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BELOW: Tedera has the ability to flourish under conditions that would find lucerne struggling. (Photo: Dr Real)



Turning on to Tedera's hardiness

The challenge ahead is to find why Tedera, a shallow-rooted, perennial is more drought tolerant than lucerne.

PhD student Kevin Foster (UWA) has made it his mission to get to the bottom of Tedera's hardiness, determined to leave no stone unturned in his investigations.

"We know how lucerne survives drought and summer, its deep roots simply access another water supply and it decreases evaporation by shedding its leaves," Kevin said.

"But Tedera is shallow-rooted and it does not drop its leaves.

"I'm taking an extremely lateral approach and not closing my mind to any possibility."

Kevin is progressing with his three-year study under the supervision of one of Australia's leading plant biologists, Hans Lambers of the University of Western Australia (UWA). Prof Lambers is accompanied in supervision by plant breeder Dr Megan Ryan, also of UWA, and Dr Real.

"Hans has provided me with some invaluable physiological input on measurement," Kevin said.

"Other students have also been fantastic in their encouragement and said from their experience they had found unexpected results."

With two field trials of Tedera in low- and medium-rainfall areas of WA's wheatbelt, Kevin will spend two years examining the plants across a range of parameters.

"I will be looking at a many different issues including stigmata control, leaf folding, light-avoiding mechanisms, water usage and leaf water content," Kevin said.

An integral part of the study will involve comparing the Tedera with lucerne in both irrigated and non-irrigated environments.

"Research into understanding how plants use water has become popular recently with the increased focus on climate change," Kevin said.

"And while it is early days yet, Tedera has performed so well it could just be what Australian farmers are looking for."

Kevin said Tedera seedlings in a trial plot at Lake Grace, WA had performed better during the past summer than mature lucerne plants in the same trial.



ABOVE: Rain out shelter containing drought-tolerant perennial legumes as part of Kevin Foster's research. (Photo: D Real)

"The seedlings were amazing, growing even in the hot of summer, while the large lucerne plants with canopies did not perform well," Kevin said.

"I will be also looking at the plants levels of drought tolerance at varying times during its lifecycle."

Preliminary results of Kevin's research are expected to be available during April/May 2009. 🌱

More information

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