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Lebeckia ambigua, a perennial for deep sandy soils

Lebeckia ambigua is a perennial forage legume that Murdoch University is domesticating. It has demonstrated great production potential on the acid infertile sandy soils frequently encountered across the wheatbelt of Western Australia (Figure 1). Currently there are very limited grazing options for farmers with these soils, and this land is mostly left barren and unfarmed.

This legume is a summer active perennial (Figure 2) and will not drop its leaves. It therefore provides high quality forage for sheep over the summer–autumn feed gap on soils that currently only support tagasaste. Unlike tagasaste, *Lebeckia* does not require expensive and time-intensive management, and will always remain within the reach of grazing sheep.

Our latest *Lebeckia* research has focused on leaf and stem nutritive value, soil improvement capacity of the plant and the identification of the associated root nodule symbionts.

Methods and results

Plant nutrition analyses shows that, over summer, *Lebeckia* leaves provide 23.1% crude protein and have 81% digestible dry matter (Table 1). This contrasts with tagasaste, which has 13.9% crude protein content and 75 to 85% digestible dry matter and a high phenolic content. These results indicate that *Lebeckia* is a promising pasture plant, with high nutritive value for grazing.

FIGURE 1 *Lebeckia ambigua* field site in spring in Tincurrin, second year after establishment

FIGURE 2 Lebeckia ambigua active growth over summer. Left 8 weeks after sowing (Nov. 2014), right 8 months after sowing (May 2015)

TABLE 1 Nutritive value of *Lebeckia ambigua* leaf and stem material

Nutritive value	Leaf	Stem
Dry Matter (%)	92.9	93.7
Crude Protein (%)	23.1	13.1
Neutral Detergent Fibre (%)	34.0	57.0
Acid Detergent Fibre (%)	21.9	44.1
Acid Detergent Lignin (%)	8.5	10.2
ASH (%)	8.7	5.7
Organic Matter (%)	91.3	94.3
Digestible Dry Matter (%)	81.0	54.7
Digestible Organic Matter in DM (%)	75.5	53.2
Metabolisable Energy (MJ/Kg DM)	12.3	7.8
Water Soluble Carbohydrates (%)	9.47	6.4

In order to obtain its nitrogen, *Lebeckia* forms a symbiosis with a special group of rhizobia that have only been discovered in the last 20 years (Figure 3). Several of the bacteria have been described as new species and shown to have high nitrogen fixation efficiency with *Lebeckia*, which enables the plant to grow without nitrogen fertiliser[1,2].

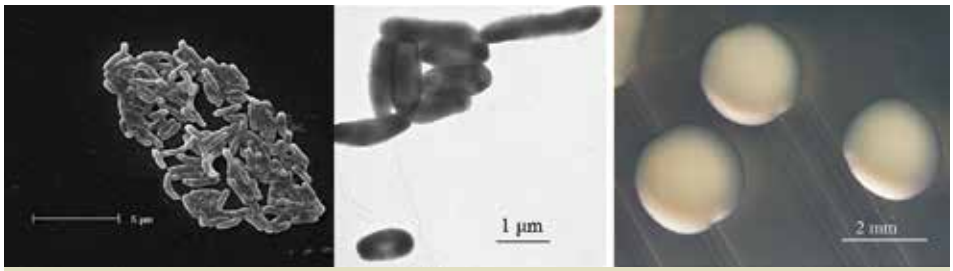

FIGURE 3 *Lebeckia ambigua* nodulating bacteria using scanning (left) and transmission (middle) electron microscopy and the appearance of colony morphology on solid media (right)

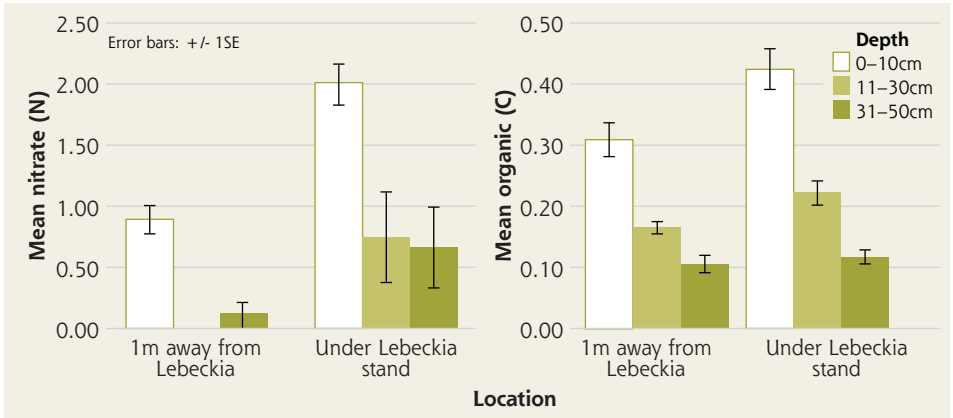

FIGURE 4 (Left) Mean nitrate level and (right) mean organic carbon shown at three soil depths with and without *Lebeckia* plants

Further research has focused on monitoring soil health changes 4 years after introduction of *Lebeckia*. The initial data indicate that *Lebeckia* is capable of improving the soil fertility and increasing soil stability by encouraging improved growth of other plant species (Figure 4).

Conclusions and recommendations

The development of *Lebeckia* is a breakthrough for woolgrowers and mixed farm enterprises. Farmers will be able to graze their sheep on high quality feed during the summer-autumn period. The plant produces good forage and nutrition for animals, fixes nitrogen and is very efficient with P and K fertiliser. Moreover, it is a legume that can produce a lot of seed and can be established by seed through a normal seeding program, which makes it easy for farmers that are already familiar with handling small seeds and establishing pastures. ■

More information

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References

1 Howieson, J.G., De Meyer, S.E., Vivas-Marfisi, A., Ratnayake, S., Ardley, J.K., and Yates, R.J. Novel *Burkholderia* bacteria isolated from *Lebeckia ambigua* — A perennial suffrutescent legume of the fynbos. *Soil Biol Biochem* 2013, **60:**55–64.

2 De Meyer, S.E., Cnockaert, M., Ardley, J.K., Van Wyk, B.E., Vandamme, P.A., Howieson, J.G. *Burkholderia dilworthii* sp. nov., isolated from *Lebeckia ambigua* root nodules. *Int J Syst Evol Microbiol* 2014, **64**(4):1090–1095.

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