Legumes of the Future

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For several decades, grassland and farming systems in Australia and New Zealand have relied on legumes to: increase soil nitrogen; improve seasonal distributions of available pasture; and provide protein to grazing animals.

In both NZ and the Tablelands of NSW, white clover has been the dominant legume base for pasture improvement. Other legumes have been adopted for speciality roles. The two main reasons for the choice of alternative legumes have been:

- the requirement for high quality; and
- environmental extremes of low fertility or severe summer drought.

New opportunities in the NZ legume breeding program may have potential for use in pastures in temperate Australia.

White clover

White clover is the cornerstone of high performing pastoral systems in NZ and is capable of fixing 200 kg nitrogen/ha/year under favourable climatic conditions. On an average farm this is equivalent to $29,000 worth of urea/year. It also provides a nutritional source with almost twice the nutritional value of grasses. In recent years, our plant breeders have produced cultivars with improved agronomic features which lead to better clover yields.

Improved tolerance to drought, low soil fertility, resistance to root invading nematodes, together with improved cool season growth and nitrogen fixation, are all high priorities in developing new cultivars.

Some of the new cultivars recently released in the market place offer potential for Australian pastures.

Grasslands Kopu, a tall, large leaved clover with improved winter activity and superior stem nematode tolerance. It is now the leading clover suited to rotational beef and dairy grazing in NZ. It has been outstanding in Victorian trials over a wide range of sites, and is now widely used in dairy and beef fattening areas of Victoria. Its improved persistence ensures a higher clover content in the sward which is so necessary for improved productivity.

At the other extreme, *Grasslands Thaora* is a small leaved, densely stoloned white clover well suited to continuous grazing management and best used in a permanent sheep pasture. Its high stolon density offers good drought recovery with surviving stolons responding quickly to autumn rains. In a 6 year trial at DSIR Grasslands Ballantrae Research Farm, Tahora produced up to 50% more lamb meat/ha than Huia and fixed 30% more nitrogen annually. Grasslands Tahora has been under evaluation in Australia and is commercially available. To date, this cultivar is receiving favourable reports from farmers and advisers alike.

Grasslands Demand which is due to be released commercially shortly is seen as a Huia replacement for the cooler regions of NZ for all livestock systems. Its potential for Australian pastoral systems has yet to be quantified, but it is currently under evaluation in Victorian trials.

Grasslands Prestige which has a high stolon density, medium sized leaf and good pest and disease tolerance will also be released soon. It appears suited to warm temperate areas and may have potential in Australia.

Future releases from private and public breeders in NZ will focus on white clovers with improved pest and virus resistance, improved quality and possibly initiating tannin production in leaves.

Kura Clover

Kura or Caucasian clover is an exciting new species which offers an answer to the decline in the legume content of sown pastures, a phenomena related to the unpredictability of weather patterns. It is also commonly called the "Iceberg" plant - the 1st year it sleeps, 2nd year it creeps and 3rd year it leaps.

Kura is a rhizomatous perennial legume that has potential to be both productive and persistent in pastures. It is indigenous to the caucasian region of Russia where it grows in environments from valley floors to sub-alpine areas. It tolerates poor drainage better than red or white clover and survives drought by becoming dormant.

Its deep branching taproot enables it to access moisture from deep in the soil profile. In addition its rhizomes enable it to spread vigorously. This extensive root-rhi-

zome complex (in excess of 30 t DM/ha underground), gives Kura clover excellent persistence. This makes Kura very attractive for soil conservation purposes, including stabilisation and revegetation of Montane areas, for erosion control and also as a potential competitor for *Hieracium* (hawk weed) in NZ high country.

Kura clover is very leafy and high in feeding value. USA research by Scheaffer *et al.* (1992) found Kura clover averaged 97% leaves, 25% crude protein and 83% digestibility. Digestibility is similar to lucerne. It is readily acceptable to livestock and contains high concentrations of minerals.

Trials to date have consistently given yields of 12-15 t DM/ha/yr, Stewart and Daly (1980) in New Zealand reported yields under fertile irrigated conditions of in excess of 13 t DM/ha/yr, while under dryland yields of 12 t DM/ha/yr were achieved.

Establishment of Caucasian clover is slow. In addition, the different ploidy selections are rhizobia specific, and inoculation will be required when sowing for successful establishment. Kura clover may have a protracted germination period due to the prevalence of hard seed. It may be 2-3 years before a stand is fully productive. Kura clover is reported to be resistant to many of the viruses common to other temperate clovers.

This species is under evaluation in NZ, Australia and the USA. Evaluation has included several cultivars such as Alpine, Treeline, Summit and Monaro. Caucasian clover has immense potential as an alternative to lucerne and lotus as a summer growing legume in the tablelands of NSW, Victoria and Tasmania, as well as NZ. It is extremely tolerant of acid soils 4.2-4.5 pH ($CaCl_2$) and has the potential in a mono-sward like lucerne or in a mix with phalaris, tall fescue, cocksfoot or ryegrass. Trials conducted in NSW have found it to be very compatible with sub clover.

At present seed production is a problem area. However, NZ research is progressing favourably and it is hoped to commercially release improved cultivars in the near future.

Other Forage Legumes

Another forage legume recently released which may offer specific potential is *Grasslands Colenso*, an early flowering red clover cultivar with good winter and spring growth. In contrast to previously released cultivars, Grasslands Colenso contains lower oestrogen levels. Potential exists for this cultivar as a speciality summer feed under rotational grazing. It has recently received recommendation in Victoria.

Grasslands Goldie is a recent perennial lotus cultivar suited to dry infertile conditions. This forage legume is non-rhizomatous with an extensive taproot. It tends to be winter dormant with a summer growth peak and has good tolerance to acid soils. Potential exists for this legume in dry areas with acid soils of low to moderate soil phosphorous status, where it will be more productive and persistent than lucerne. It has been evaluated extensively throughout Australia and has persisted well at Hamilton and Seymour.

Conclusion

Pasture improvement based on legumes, offers increases in animal productivity. Legumes will always remain essential components of grassland farming. White clover will remain an important perennial legume in Australia. However, persistence and yield fluctuations will offer opportunities for other legumes like Kura clover and Lotus. Species derived from New Zealand breeding and selection programs offer good prospects to provide better legumes for use in temperate Australia.

References

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