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Seed Research at the Charleville Pastoral Laboratory

The Charleville Pastoral Laboratory was opened in 1968 as a pasture research centre for south-western Queensland. Administered by the Queensland Department of Primary Industries, with added finance from the Australian Wool Corporation, it currently has a staff of seven agricultural science or science graduates and five technical officers engaged in pasture and native vegetation research. South western Queensland graziers depend almost entirely on native pasture and shrub communities for livestock feed.

Thus the emphasis of our work is on native pastures, their ecology, productivity, reaction to grazing and long term stability. Some plant introduction has been undertaken and hundreds of potential species screened.

This program has necessarily meant putting a great deal of time into studying the seed production and germination of species for which little or no information was available. Unless we could collect and adequately store sufficient quantities of viable seed, we could not hope to carry out glasshouse or field growth studies. Even more importantly, we needed to be able to germinate seeds of any important species whenever we wished, including exotic species. Much of the work has been trial and error, but we now have a fair general picture of the idiosyncrasies of many of the native pasture plants.

Generally, leguminous species present no problems once the seed has been adequately scarified. Legumes reach nearly 100% viability within a few months of harvest, hold this viability for years if stored in packets at air temperature, and maintain their hard seededness for years in laboratory storage. However, many have pods which shatter very early, for example, *Rhynchosia minima*, and all are very susceptible to insect damage, both in the field and in storage.

Grasses fall into a range of types with respect to ease of handling of their seed. From some it is easy to harvest good quality seed, for example, *Thyridolepis mitchelliana* and *Digitaria* spp., while from others it is difficult, for example, *Dichanthium sericeum* and *Themeda australis*. Some yield almost pure seed, for example, *Cenchrus ciliaris* while others carry much trash, for example, *Cymbopogon obtectus* and *Iseilema* spp. Many are easy to clean and some may yield almost pure caryopses, for example, *Dactyloctenium radulans*. In others, it is almost impossible to separate the seed mechanically from other trash, for example, *Themeda australis*. Some have been almost impossible to germinate in the laboratory, for example, *Eragrostis eriopoda*, while others rarely give trouble, for example, *Astrebla lappacea*. Most require a period of ageing before full viability is attained, but thereafter hold this for several years under ambient conditions (which are dry for much of the year). However, viability of seeds is generally not as high as in the legumes. Insect pests are far fewer than with the legumes.

Forbs and other dicotyledonous species have received very little attention until recently. In general, it is easy to collect seed from the annual species, but many perennial shrubs set good seed only occasionally. It is usual to have problems getting such seeds to germinate in the laboratory, but we are learning. Many have spines or mucilaginous coats and preconditioning of some sort seems needed in most cases, for example, drying or weathering. Saltbushes appear to lose their seed viability very quickly, in 1-2 years.

Contrary to earlier expectations, few species have been shown to require any special dormancy-breaking mechanisms other than normal ageing. Young seedcoats inevitably retard moisture uptake. Germination occurs over a wide range of constant temperatures, with 25-30°C being most favourable and extremes most unfavourable. An obligate requirement for alternating temperatures has not been found in any species. Little data are available on the normal rate of activation of native seeds in the field, but work is now under way to examine this aspect of the ecology of these species. We have almost no information on seed loads in the soil or upon seed yields of native species. We do have some data on seedling densities and times of the year when germination occurs in the field.

To date, our seed studies have been ecologically biased and undertaken to fulfil an immediate need. We still have a long way to go before reaching a satisfactory level of understanding of our native pasture species seeds. *Cenchrus ciliaris* and *Eragrostis curvula* are the only species we work with for which there are currently any official seed testing guidelines.

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