



The 'rights' stuff

Since 2000 the Queensland Department of Primary Industries & Fisheries Redlands Research Station has been a centralised test centre for conducting Plant Breeders Rights assessments. Here senior scientist for turf Matt Roche provides a background on the facility's PBR works and how it is playing an integral role in the future development of the Australian turf industry.



The growth of Australia's \$450 million per annum turf production industry can primarily be attributed to the breeding, development and rollout of new turfgrass cultivars. The development cost for new cultivars is high, but this can be offset after release by royalty streams available to breeders of Plant Breeder's Rights (PBR) protected cultivars.

This by no means implies that non-PBR or older varieties are not useful or do not have a place within today's turf industry. However, it is imperative for turf researchers and breeders to continue to develop further and to enhance key turfgrass traits to meet Australia's harsh environmental conditions, developing varieties that more closely match client needs, which, in turn, will sustain a viable Australian turfgrass industry into the future.

Cultivars are protected for 20 years following the grant of PBR. If a turfgrass cultivar is sold or marketed illegally during this time, the title holder may initiate legal action. The PBR title holder is entitled to seek damages or an account of profits, which can range from \$55,000 for individuals to \$275,000 for companies.

An application for PBR on a new variety in Australia is based on a 'breeder testing' system. The applicant, in conjunction with a nominated 'qualified person', establishes, conducts and reports on a comparative

growing trial to demonstrate that the new (candidate) variety is distinct, uniform and stable, hence the term a 'DUS trial'.

Under PBR regulations introduced in 1996, establishments designated as centralised test centres (CTCs) may be officially authorised by IP Australia (the Federal Government agency responsible for administering PBR) to conduct comparative growing trials on behalf of a wider group of breeders.

The turfgrass CTC located at the Queensland Department of Primary Industries and Fisheries (QDPI&F) Redlands Research

PBR assessments at the QDPI&F's Redlands Research Station began in 2000 and has significantly increased the efficiency of the PBR process for turfgrass breeders within Australia

Station near Brisbane focuses predominantly on warm-season species. A second CTC associated with the Pastoral and Veterinary Institute at Hamilton in Victoria does conduct growing trials on cool-season grasses (perennial ryegrass, tall fescue, etc), but essentially works only with cultivars for pasture use.

PBR assessments started in 2000 at Redlands. Under the CTC model, this service has significantly increased the efficiency of the PBR process for turfgrass breeders within Australia. To date, the QDPI&F have processed 25 turfgrass cultivars under the CTC model - 80 per cent of all turfgrass registrations in Australia from 2000 to 2008 (Table 1).

A major benefit of a CTC is that it enables a larger number of candidate varieties to be tested in a single comprehensive DUS trial with a larger number of comparators or varieties of common knowledge. To this end, Redlands Research Station boasts a 'living library' of turfgrasses - an in-ground collection of 138 warm-season turfgrasses grown in unreplicated observational plots measuring 3 x 2.5 metres.

TABLE 1. CUMULATIVE NUMBERS OF PUBLISHED PBR DESCRIPTIONS OF TURFGRASS CULTIVARS IN AUSTRALIA (TO JUNE 2008).

Genus/group	PBR Registrations (pre-2000)	Total PBR Registrations (2000-08)	Descriptions from QDPI&F Redlands (2000-08)
<i>Axonopus</i>	0	1	1
<i>Bothriochloa</i>	1	0	0
<i>Buchloe</i>	1	0	0
<i>Cynodon</i>	5	12	12
<i>Digitaria</i>	0	1	0
<i>Panicum</i>	1	0	0
<i>Paspalum</i>	2	0	5
<i>Pennisetum</i>	0	1	0
<i>Poa hybrid</i>	0	1	1
<i>Stenotaphrum</i>	2	7	2
<i>Zoysia</i>	0	7	4
Total	12	31	25

Current *Stenotaphrum secundatum* (buffalograss) spaced plant field trial at Redlands

When new cultivars are released within Australia, or overseas cultivars have been imported through the Australian Quarantine Inspection Service, these new cultivars need to be incorporated into the 'living library' to keep it up to date. In such cases, older or less favoured turfgrass varieties may be removed from the field plots to make room, but are then planted in backup 40-litre tubs for future access.

Currently, over 100 genotypes are kept in the backup collection and, together with the unreplicated field plots, provide a valuable source of material for use in PBR and/or other funded trials undertaken by the QDPI&F Turf Team.

DUS trials generate comparative data on different varieties. This is also useful in developing a better understanding of the plants' growth habits and required management practices. For example, a researcher may observe that a particular cultivar spreads faster laterally and produces more branches along its stolons in a spaced plant trial. These data are useful to turf managers wanting to know the likely timeframe that a turf divot may take to repair, or to turf farmers trying to predict the maximum number of harvests per year for the new cultivar on a commercial sod farm.

A CTC also provides greater scientific rigour and instrumentation. Independent field or glasshouse tests are conducted, if necessary, with the benefit of specialised facilities and equipment. Field trials enable the qualified person to observe and record morphological and developmental characteristics of the candidate variety against (generally) multiple comparator varieties grown as spaced plants and as swards.

Most of the descriptive data required for PBR registration are generated through spaced plant trials, which allow inherent plant traits to be more fully expressed than in a sward trial. In these trials, 30 plants (for vegetative turfgrasses) or 60 plants (for cross-breeding seeded varieties) are grown in a minimum of three replicates for later statistical analysis of the data.

For spaced plants, the minimum set of descriptors that should be measured is usually 10. These descriptors include assessing the plant's development (lateral spread, growth habit, days to flower), internode lengths and diameters on stolons and flowering tillers, leaf length, width and sheath characteristics on stolons and tillers, and inflorescence (seed head) characteristics. For sward experiments, the minimum set of descriptors may also



include measurements of the unmown plant height and inflorescence density, as well as inflorescence, stem and leaf measurements.

A replicated field trial enables a qualified person to establish the individuality of the new (candidate) cultivar and to generate the documentation needed for a grant of PBR. The field trial provides an opportunity for QDPI&F researchers to measure and record up to 27 turfgrass characteristics (Table 2) for each variety being tested.

These descriptors, along with ground and air temperatures and differences in the incidence of pests and disease, contribute to developing a better understanding of the cultivar and how best to manage it. The extensive list of descriptors measured provides comprehensive DUS data, which also strengthens the legal right of the plant breeder should a future dispute arise.

Morphological characteristics, especially those least affected by environmental factors are preferred. Performance attributes can also be included as distinguishing characteristics provided they are clear and consistent. Clear repeatable varietal differences must be demonstrated.

While comparative DNA testing can be an important and useful adjunct to those primary tests, such information is only accepted by IP Australia and the International Union for the Protection of New Varieties of Plants (UPOV) as secondary (or supporting) data for the purposes of PBR.

DNA testing of plant material is relatively costly. However, QDPI&F and University of Queensland scientists have been collaborating to develop standard extraction and testing protocols and a reference library of varietal

DNA fingerprints to make this technology more affordable and convenient for breeders in the future.

For further information on PBR or DNA testing through the QDPI&F turf research group, visit www.dpi.qld.gov.au/turf or contact Matt Roche, (PBR qualified person) on (07) 3286 1488.

TABLE 2. TURFGRASS DESCRIPTORS (CHARACTERISTICS) RECORDED IN SPACED PLANT TRIALS AT REDLANDS RESEARCH STATION.

Whole plant measurements

- Diameter of spread (4 measurements per plant)
- Growth habit
- Days to first flower

Stolon measurements

- Number of branches at nodes 2, 3, 4, 5 and 6
- Fourth internode length, diameter, colour
- Fourth internode leaf length (L), width (W) and L:W ratio
- Fourth internode sheath length

Flowering tiller measurements

- Flag leaf length, width and L:W ratio
- Flag leaf sheath length
- Fourth leaf length, width, L:W ratio and colour

Inflorescence measurements

- Peduncle length, diameter
- Spike length(s)
- Number of spikes present
- Inflorescence density