

Autumn 2009 saw the AGCSA embark on a new three-year research project to evaluate a number of new bentgrass cultivars which have recently hit the market. The aim of the project is to assess their management and performance under Australian conditions and in this instalment of AGCSATech Update senior agronomist Andrew Peart examines the initial establishment results across the three trial sites.

In Volume 11.3 (May-June 2009) of Australian Turfgrass Management, the Australian Golf Course Superintendents Association (AGCSA) outlined details of a new bentgrass variety trial to be conducted at three sites around the country.

Since its inception, the AGCSA's technical division AGCSATech has been involved in a number of turfgrass cultivar trials, and between 2000 and 2005 undertook an extensive project evaluating a range of bentgrass cultivars that were then available on the market. Since the completion of that project, the results of which can be viewed in full through the AGCSA website, several new bentgrass cultivars have been bred and some of these are now being utilised on golf courses around Australia.

As part of its research activities, the AGCSA has established a new bentgrass trial in Victoria, NSW and South Australia to objectively assess the growth and performance characteristics of these new grasses under local conditions. The project is jointly funded by AGCSATech and Horticulture Australia Ltd (TU08002) and over the next three years will evaluate the performance and maintenance requirements of the new strains compared to the established industry standards.

Working with the Australian Seed Federation (lawn and turf seed group), the AGCSA contacted a number of seed companies and gave them the opportunity to submit cultivars for the trial. The companies involved and varieties submitted were: Advanced Seed (varieties Tyee, 007, Dominant Xtreme, SR1150

Cromer Golf Club in Sydney is one of three sites where the AGCSA has established a new three-year bentgrass variety trial. The Cromer plots are pictured at 23 days after sowing



Establishment results emerge from bentgrass trials

and SRP1RH93); Simplot (T-1); Heritage (Penn G2, Authority and Penn A1); DLF Seeds (Cobra 2 and CY 2); Seed Force (Shark); and PGG Wrightson (Declaration, Mackenzie, SRP1GMC and Mariner). A vegetative selection, called AGCSA1, has also been included as part of the trial.

Over a two week period in April the three trial sites were established. Keysborough Golf Club (Melbourne) was sown on 9 April, Cromer Golf Club (Sydney) 15 April and Royal Adelaide Golf Club (Adelaide) 17 April. The seeding rate for the trial was based on 5 grams per square metre for the seeded varieties, while the AGCSA1 vegetative selection was planted at a rate equivalent to 0.28m³/100m².

The seeding rate for each variety was adjusted following results of a germination test conducted by Assure Quality (generally between 85 per cent and 98 per cent) as well as their seed count due to some varieties being coated, namely Penn A1, Penn G2, 007, Tyee and Mackenzie.

Plot layout across the three sites is generally a replicated block design with the exception of Cromer Golf Club which is a completely randomised design due to the



size of the trial area. Plot sizes range from 3.5mx1.0m at Keysborough Golf Club to 3.0mx1.5m at Royal Adelaide Golf Club.

At Royal Adelaide there are two varieties not included at either of the other two trial sites. One of these is Mariner, which has been renowned for its tolerance of higher salinity water, while the other is an RAGC blend which consists of Seaside, Highland, Penn G2 and Penncross bentgrasses.

RESULTS

Establishment data was collected over winter and early spring at each site with initial germination rate (0-5 scale), initial turfgrass vigour (0-5 scale) and per cent cover (%) measured.

INITIAL GERMINATION

At Cromer Golf Club there was a significant difference observed in initial germination at nine days after sowing (DAS). Authority showed the most seedling germination after nine days than any other variety with the exception of Penn G2, Penn A1 and SRP1GMC. At nine days after sowing 007 had the least amount of seedlings to germinate, however, this was not significantly less than another nine varieties.

At the Keysborough Golf Club and Royal Adelaide Golf Club trial sites there was no significant difference between any of the varieties for seedling germination over the

The Keysborough Golf Club plots at 70 days after sowing

TABLE 1. GERMINATION (0-5) KEYSBOROUGH GC

Variety	7 DAS	11 DAS	14 DAS
007	1.3	3.7	3.7
Penn A1	1.3	3.7	3.7
Authority	1.3	4.0	4.0
CY 2	1.0	3.7	3.7
Cobra 2	1.7	4.0	4.0
Declaration	2.0	4.3	4.7
Dominant Xtreme	2.0	3.3	3.7
Penn G2	1.7	4.3	4.0
Mackenzie	3.0	4.7	4.7
Shark	1.7	4.3	4.3
SR1150	1.3	4.0	4.0
SRP1GMC	3.0	4.3	4.3
SRP1RH93	1.7	4.0	4.0
T-1	1.7	3.7	3.7
Tyee	2.0	4.3	4.3
LSD (P<0.05)	ns	ns	ns

TABLE 2. GERMINATION (0-5) CROMER GC

Variety	6 DAS	9 DAS
Authority	1.9	3.3
Penn G2	2.3	3.0
Penn A1	1.5	2.8
SRP1GMC	2.1	2.4
Cobra 2	2.0	2.3
Declaration	1.5	2.1
Tyee	1.2	2.0
SRP1RH93	1.3	2.0
CY 2	1.4	2.0
T-1	1.5	1.9
MacKenzie	1.6	1.8
SR1150	1.3	1.8
Dominant Xtreme	1.2	1.6
Shark	0.9	1.5
007	0.8	1.3
LSD (P<0.05)	ns	0.9

TABLE 3. GERMINATION (0-5) ROYAL ADELAIDE GC

Variety	8 DAS	14 DAS	21 DAS
007	0.7	3.0	4.3
Penn A1	1.7	3.5	4.8
Authority	1.3	3.7	5.0
CY 2	1.7	4.0	5.0
Cobra 2	1.7	4.2	5.0
Declaration	1.3	3.7	4.8
Dominant Xtreme	1.7	3.7	4.8
Penn G2	1.7	3.7	4.8
RAGC Blend	0.7	3.8	4.8
MacKenzie	1.5	3.5	4.8
Mariner	2.3	4.0	5.0
Shark	0.5	3.2	4.8
SR1150	1.0	3.0	4.7
SRP1GMC	1.7	3.8	5.0
SRP1RH93	1.5	3.8	4.8
T-1	1.7	3.2	4.7
Tyee	1.7	3.8	5.0
LSD (P<0.05)	ns	ns	ns

three assessment dates. Germination results for each location can be viewed in Tables 1-3.

INITIAL VIGOUR

At Cromer Golf Club there was a significant difference observed in initial vigour at nine days after sowing. Authority had the quickest vigour after this time than all other varieties with the exception of Penn G2 and Penn A1. At nine days after sowing 007 had the least amount of initial vigour, however, like the germination results above this was not significantly less than another six varieties.

At Royal Adelaide Golf Club there was a significant difference observed in initial vigour at 14 days after sowing. Mariner was significantly more vigorous after 14 days than 007, SR1150, Shark and the RAGC blend but was not significantly more vigorous than any of the other varieties. At 21 days after sowing Mariner and Penn G2 were significantly more vigorous than 007, Declaration, T-1, SR1150, Shark and the RAGC blend, but was not significantly more vigorous than any of the other varieties.

At Keysborough Golf Club there was no significant difference between any of the varieties for initial vigour over the three assessment dates. Initial vigour results for each location can be viewed in Tables 4-6.

PERCENTAGE COVER

At Cromer Golf Club there has been no significant difference in turf cover between any of the seeded bentgrass varieties or the vegetatively planted bentgrass apart from the initial assessment at 21 days after sowing. At that stage the vegetative planted variety had significantly more cover than all other varieties, however, since then the seeded varieties have not had significantly less cover.

The percentage cover at Keysborough has illustrated that the vegetative variety has had significantly less coverage than all of the seeded bentgrass varieties since 82 days after seeding with the exception of one assessment date (119 DAS) when it did not have a significantly less turfgrass coverage than T-1. T-1 has produced the least amount of coverage compared to the other seeded varieties since the first assessment date and was significantly less at 108 and 119 DAS.

At Royal Adelaide there has been no significant difference in turf cover between any of the seeded bentgrass varieties or the vegetatively planted bentgrass. However, the overall maturity of the plots at Royal Adelaide in terms of a percentage cover has been slower than at either Cromer or Keysborough. Percentage cover results for Keysborough and Cromer can be viewed in Tables 7-8.

TABLE 4. INITIAL VIGOUR (0-5) KEYSBOROUGH GC

Variety	14 DAS	19 DAS	31 DAS
007	2.0	1.2	3.0
Penn A1	2.7	2.0	4.0
Authority	3.3	2.0	4.3
CY 2	3.3	2.0	3.3
Cobra 2	3.0	2.0	3.7
Declaration	3.7	1.7	4.0
Dominant Xtreme	2.3	2.0	4.0
Penn G2	2.7	2.3	4.3
Mackenzie	3.3	2.7	4.0
Shark	3.0	2.3	4.3
SR1150	2.7	1.7	4.7
SRP1GMC	3.0	1.7	4.3
SRP1RH93	3.0	1.3	4.0
T-1	2.3	1.3	3.0
Tyee	3.3	2.0	4.0
LSD (P<0.05)	ns	ns	ns

TABLE 5. INITIAL VIGOUR (0-5) CROMER GC

Variety	15 DAS
Authority	3.8
Penn G2	3.5
Penn A1	3.3
Tyee	2.6
SRP1GMC	2.4
Cobra 2	2.4
MacKenzie	2.3
CY 2	2.3
SR1150	2.2
SRP1RH93	2.2
Declaration	2.2
T-1	1.9
Dominant Xtreme	1.8
Shark	1.7
007	1.5
LSD (P<0.05)	0.7

TABLE 6. INITIAL VIGOUR (0-5) ROYAL ADELAIDE GC

Variety	14 DAS	21 DAS
Penn G2	2.8	4.2
Mariner	3.0	4.2
SRP1RH93	2.7	4.0
Penn A1	2.7	4.0
Tyee	2.3	3.8
SRP1GMC	2.7	3.8
Cobra 2	2.8	3.8
Authority	2.3	3.8
CY2	2.5	3.5
MacKenzie	2.0	3.3
Dominant Xtreme	2.2	3.3
SR1150	1.7	3.2
Shark	1.7	3.2
RAGC Blend	1.7	3.2
T-1	2.2	3.0
Declaration	2.2	2.8
007	1.0	2.0
LSD (P<0.05)	1.0	0.9

DISEASE INCIDENCE

Incidence of damping off disease (*Pythium* spp.) was recorded at both Cromer and Keysborough around one month after sowing. At Cromer the seeded varieties in general had more incidence of disease than the vegetatively planted bentgrass with all varieties, with the exception of 007, having a significantly greater area affected.

At Keysborough the percentage area affected was not nearly as great and there was no significant difference between any of the seeded varieties (see Tables 9-10).

FUTURE ASSESSMENTS

Now that a full coverage has been achieved, the trial sites will continue to be assessed on a regular basis for the following parameters;

- Turf quality (bi-monthly);
- Turf density (bi-monthly);

- Turf colour (bi-monthly);
- Incidence of disease and pests (as they occur);
- Thatch depth (four times per year);
- Wear tolerance (four times a year, Vic site only);
- Spiking tolerance (four times a year, Vic site only);
- Green speed using a modified stimpmeter (four times per year); and
- Surface hardness (four times per year).

Regular updates on these assessments will be provided in future editions of Australian Turfgrass Management and field days are also planned at the three trial sites.

VICTORIA AND OFF-LABEL USE OF PESTICIDES

At the Hobart conference the issue of off-label use of pesticides in Victoria was again

raised and it is fair to say that it still causes consternation among turf managers and chemical suppliers. It is worth reviewing what are the general principles governing the use of off-label pesticides in Victoria.

In Victoria, pesticide laws allow the use of a pesticide for any purpose, whether that use is registered or not, so long as:

- The pesticide is registered for at least one use (e.g., a crop) in Victoria;
- The pesticide is not one of about 25 prescribed restricted pesticides, or is a Schedule 7 poison;
- The intended use is not specifically prohibited in Victoria, or if it is at a greater rate, or shorter interval between uses; and
- The intended use does not lead to a residue which exceeds the MRL for that crop.

This regulatory regime allows a great deal



At the Royal Adelaide Golf Club trial site (pictured here at 14 days after sowing), there are varieties not included at either of the other two trial sites – Mariner and an RAGC blend consisting of Seaside, Highland, Penn G2 and Penncross bentgrasses

also have re-entry periods, the off-label use requires a higher degree of diligence to enforce this requirement. This may require signage saying “off-label chemical product in use”. This is not a legal requirement, but if there is an event the superintendent will have to demonstrate he/she did everything reasonable to keep people from re-entering the site, and that includes staff.

This approach has the effect of minimising the potential liability to the state government of any adverse outcomes arising from the use of pesticides. The responsibility is entirely with you and the club.

It is important to note that registered turf chemicals have passed a rigorous testing programme that ensures the products are fit for use and that manufacturers of registered chemical products are providing a warranty when their products are used according to the label instructions.

Registered turf chemical products are priced to include the cost of all the testing and

of freedom to the pesticide user in Victoria in that he/she does not have to apply for a permit to use a pesticide for most off-label uses, as the regulations render a permit unnecessary. So what are the responsibilities of the user?

- This places the responsibility for minimising public health and environmental risk squarely on the shoulders of the user, who is probably the least informed and least able to make a value judgment on the relative risk he/she is undertaking;
- Risk assessments – because of off-label use, a risk assessment must be made. It must be both a safety/health and an environmental risk assessment. In Victoria

the pesticide user (is it the sprayer, the super who told him to spray or the employer?) is responsible to do so before any proposed off-label use;

- Any person who chooses to use these chemicals in an off-label manner does so accepting total responsibility for efficacy (whether the chemical achieves the desired result or not), residues in the environment and OH&S issues;
- Re-entry – if the product is used off-label and has re-entry holding periods they must be enforced to keep staff, the public and golfers out until the re-entry time has elapsed. While registered products may

TABLE 7. % COVER KEYSBOROUGH GC

Variety	19 DAS	40 DAS	60 DAS	82 DAS	108 DAS	119 DAS	131 DAS
Declaration	47	82	83	88	95	97	99
SRP1GMC	40	80	88	87	93	95	98
Shark	40	77	87	87	93	95	98
CY 2	38	73	80	87	93	95	98
Penn G2	38	80	82	87	93	95	98
Mackenzie	43	78	82	85	91	93	98
Authority	42	85	83	87	93	93	98
SRP1RH93	32	77	82	85	90	93	97
Cobra 2	43	77	82	82	92	87	97
Tyee	33	75	82	82	89	93	96
SR1150	32	80	83	82	90	92	96
Penn A1	37	75	78	83	90	92	96
Dominant Xtreme	33	80	77	82	91	92	96
007	25	73	78	82	89	88	95
T-1	22	67	73	80	87	83	94
AGCSA 1	-	-	72	65	75	75	85
LSD (P<0.05)	ns	ns	ns	8	6	10	5

TABLE 8. % COVER CROMER GC

Variety	21 DAS	36 DAS	53 DAS	70 DAS	84 DAS	98 DAS	126 DAS
Authority	73	75	78	81	82	88	97
AGCSA 1	72	78	83	77	84	86	96
Penn A1	56	75	80	81	83	90	99
Penn G2	40	67	73	74	75	83	99
Cobra 2	38	63	71	73	71	78	97
CY 2	35	63	72	73	76	81	96
Tyee	34	65	73	73	79	86	99
MacKenzie	33	62	73	75	78	85	99
SRP1GMC	33	66	75	80	79	88	99
Shark	28	58	72	72	77	85	98
Dominant Xtreme	28	53	63	67	68	77	96
SRP1RH93	27	59	71	73	76	81	96
SR1150	25	58	67	72	72	77	97
T-1	24	53	63	68	68	74	95
007	24	58	68	74	74	87	98
Declaration	22	57	68	73	77	84	99
LSD (P<0.05)	17	ns	ns	ns	ns	ns	ns

TABLE 9. DISEASE INCIDENCE (% AFFECTED) KEYSBOROUGH GC

Variety	32 DAS
007	6.7
Penn A1	5.0
Authority	0.0
CY 2	6.7
Cobra 2	5.0
Declaration	5.0
Dominant Xtreme	0.0
Penn G2	0.0
Mackenzie	3.3
Shark	3.3
SR1150	5.0
SRP1GMC	3.3
SRP1RH93	0.0
T-1	13.3
Tyee	3.3
LSD (P<0.05)	ns

TABLE 10. DISEASE INCIDENCE (% AFFECTED) CROMER GC

Variety	25 DAS
Penn G2	60
Authority	56
Declaration	55
CY 2	53
Cobra 2	50
MacKenzie	47
Tyee	46
Shark	43
SRP1RH93	43
T-1	41
SRP1GMC	41
Dominant Xtreme	36
Penn A1	33
SR1150	31
007	27
AGCSA 1	4
LSD (P<0.05)	25

the cost of the registration process, and in the end it is the testing and registration process that provides assurance of quality and efficacy.

SOIL TESTING

Soil testing is a routine activity undertaken in the management of most turf areas, whether it is a golf course, sportsfield, racetrack or other sports turf surface. Whether it is soil physical testing for a construction project or routine nutrient testing, both play an important role in establishing and maintaining high quality turf surfaces.

The fundamentals of soil testing are well documented, however, with a multitude of testing laboratories, different methodologies and data interpretation there is an increased opportunity for confusion and misuse of the data. One of these areas of confusion has been in the selection and testing of sands and organic amendments for the construction of golf greens.

The selection and testing of soils used in the construction of turf areas is a critical factor in ensuring that the surface meets the requirements for the particular application. Good drainage, a high degree of aeration and adequate moisture retention are typical factors that determine the suitability of a soil as a rootzone material.

Sands used for the construction of golf greens need to meet a very specific set of criteria and these have been well documented by the USGA Greens Section. Problems often arise where only some of the key selection parameters (other than particle size distribution) are tested. All sands for greens construction must be tested for the following physical criteria;

Physical properties	Preferred range
Total Porosity (%) (at 30cm tension)	35 – 55
Volumetric Water (%) (at 30cm tension)	15 – 25
Aeration Porosity (%) (at 30cm tension)	15 – 30
Hydraulic conductivity on a compacted sample (mm/hr)	> 150

The test criteria that appears to be most neglected is the determination of the volumetric water content (VWC) which is a measure of how much water the soil profile will hold at or near field capacity. In the first instance it is important to determine whether the particular sand has adequate moisture retention, whether it holds too much water and if the moisture content is too low how much amendment is required.

In recent experience, sands holding too much moisture has been an issue and it particularly relates to the addition of organic amendments. If the VWC is low and an organic amendment has to be added to raise the

VWC, it is essential that the organic matter and sand mix is tested at various ratios before determining the rate of amendment.

The two most commonly used organic amendments are peat moss and coco-fibre. It is important that any organic matter has a minimum of 85 per cent by weight organic matter based on a loss on ignition test. It is important to remember that what is required is the organic matter and not the extraneous matter (i.e. fine soil particles) that can come with it. There are 'dirty' peats where there is a high proportion of silt and clay particles, which if added to a sand can result in an excessively high VWC.

Where other amendments may be added to increase moisture retention it is essential that the characteristics of the amendments are well known and that the sand/amendment mix is at the very least tested for VWC and saturated hydraulic conductivity. It is not good enough just to check the effect on the drainage rate of the mix.

Determining the moisture release curve of sands and sand/organic mixtures are some times undertaken as a double check against the sand and organic matter mix. This is particularly useful where the characteristics of the amendment are not well known. The addition of fine particles can dramatically increase the capillary fringe where the perched water table can extend well into the rootzone, the result being a wetter and poorly aerated profile.

Testing of soils used in construction and interpretation of the data is a critical step in the construction of any turf profile. The basic criteria for rootzone mixes are well known and should always be followed. The use of any

new sand sources or amendments must be thoroughly tested before use and then check tested during construction.

COURSE STANDARDS

During the recent Sustainable Golf seminars given by Steven Isaac and Daryl Sellar, it was often repeated that many of the confusions and conflicts that occur around golf clubs relating to course preparation relate to the club having no course standards policy document.

This issue was again recently raised in relation to the maintenance of bunkers and what to do with the rakes! The ensuing discussions came up with a multitude of

'solutions' and again reinforced the fact that there is no one answer and that every golf course/club can have different philosophies that work for them.

It is unfortunate that too few clubs have a course standards policy document and tend to make statements such as "We want firmer and faster greens" or "The course needs to be the best presented in the district". These may be admirable sentiments and ambitions but are they achievable within the limitations of the site and the available resources? There is little to be gained from arguing at a committee meeting without being armed with the facts. The onus is going to be on the superintendent initially to define a standard and then detail the resources that are required to meet that standard.

Understanding what that standard may be can be a challenge to define, however, it may be as simple as observing the golf course and picking a point in time when you believe that it is representative of what is achievable most weeks of the year. This standard should allow for room for improvement where with additional inputs the standard can be lifted for special events.

For that selected standard, manpower and equipment requirements to undertake each particular task must be defined and costed and then presented to management. At that point, reasonable decisions can be made based on facts. The high cost and labour input areas of maintenance need to be highlighted in this process.

When it comes to deciding on a particular requirement for the golf course, such as what to do with the bunker rakes, this should be decided by the club and then documented in the course preparation document. This then tells the members what the procedure is and gives a clear direction for the ground staff to follow. If nothing else it provides a reference point where people can be referred to rather than getting involved in circular and unresolved discussions.

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Thanks to Terry Muir (e-par) for providing information for this article. Decisions on the off-label use of pesticides should not be based on this article and reference must always be made to the relevant legislation. 🌱