As part of its research activities the AGCSA has established trial sites in Victoria, NSW and South Australia to objectively assess the growth and performance characteristics of new bentgrass varieties under local conditions

AGCSA trial to assess new bent varieties

With a number of new bentgrass varieties hitting the market in recent years, the AGCSA is embarking on a trial to assess their management and performance under Australian conditions. In this instalment of AGCSATech Update John Neylan looks at this three-year project as well as Curvularia and summer bentgrass decline.

The AGCSA has an ongoing priority to foster research in golf turf maintenance including the evaluation of new turfgrass varieties. Since 2000, AGCSATech has been involved in several turfgrass cultivar trials including the evaluation of new bentgrass cultivars, the selection and evaluation of bentgrass off-types, the selection and evaluation of hybrid couchgrass off-types and the evaluation of new hybrid couchgrass and seashore paspalum cultivars for greens.

The AGCSA bentgrass cultivar trials that started in 2000 were completed in 2005. Since that time there have been several new bentgrass cultivars bred in the USA and in the 2003 National Bentgrass Test (US National Turfgrass Evaluation Program) there were 16 new cultivars tested.

With the bentgrass cultivars that have been available over the past 10 years, most turf managers would be well satisfied with their performance and see little or no need for change. Turfgrass breeders are forever looking for improvements, whether it is better disease tolerance, reduced inputs (e.g.: fertiliser and chemicals) or improved local adaptation.

The observation has been made by Bigelow (July 2007, TurfGrass Trends - www.turfgrasstrends.com) that many of the new cultivars appear to have narrower regions of adaptation with some cultivars performing very well in certain regions but not in other locations. In the 2000-2005 AGCSA bentgrass trials undertaken in three states, it was demonstrated that the best performers generally topped the rankings at each location, however, there was often one or two cultivars that exhibited superior characteristics in one state but not in others.

The bentgrass breeding programmes have all had different objectives in terms of turf characteristics. Bentgrasses are most commonly selected for greater turf density, reduced spiking, lower cutting height, increased salt and heat tolerance and increased disease resistance. The most obvious changes in characteristics have been in turf density and vigour. While the bentgrasses have become denser and produce smoother and faster putting surfaces, they require more frequent cutting, dusting and thatch removal.

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 the new grasses under local conditions. The project, which has begun this autumn and is jointly funded by AGCSATech and Horticulture Australia Ltd, is to evaluate the performance and maintenance requirements of the new strains of bentgrass compared to the established industry standards.

The AGCSA has been working with the Australian Seed Federation in contacting the relevant seed companies to enable them to submit cultivars, if they so wish. The varieties that have been submitted for establishment at each site are detailed in Table 1. The plots will be assessed for the following parameters:

- Turf quality;
- Turf density;
- Incidence of disease and pests;
- Thatch depth;
- Wear tolerance – four times a year (VIC site only);
- Spiking tolerance – four times a year (VIC site only); and
- Green speed using a modified stimp.

TABLE 1. BENTGRASS VARIETIES SUBMITTED AS PART OF 2009-2011 AGCSA TRIAL

Company	Variety
Advanced Seed	Tyee
	007
	Dominant Xtreme
	SR1150
	SRP1RH93
Simplot	T-1
Heritage	Penn G2
	Authority
	Penn A1
DLF Seeds	Cobra 2
	CY 2
Seed Force	Shark
PGG Wrightson	Declaration
	Mackenzie
	SRP1GMC
	Mariner*
AGCSA	AGCSA1 (vegetative selection)

*Adelaide only

The three trial sites – Keysborough Golf Club (VIC), Royal Adelaide Golf Club (SA) and Cromer Golf Club (NSW) – were sown in April and once they are established there will be field days held in each state and regular updates in ATM.

CLIMATE OF SYDNEY COURSES

The past summer has provided yet another example of the influence Mother Nature has over our ability to produce high quality playing surfaces on Australian golf courses. The fickle nature of the Australian climate this summer not only demonstrated the extremes from one end of the country to the other, but on a local basis the variations were also considerable. The greater Sydney area is a typical example of the localised extremes and in particular the difference between courses along the coast compared to those several kilometres inland.

During the summer AGCSATech was required to investigate the factors affecting the health and condition of bentgrass greens on Sydney metropolitan inland golf courses compared to their metropolitan coastal counterparts. The climatic differences between the coast and the inland have often been discussed with the general observation being that the climate was cooler and less humid along the coast. With many golf courses having on-site weather stations it was possible to gather comparative data and to examine whether this observation was correct.

Weather data was collected from several on-site weather stations as well as the official Bureau of Meteorology weather station at Observatory Hill. The data collected demonstrates that on many occasions the coastal courses did not reach the same maximum temperatures as often as the inland golf courses did due to afternoon sea breezes that provide cooler conditions. Temperature data is provided in Figures 1 and 2 and demonstrates the marked differences between the coastal and inland environments. Table 2 provides a summary of temperature data.

A large amount of weather data from various sources was reviewed and an effort has been made to standardise and summarise it. In examining the maximum temperature across several key dates (Figure 2) it can be seen that the inland golf course environment is considerably hotter.

To help improve air flow across one of its problem greens, Avondale Golf Club has been trialling the use of a fan. Since its employment there has been a substantial improvement in plant health, turf density and playing surface quality

In terms of relative humidity, the inland golf course environment has very high humidity levels when compared to the coastal environment (Figure 3). The open conditions on the coast allow the winds to moderate the temperatures and can move the saturated air mass. With an inland environment, often with an expansive treescape, the air movement is poor and the atmosphere tends to remain at a higher humidity. These contrasting conditions have a dramatic effect on the maintenance and presentation of bentgrass putting greens.

SUMMER BENTGRASS DECLINE

Maintaining creeping bentgrass in a transitional climate is a challenge during high temperatures and humidity, particularly when there is an expectation for firm, fast putting surfaces. Given the potential for contrasting climatic conditions from course to course, it is timely to review our knowledge of creeping bentgrass and its performance as it relates to climate.

Creeping bentgrass is a cool-season grass and the optimum temperatures for growth are 16-24°C for shoot growth and 10-18°C for root growth (Beard, 1973). As temperatures increase above this optimum range, the bentgrass is under increased stress. Once temperatures exceed 29°C ambient and soil temperatures are greater than 24°C, particularly for extended periods, bentgrass is under very high stress.

With prolonged periods at these temperatures, bentgrass will effectively shut down its growth with a loss of turf density and root mass. Under these conditions the plant is more susceptible to damage from diseases such as *Pythium* sp. The new cultivars such as the Penn series bentgrasses have improved heat stress tolerance, however, even they will struggle at temperatures exceeding 30°C for extended periods.

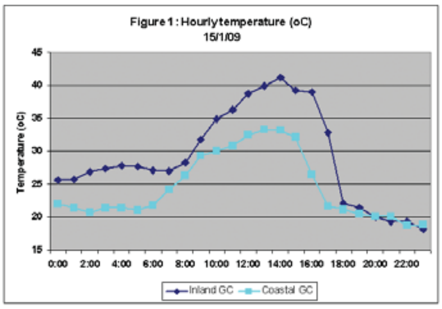
Summer bentgrass decline is a well documented malady in transitional zones that experience hot and humid summers. Thinning of the turf canopy, yellowing of leaves, and death of roots and die back of the bentgrass are the most common symptoms. The cause of summer bentgrass decline has been attributed to numerous factors with high temperature and high relative humidity being the main causes (Carrow, 1996).

High temperature is the primary factor leading to summer bentgrass decline and in particular high soil temperatures. It tends to be a greater problem on sites with reduced evapotranspirational cooling due to poor air circulation and high humidity. These factors all contribute to soil heat retention, and therefore higher soil temperatures at night. These are typical conditions experienced on many courses that have extensive treescapes.

Cool-season grasses cool themselves through evaporative cooling and as the plant heats up, the water in the plant absorbs much of this heat. As the moisture moves out of the plant through transpiration, air movement (wind) across the turf canopy takes this moisture away thereby cooling the turf. Where there is high humidity and poor air movement, the zone immediately above the ▶

TABLE 2: DAILY MAXIMUM TEMPERATURE COMPARING THE WEATHER STATIONS AT AN INLAND GOLF COURSE, OBSERVATORY HILL (BOM SITE) AND TWO COASTAL GOLF COURSES

Date	Sydney inland golf course	Observatory Hill (BOM site)	Sydney coastal golf course	Northern coastal golf course
5/1/09	35	28	25.6	27.9
6/1/09	36	29	28.1	27
7/1/09	39	33	26.6	27.9
14/1/09	37	29.7	28.5	29
15/1/09	42	33	33.3	35.5
23/1/09	34	32	32.6	
24/1/09	40	41	41.1	
25/1/09	26	26	33.8	
5/2/09	34	29	27.7	
6/2/09	37	30	28.3	
7/2/09	38	34	31.2	
8/2/09	35	29	30.9	

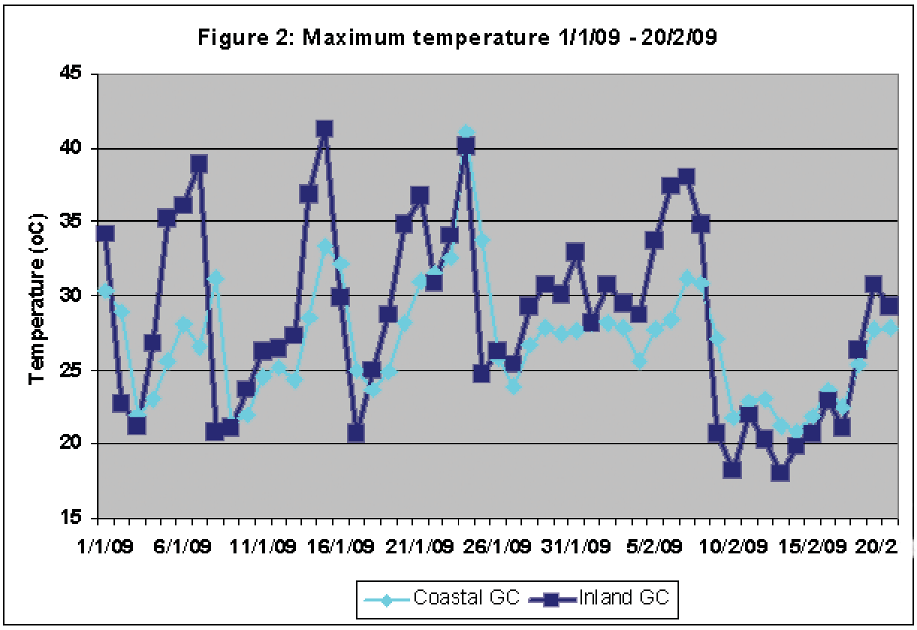


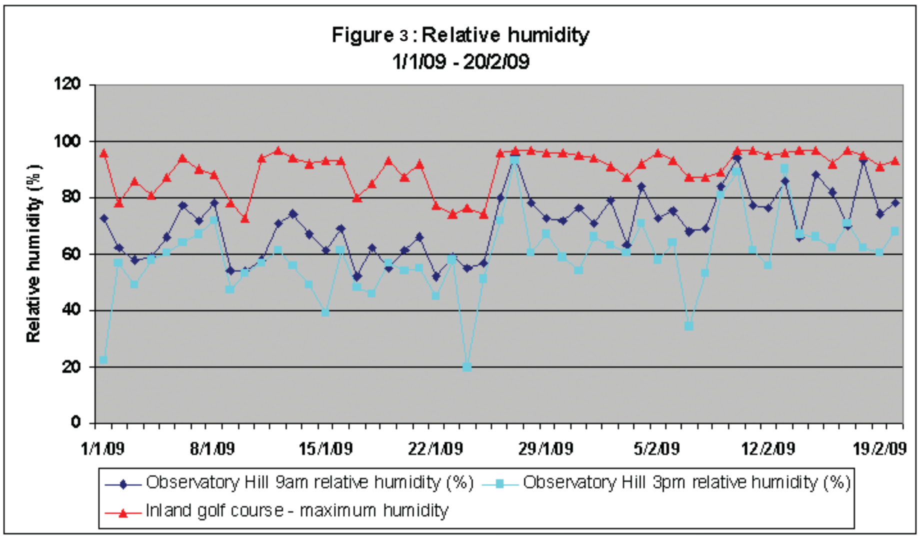
canopy remains saturated with moisture and consequently the plant continues to heat up.

The main effect of summer bentgrass decline is a reduction in the root system which results in the plant having less ability to tolerate hot and dry conditions. Carrow (1996) discusses the break down of the root system which forms a gelatinous substance in the rootzone that retains water, reduces infiltration rates, reduces soil oxygen and forms an impervious layer. To produce firm and fast greens under these conditions often requires the surface to be dried out, including the upper rootzone, which under summer stress conditions will invariably result in turf loss.

On many US golf courses fans are used to modify the environment (by removing the saturated air from the leaf canopy) and therefore resulting in improved turf growth and health. Here in Australia, Avondale Golf Club in Sydney has been trialling a fan on a heavily shaded green (the 10th) that sits in a depression where there is very little natural air movement and there has been a substantial improvement in plant health, turf density and quality of the playing surface. This demonstrates the importance of something as simple as good air flow across a turf surface in maintaining good turf health.

Bentgrass can survive Australian summers with the correct management, however, the maintenance strategies need to alter depending on temperature, humidity and the local microclimate. The typical strategies of lifting cutting heights, increasing soil aeration using solid tines and the hydroject and maintaining adequate soil moisture are keys in summer bentgrass survival. The use of subsoil aeration systems can also improve the levels of oxygen in the rootzone and improve soil cooling. However, this is often at the expense of speed and firmness of greens.





CURVULARIA

During the recent prolonged wet weather in Queensland, in particular the tropical north, an old yet damaging disease reared its head as hybrid couchgrasses struggled in low light and low growth conditions.

The disease pathogen most prevalent was the leaf disease *Curvularia* spp. According to Smiley et.al. (2007), *Curvularia* spp. are pathogenic to plants weakened by heat or drought stress, though a range of conditions such as high numbers of root feeding nematodes, insects and fertility imbalances can predispose the plant to disease. In warm, wet weather infections can spread rapidly.

There are several species of *Curvularia* that result in what can be termed as *Curvularia* blight. They are all active colonisers of thatch and leaf litter which serves as the principal source of inoculum for the initial outbreaks of the disease. Penetration of the plant is accomplished by growth of mycelium and spores through cut leaf tips, leaf and crown surface wounds and Helminthosporium-incited lesions (Couch, 1995).

Curvularia blight is particularly favoured by conditions that cause accelerated leaf aging (senescence). Any factors that causes plant stress and die back in the leaf tissue that weakens the plant and allows the fungi to penetrate the leaf tissue assists in generating an infection. *Curvularia* diseases are also favoured by prolonged leaf wetness, poor air movement and high humidity. These conditions are typical of those experienced in the tropical north and other parts of Queensland during summer. Physiological changes in the plant that increase susceptibility includes low light, low cutting heights and excessive thatch.

As with most turfgrass diseases, effective control is best achieved when growing conditions are at an optimum. Adequate thatch control, keeping cutting heights up during high stress periods, improving air movement and compaction control are all critical factors. Contact fungicides such as mancozeb, iprodione, chlorothalonil and thiram are all very effective in controlling *Curvularia*. However, where there are prolonged periods of wet weather the contact fungicides may only have a short-term effect and repeated applications will be required.

REFERENCES

A full list of references can be obtained from the AGCSA ph (03) 9548 8600.