

LOW INPUT GRASSES FOR GOLF COURSE FAIRWAYS IN VICTORIA

Summary

In 1996 trial plots were established on eight golf clubs throughout Victoria to investigate turfgrass performance and fairway quality in a low input environment. Only couch grass (*Cynodon dactylon*) was able to offer good and consistent fairway quality under the restricted watering regime imposed in the trial. Once successfully established, irrigation may be considered optional on couch fairways in southern Victoria, or a minimal requirement in Northern Victoria. Of the couchgrass varieties trialed, 'Santa Ana', 'Wintergreen' and 'Legend' offered the best combination of qualities, including drought tolerance, short winter dormancy and consistent fairway quality. The thatching tendency of Santa Ana and Wintergreen, however, is very high and these varieties are not recommended in a low input environment because of the eventual cost that thatch removal will entail. The couch variety Legend provides the best compromise between good fairway quality and reduced thatching tendency. Its length of dormancy is as short as any couch available and its establishment speed is clearly superior to any of the sprigged couch varieties. It can be successfully managed using either in a Pure Couch strategy or a 2 grass strategy. The couch variety Legend is recommended for Victorian golf clubs looking to establish and maintain low input fairway surfaces.

Introduction

The Victorian Golf Association has established a Turf Research and Advisory Board with a modest budget to devote to turfgrass research of potential benefit to Victorian clubs. There is no publicly funded and independent turf research organisation in the country at present so this budget is significant in the overall turf research climate. The federally-funded Horticultural Research and Development Corporation can support horticultural research it considers to be of merit, as it has in this project, on a dollar for dollar basis. The VGA wishes to thank the HRDC for this support and hopes to continue this relationship with future research projects.

In 1996 the VGA Turf Research and Advisory Board assessed the current priorities for its trial program and decided to initiate a study of fairway grass performance under low inputs (and low cost). Fairways obviously represent the largest area of maintained, in-play turf on the golf course and so account for a large proportion of turf management costs for the club. Fairway quality also contributes in a major way to player satisfaction and enjoyment and their inclination to play more often, or to return to a particular club.

In mid-1996 the VGA TRAB tendered a research project titled the 'Low Input Fairway Grass Trial' and the successful tenderer (Phillip Ford) started the establishment phase of the trial in the summer of 96/97.

Trial Establishment

Seven country golf clubs were initially selected, representing a wide range of climatic conditions and soil types. These clubs were Eaglehawk, Jubilee, Valley View, Ballarat, Leongatha, Nhill and Warracknabeal Golf Clubs. At later stages some aspects of trial work were also done at Eastern, Clunes and Riverside Golf Clubs. The board wishes to thank those clubs for their support and involvement.

The plot set-up varied from club to club but in most cases they were located on existing fairways. The grasses trialed were decided in consultation with the Golf Course Superintendent and ranged from a basic comparison of four or five couch grass varieties at some clubs, through to a comparison of 19 different grass types at Ballarat Golf Club. All sites had at least four important couch varieties (Santa Ana, Legend, Bosker and WindsorGreen) present. The couchgrass plots were sprigged at most sites but turfed at three sites. This was due to the wishes of the Superintendent at each club but the comparison of turfing versus sprigging yielded some interesting results in any case.

The grasses trialed covered the full range of fairway options from the couchgrasses (including many local selections, and some seeded varieties, as well as the four 'superior' sprigged varieties) to the cool season grass

species (Bentgrass, Ryegrass and Fine Fescues). Two Australian native grasses were also trialed (Weeping Grass and Wallaby Grass).

No trial site included kikuyu, for a number of reasons. First, none of the trial sites wanted us to import kikuyu to their club. Secondly, the accepted data on the mowing and dethatching requirement of this grass eliminated its claims as a 'low input' grass and the Project Officer felt that this species had little or no potential use in a low input environment. While there are several clubs successfully managing kikuyu fairways at present it is recommended that clubs looking to change their fairway species consider the couchgrass options resulting from this trial work and not consider kikuyu.

The establishment phase during the summer of '96/97 could not be considered low input in that generous water and fertiliser was applied as needed. An important (and inescapable) fact of life is that if inputs are compromised during the establishment phase, poor turf quality and ongoing problems will inevitably result. Regardless of the later input levels destined for that fairway surface the input levels during the establishment phase must be generous. This means clubs with a limited budget or water allocation who wish to change fairway grass type will have to concentrate their efforts on a manageable area each year, ensuring each area is fully established to a mature, 100% cover before starting to reduce inputs.

This approach was adopted in this trial, so by the autumn of 1997 all grass plots at all sites had achieved a mature, 100% coverage. The exception to this was the couchgrass cultivar 'WindsorGreen', developed in Sydney by Peter McMaugh, of Turfgrass Scientific Services. None of the sprigged plots of WindsorGreen achieved a full cover due to a very slow establishment rate in our Victorian climate. Clubs with expectations of a rapid and complete coverage of grass from sprigging should avoid WindsorGreen because of this. On the other hand WindsorGreen has exhibited exceptional density and turfgrass quality in Sydney and comparable climates, and similarly in this trial at sites where the plots were established by turf.

Analysis of Fairway Inputs

During this establishment phase of the trial a representative survey of Golf Course Superintendents was conducted to analyse fairway inputs and determine which input reductions offered the greatest leverage on costs. Water costs and labour (mowing) costs figured the highest, while current-practice fertiliser and pesticide costs were quite low. De-thatching costs were also identified as a major potential cost. Although very few clubs had undergone dethatching operations to that time, they recognised the need to do it at some stage.

Water costs took into account the labour, depreciation and pumping costs as well as the cost of the raw material. With town water costs now averaging \$700/MI (and probably rising), fairway irrigation is simply not an option for many clubs. Even clubs with access to 'free' water (from catchment dams, bores or rivers) were surprised to estimate that pumping costs alone could exceed \$180 per megalitre.

Given these facts, reducing watering costs and concentrating on drought tolerance was the priority during the summers of '97/98 and '98/99. Fortunately (for us) these summers coincided with the onset of a major El Nino phenomenon, resulting in a severe test of the grasses in the trial.

Drought Tolerance

There is a fundamental biological difference between the group of grasses known as the Warm Season Grasses (eg: couch, buffalo, kikuyu, paspalum) and the Cool Season Grasses (eg: bent, ryegrass, Poa and the fescues). The key difference is in the process of photosynthesis, which is the process where plants use the energy of sunlight to convert carbon dioxide into plant carbohydrates.

Put simply, Cool Season Grass photosynthesis requires the leaf stomata (the pores in the leaf) to be open so that the leaf cells have ready access to the carbon dioxide in the atmosphere. But when these stomata are open, water is readily lost by the plant. So in order for adequate photosynthesis to occur in a Cool Season grass, a lot of water must be used (something like 6 MI/ha each summer).

This water loss through the leaves, by the way, cools the plant down in much the same way that sweat evaporating off your own body cools you down in summer. If adequate water is not supplied to a Cool Season

grass, two things happen – first, carbohydrate production will be inadequate and the grass will go backwards. Secondly, the lack of a cooling effect will result in the foliage heating up, which causes Heat Stress. In both cases, death of the plant is the inevitable result. In our climate, Drought Stress and Heat Stress are inextricably linked – so in this discussion the term Drought Stress is used loosely to describe damage to the plant from a combination of heat and dehydration.

In nature the Cool Season grasses (eg: bent or rye in an unirrigated pasture) try to avoid Drought Stress by going dormant in late spring. They lose colour and activity for the summer and resume growth at the autumn break when cooler temperatures and rainfall allow them to break dormancy. With inadequate irrigation, Cool Season grass fairways will do the same thing, to the detriment of the playing surface from October right through to May on average. Even after May the grass recovery can be patchy, and heavily reliant on *Poa annua*. *Poa*, by the way, doesn't use the summer dormancy strategy – it sets seed each spring and then dies, relying on that seed germinating to form new plants the following autumn. This strategy (called the escape strategy) is extremely successful for the survival of this species in unirrigated fairways as an annual winter invader.

Warm Season Grass photosynthesis is different - it is equipped with a carbon dioxide extraction system. This means the Warm Season species don't need to have wide open stomata, as even very low CO₂ levels will allow them to continue photosynthesis. Because the stomata are either shut, or only partly open, the water loss from the leaf is much reduced. Note – these grasses can open their stomata and use a lot of water if you want to give it to them. But if you don't give them water they shut their stomata down tight, and use very little water. What about Heat Stress? Certainly when the stomata are shut down tight they will lose very little water, so the evaporative cooling effect is lost. However the foliage of these grasses can tolerate much higher temperatures than the Cool Season grasses and in Victoria's climate Heat Stress is not a threat to Warm Season grass survival.

In short, there is a fundamental biological reason why Warm Season species such as couchgrass are so much more drought tolerant than Cool Season grasses. In essence, established couchgrasses cannot be killed by Drought or by Heat Stress in Victoria's climate. Cool Season grasses, however, will either die or have a very long summer dormancy period unless generous and frequent irrigation is provided. The trial data shows this very well.

Trial Results – Drought Tolerance

The following summary tables from two sites show quality ratings on a 0 to 10 scale where 0 = bare soil, and 10 = perfection. N/r means there wasn't enough grass to rate, and the plot had been taken over by weeds.

The LSD figure stands for 'Least Significant Difference', which is the result of a statistical calculation applied to trial work such as this. Any two grasses have to be different by at least that LSD figure to be considered statistically different. For example in Table 1 in June '97 the quality rating of Legend is 7.7 and the rating for Wintergreen is only 6. The difference between them is 1.7 points, which is a fair difference – but the LSD is 2.4, so from a statistical point of view you shouldn't conclude that Legend is definitely better than Wintergreen at that assessment.

You can say that Legend is better than the local couch, however, because it is 3.0 ratings points below Legend, a difference that is greater than the LSD figure. It pays to bear this in mind when interpreting the data tables.

The plots at Valley View were only watered when the toughest plots started to lose colour from drought stress (in effect when the couch grass plots started to brown off in summer).

Table 1: Quality ratings at Valley View Golf Club

Grass	20/6/97	21/8/97	15/11/97	16/2/98	4/6/98	28/8/98	10/12/98
Santa Ana	7.0	8.3	7.7	7.7	7.3	6.7	8.0
Legend	7.7	7.3	8.3	7.0	5.7	7.0	6.3
Wintergreen	6.0	7.3	6.3	6.0	5.7	5.3	6.8
Local couch	4.7	6.7	6.3	5.7	5.3	5.2	5.3
Princess	4.0	4.3	6.0	5.3	3.7	6.2	5.8
Jackpot	7.0	6.3	5.7	3.7	4.0	3.3	2.8
Vict. Bent	8.0	7.3	5.0	1.3	3.0	3.0	3.0
Fine Fescue*	5.3	6.0	3.9	1.0	0.7	n/r	n/r
LSD (P=0.05)	2.4	2.0	2.1	1.4	1.8	1.7	1.6

* an average for three species (Red, Sheeps and Hard Fescues)

The plots at Ballarat weren't watered at all over the summers of 97/98 and 98/99.

Table 2: Quality ratings at Ballarat Golf Club

Grass	12/6/97	11/9/97	21/11/97	2/3/98	2/7/98	4/9/98	13/12/98
Santa Ana	8.7	3.0	5.7	5.7	4.0	7**	8.8
Legend	7.7	2.0	5.3	5.3	3.3	7**	8.3
Local couch	5.3	1.0	5.3	4.7	1.7	7**	7.7
Elite Ryegrass*	6.7	6.5	7.0	1.7	3.5	5.0	5.3
Vic. Ryegrass*	4.5	2.2	3.4	1.7	4.7	4.8	3.2
Vic. Bent	4.0	3.3	2.7	0.7	n/r	n/r	n/r
Fine Fescue	3.0	1.0	0.3	0.7	n/r	n/r	n/r
Jackpot	3.0	0.7	0.3	0.7	n/r	7**	3.3
LSD (P=0.05)	1.9	1.9	1.9	1.2	1.7	1.6	1.3

* averages for two varieties – Cutter and Imagine for the elite US turf-type ryegrasses, and Camel and Victorian Perennial for the Vic. ryegrasses

** the couch was not visible under a thick sward of *Poa annua*, rating 7.

These two tables raise several points of discussion:

1. Fine Fescues are marketed as 'drought tolerant', but under fairway conditions and the drought stress (in combination with the Heat Stress mentioned earlier) they very quickly died. At both clubs the Fine Fescue plots were well established by winter '97. Even with 100% establishment, however, the quality was not high as the grass lacks the density to hold a good ball presentation. By the spring of '97 they were already starting to suffer stress, and by November '97 it was virtually all over. These plots did not recover after that summer. As a result, this trial concludes that the Fine Fescues have no role in low input fairways in Victoria. The Fine Fescues, by the way, include three species --Creeping Red Fescue, Sheeps Fescue and Hard Fescue. All behaved in a similar manner, so their results were averaged in the table above.
2. Victorian Creeping Bent is well established as a pasture weed in unirrigated pastures throughout Victoria, even in the north-east. It is a Cool Season grass, and there was some hope that it would provide good drought tolerance and summer survival, combined with good winter colour. The variety chosen was called 'Taggerty', being a local selection of Victorian bent growing in unirrigated pasture land near that town. The early quality ratings were good, and in the winter of '97 the dark green of these plots contrasted dramatically with the bleached brown of the dormant couchgrass. After November '97 the Vic. bent went into its summer dormancy and while it did

recover reasonably in the following autumn, the damage suffered over summer never allowed it to regain those early quality ratings. As a result, this trial concludes that Victorian Bent will not provide ongoing survival and quality under low irrigation inputs. It probably has good potential for fairways and greens surrounds that receive moderate irrigation, however.

3. The Perennial Ryegrasses exhibited better than expected drought tolerance at Ballarat, given that this site received no summer irrigation at all. Similar results were noted at Leongatha (not tabled), where Perennial Ryegrasses were included. In the winter of '97 the American turf type ryegrasses provided good fairway quality, even through to November. The summer Drought/Heat Stress, however, killed many plants. While a good proportion (around 80%) of the sward survived, the quality was never able to get back to first year levels. Ryegrass (like the Fine Fescues) can't creep, so once plants have been lost the ground can't be recovered, except by weeds. Where ryegrasses are used in fairways, periodic oversowing can provide recovery of these lost plants, but a Low Input regime would preclude expensive oversowing. As a result, this trial concludes that Perennial Ryegrasses have no place in a Low Input fairway system.
4. Although not shown in the tables, the native grasses (Weeping Grass and Wallaby Grass) died. While there is some breeding work going on with these species, at this stage they appear to have no potential on fairways.
5. All couchgrass plots that had been established to 100% coverage were able to maintain 100% survival for the rest of the trial. In other words drought stress is not a threat to couch survival. In a very hot part of the state, in a very sandy soil (Warracknabeal) the quality of all couches suffered badly from drought stress, but it wasn't actually killed. This trial clearly shows what has been known for years, that watering of couch is optional. If you do water it, the couch will be dark green and very active. If you don't have water, the couch will subsist on natural rainfall, occasionally lapsing into summer dormancy if rainfall hasn't occurred for several weeks. Even at this stage, however, the surface can maintain good fairway quality, except perhaps in the hotter areas of northern Victoria, and especially in a very sandy soil, where grass density will decline. It is noticeable that even light rainfall in the summer will revive the couch colour and activity.
6. Table 1 and Table 2 show that Santa Ana and Legend were the two grasses most often at the head of the rankings, although usually not clearly separated from each other or the other couch grasses by the LSD margin. One can assume from this trend that Santa Ana and Legend were consistently the best performers in the trial.
7. Wintergreen couch also performed well at the four sites it was represented. Bosker couch provided adequate quality ratings, usually near or just ahead of the various local couch varieties used. No local variety used threatened the superior quality of Santa Ana or Legend.
8. Jackpot and Princess are seeded couchgrasses (the others mentioned so far need to be sprigged). The advantages of a seeded couch are many, including ease of storage, and the ability to use conventional seed drills for establishment. Both seeded couches provided rapid establishment (see later), but Jackpot's quality ratings declined progressively over the life of the trial. Its winter dormancy is also much longer than the superior couches. Jackpot lacks density, and its growth habit is too upright to provide good ball support. It makes an excellent grass for the light rough or the carry-ways in front of the tee, however, especially when contrasted with a higher quality couch on the fairway. This trial recommends the use of Jackpot or Common Hulled Couch for such areas. Like any couch establishment, care and attention during the establishment phase is essential. A December sowing followed by generous watering and fertilising for the first month should provide a full cover, after which the inputs can be cut back.
9. Princess is a new American seeded couch with enormous potential. It actually contains some naturalised Australian couches in its parentage. Although sown a little later than the rest of the plots (which gave it some lower ratings early in the trial), it exhibited the short dormancy and high quality in the same bracket as Santa Ana, Legend and Wintergreen. Seed production of this variety

is very poor, and commercial quantities may be several years off. It will also be expensive, so this trial concludes that clubs forget about this variety for now – if the decision is made to switch to couchgrass fairways, then go for the chosen sprigged variety. Commercial availability of Princess may never happen.

To summarise to this point, the emphasis on Drought/Heat Tolerance has eliminated all Cool Season grasses from our enquires, narrowing the choice of a Low Input fairway grass to one of the couch varieties. Before discussing the relative merits of these varieties, we should summarise some general statements about couch:

1. Once established, watering of couch grass is optional. In no way is its survival threatened by drought stress in our climate.
2. The main impediment to couch survival is shade. This doesn't mean it requires full sun all the time, and some winter shade is tolerated while the couch is dormant.
3. Couch is a very herbicide-resistant species, which is a huge advantage. There is no weed, including kikuyu, onion grass and paspalum, that can't be selectively eliminated from a couch fairway using herbicides currently on the market. The only 'weed' that can't be dealt with is another couch. The range of herbicides that can be used includes some extremely cheap and effective herbicides, allowing weed control for under \$10 per hectare in some cases. An accidental finding during the trial was that Legend couch is extremely tolerant to atrazine, more so than Santa Ana and Wintergreen (Jackpot couch and the local couches at this site were completely killed by the same application).
4. Couch goes into dormancy over the winter. It has evolved this strategy in an attempt to avoid Winter Kill (freezing damage, which can occur in severe climates where temperatures drop to below minus 8°C). In Victoria's climate, where Winter Kill is not a threat, it goes dormant simply to avoid conditions unsuitable for its growth. Practices such as autumn and spring nitrogen/iron applications can reduce dormancy (these treatments were not used in this trial, being a low input trial). In this trial the dormancy in 1997 averaged 6 weeks, in 1998 around 8 weeks. During this time the surface is bleached brown, but still provides an acceptable playing surface either on its own, or by allowing the winter invasion of Poa.
5. Couch can suffer pest and disease problems, especially Spring Dead Spot (a winter patch disease), as well as a range of unspecified winter leaf diseases. One observation is that Santa Ana and Wintergreen seem particularly prone to these winter blights. Couch can also suffer a range of insect pests, like any turfgrass.
6. An interesting finding of this trial was that Legend and Bosker both provided a superior surface when sprigged, but that turfed areas were stemmy and coarse for up to two years. Bear this in mind if you are turfing areas (eg: tees) – the quality may be poor for some time.

If a decision is made to convert fairways to couch, several factors need to be considered when selecting a variety. This trial has found that there is no real difference in the dormancy length of Santa Ana, Wintergreen or Legend, or in their quality (all provide an excellent surface). But there are other differences – in cost and availability, the leaf texture, the establishment rate and the rate of thatch accumulation.

Cost and Availability

Legend couch is a selection discovered during a late 1980's trial project run by Turfgrass Technology and funded through the initiative of John Mitchell from the Melbourne Cricket Club. It was selected from Wonthaggi, so is a 'local' couch type well naturalised over many years to cooler, Victorian conditions. It is not patented under Plant Variety Rights protection, so no royalty payments are required in its sale. It is only available through Strathayr, however, who control the availability and hence the price. The material can be provided either as bagged sprigs, or in turf form. Its current cost is \$8.50 per square metre, which is around double the price of other varieties.

The sprig rate is still being worked on, but a sprigging ratio of 20:1 (ie: one square metre of turf mulched into sprigs and spread over 20 square metres of ground) would cost over \$4,000 to establish one hectare. Supply is reasonably good, but clubs would need to order the material well in advance.

Santa Ana and Wintergreen, on the other hand, are readily available at many clubs throughout Victoria. Usually these clubs will be wanting to dethatch, and getting rid of the excess sprigs/thatch can be a problem. It is rare now that donor clubs charge for this material.

Establishment Rate

In southern Victoria the chance of getting a 100% couch cover from sprigging can be lineball, depending on the summer. Establishment rate, then, is a big issue. Even in warmer climates, however, the prospect of being able to open a sprigged fairway in 9 weeks instead of 15 weeks is very attractive. The faster and more aggressive the establishment rate the less time there is for weed competition. At Jubilee G.C. the site was badly infested with Summer Grass (*Digitaria sanguinalis*). Even a pre-emergent application of Ronstar didn't stop the weed – but it highlighted the benefit of speed of coverage (Legend) and competitive ability (Santa Ana) in reducing weed invasion at establishment. In contrast, WindsorGreen had slow establishment rate and poor competitive ability, and its coverage after 16 weeks at this site was very poor.

Ronstar was only used at this site – all the other sites had to battle the weeds without any herbicide assistance. Bear in mind, too, that low budget clubs are unlikely to be able to afford the \$2,000/ha cost of Ronstar at establishment. The results of establishment by March 1997 are shown below:

Table 3: Percentage ground cover of the couch grasses (Summer 96/97)

	Valley G.C. 14 weeks	View Leongatha G.C. 15 weeks	Ballarat G.C. 11 weeks	Nhill G.C. 11 weeks	Jubilee G.C. 16 weeks	Jubille G.C. % Summer Grass
Legend	92	90	99	97	53	47
Jackpot	92	N/S	95	93	2	98
Bosker	86	80	98	96	37	63
Local couch	83	N/S	87	92	N/S	N/S
Wintergreen	78	63	N/S	78	25	65
WindsorGreen	80	65	70	92	7	93
Santa Ana	73	52	86	83	45	55
LSD (P=0.05)	26	35	28			

N/S = not sown at this site

Although not statistically significant, in general terms Legend was the fastest of the sprigged couches and Santa Ana was the slowest. Santa Ana has a great competitive ability, however, and was able to catch up. In contrast many WindsorGreen plots never achieved full cover over three summers – its establishment rate was slow, and its later competitive ability was poor in our climate.

By the way the fastest couch establishment in general was with the seeded couches Jackpot or Common Hulled couch. When sown into warm soil in December or January the germination and establishment rate is very rapid and some areas looked ready for play in four weeks or so. Unfortunately neither of these couches has the density or short dormancy suitable for fairways, but their potential in the rough and light rough should be considered.

Texture and Quality

Wintergreen and Santa Ana are both fine textured, dense couch grasses. This provides a very tight surface especially at the very low mowing heights (under 12mm, say) that brings out its quality best. While low handicap golfers may appreciate this tight surface, club members with a more inconsistent swing may not

handle it as well and will agitate to have the mowing heights raised (these golfers prefer more 'air' under the ball). These higher mowing heights allow the more vertical growth habit of Santa Ana and Wintergreen runners to build up excessive thatch, leading to spongy surfaces and mower scalping (see the Thatch section, later).

Legend, on the other hand, is a medium textured, dense couch variety with a more prostrate stolon growth habit. It is probably more suited to a medium mowing height (12 – 16mm) and provides an excellent and consistent fairway surface for all golfing abilities.

Thatch Accumulation

Table 4 shows the thatch accumulation measurement at two of the sites. Santa Ana and Wintergreen clearly produce more thatch than Legend and the other couches listed.

Table 4: Thatch accumulation after three years under low inputs

Grass	Thatch	
	Nhill	Valley View
Wintergreen	18	24
Santa Ana	20	21
Legend	17	16
Bosker	10	10
Local couch	9	10
LSD(P=0.05)	4	3

The more upright growth habit of both Santa Ana and Wintergreen contribute to their thatch accumulation, and the sponginess of that thatch. Legend has a much more compressed thatch, and while it may also require dethatching, it would be at a much reduced frequency compared to Santa Ana and Wintergreen.

It had been hoped that minimising inputs would make thatch a non-issue, but even under low inputs (of water and fertiliser in particular), the couch grasses still accumulated thatch – obviously at a slower rate than if they had been generously watered and fertilised, but still at a rate that might require dethatching every 4 – 8 years, for example. Thatch removal by a contractor will cost around \$1,000 per hectare.

The very low thatch accumulation levels of the local couch varieties and Bosker are desirable but unfortunately that trait accompanies the reduced density and aggression of these varieties.

Legend clearly steers the moderate course, maintaining adequate density and more than adequate aggressiveness but at a reduced thatching rate compared to Santa Ana and Wintergreen. The results of this trial clearly favour Legend as the couch variety to trial at your own location as a fairway grass suited to low input levels.

Winter Cover

There is one more factor to consider. A couch grass surface will be dormant over the winter. Dormant couch can provide an excellent fairway surface, although divot recovery will obviously be minimal right through the cooler months. In poorly drained situations the pure couch surface can also be compressed into the mud and the presence of worm castes can lead to further deterioration of the surface. There are two main winter strategies that clubs with couch fairways can adopt:

- i) The Pure Couch strategy: where winter grasses are prevented (using herbicides) and fertiliser is used at the onset of dormancy, and again at spring green-up to reduce the length of dormancy. In short, the club puts up with poor aesthetic quality for two or three months of the year in exchange for excellent fairway quality for the other nine or ten. An added bonus for clubs with bentgrass greens is that Poa seed is not continually walked onto the greens.

- ii) The 2 Grass strategy: where winter grasses (mainly *Poa annua*) are allowed to invade to provide colour and growth over the winter months. This strategy can hide or prevent most of the problems associated with worm castes and the couch being compressed into the mud in highly trafficked, poorly drained areas. On the down side, excessive *Poa* competition can reduce or even eliminate couch recovery in the spring, leaving poorly grassed areas. The 2 Grass strategy is still employed at Royal Melbourne Golf Club but has lost favour with most of the other metropolitan clubs with couch fairways.

This trial has shed some light on the 2 Grass strategy that might allow better management of this system. The essential point in the success of the 2 Grass system is to prevent the *Poa* plants becoming too large and competitive. This is achieved by retarding their germination for as long as possible (eg: retarding it until June, instead of April) and maintaining very high *Poa* seed numbers. The following points discuss this further:

1. The longer couch activity is retained in the autumn and early winter, the more *Poa* germination is retarded. Short dormancy couches such as Santa Ana and Legend assist this process.
2. The use of fertilisers in autumn and spring to further shorten couch dormancy should be avoided, as *Poa* will get most of the benefits, not the couch.
3. Fairway irrigation in the later summer and through the autumn should be avoided, even to the point of drought stressing the couch, in order to retard *Poa* germination until as late as possible. In all cases where the 2 Grass system was working successfully, fairway irrigation was minimal or non-existent. In cases where irrigation was more generous, the *Poa* was excessively competitive over winter to the detriment of the couch component.
4. The density and texture of the couch variety is not as big a factor in *Poa* compatibility as once thought. Conventional wisdom stated that you would choose a coarse textured, low density couch variety (such as a local couch) for a 2 Grass system, as the very dense couch varieties such as Santa Ana would only allow *Poa* germination in clumps, rather than as an even sward. This trial showed that Santa Ana can support just as good a *Poa* cover as any other couch, provided the *Poa* seed numbers were high. The Turf Manager should assist *Poa* seeding in the spring to ensure high seed numbers in the following winter and create an even transition to the *Poa* cover.
5. The fairway can successfully and painlessly transition back to a couch cover in the springtime, even when the *Poa* component over winter has been at 100% cover. The two keys to the spring transition are:
 - i) use a short dormancy couch (such as Santa Ana or Legend) that is aggressive, and ready to resume growth in early spring, and
 - ii) ensure the *Poa* plants have not become too big and competitive over the winter – high seed numbers, and a late germination of this seed, will keep the individual *Poa* plants small and easily stressed out.

In short, the 2 Grass system is a viable alternative if managed well, and provides colour and growth over the winter months if that is considered essential by the club.

Summary

The trial work to date has resulted in a number of clear conclusions that will help clubs in their decision making, and it is important these findings are circulated as soon as possible. To recount the main points:

1. Where water is the limiting input, couchgrasses can provide a high quality, drought-proof fairway surface. Once successfully established, irrigation may be considered optional on couch fairways in southern Victoria, or a minimal requirement in Northern Victoria.

2. The couch varieties Santa Ana and Wintergreen have shown excellent fairway quality, even under low inputs. Their drought tolerance is equal to any of the couch varieties trialed. On top of that, sprigs of these two varieties are readily available, usually at no cost to the club. Their thatching tendency, however, is very high and these varieties are not recommended because of the eventual cost that thatch removal will entail.
3. The couch selection Legend provides the best compromise between good fairway quality and reduced thatching tendency. Its length of dormancy is as short as any couch available, including Santa Ana and Wintergreen, and its establishment speed is clearly superior to any of the sprigged couch varieties.
4. Legend couch can be successfully managed using either in a Pure Couch strategy or a 2 grass strategy.
5. Legend is not widely used as yet so planting material will be more expensive.

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