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David Blackmur - Curriculum Manager for Horticulture and Forestry

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A Better Breed of Seed

Gerard van 't Klooster looks at the breeding of disease resistant turfgrass varieties

The Greeks and the Romans talked about 'pratulum' or the little meadow in the garden (source *Lawns and Playing Fields* by F. J. Reed). Later, people started to play golf, bowls, cricket and football on this turf and from then on there was a greater need to keep grass short.

After the invention of the rotary mower in 1830 by Edwin Budding, grass could be mowed more regularly and that gave rise to a denser sward. The grass mixtures of a 100 years ago contained more species than they do today. Although this meant less disease, people wanted to see a more even result, without too many patches of different grass species. These days we can make a cultivar selection within a few species and these are normally well adapted for golf and sports turf.

There are many breeding programmes all over the world which are aiming to find the best of the best. Programmes can start with a selection of collected plants, or with cross-breeding between existing varieties. The whole selection process can take from 9-12 years and after that the official testing process starts. There are many different ways of breeding and selection and this varies between different grass seed companies.

End-users can see the improvements that have been made over the years when they use Pacey – one of the first perennial ryegrasses for turf. Persistency, sward density, colour, winter hardiness, drought tolerance and of course disease resistance are all improved. But denser swards, or longer active turf, contains more diseases than it did 20 years ago. And because people travel more, and seed and turf are imported, some 'new' diseases are more of a problem for the greenkeeper, groundsman or home-owner.

The use of pesticides is restricted and the pressures to reduce usage are growing all the time. This is why the use of more disease resistant cultivars or mixtures is the best choice for healthy turf. And think about the fact that we have to co-operate with Mother Nature. Turf is a society of many plants which, together, form your fairway or green. Sometimes all the plants are the same species, so they are very closely related, but when mixtures are used the plants are from different species. There is always competition and co-operation between the plants – many plants together are stronger than just one plant. But there is also competition for water, fertiliser, light and, of course, room to grow.

Initially, germination of seed can be excellent, but within three months the survival of the fittest comes into play. Plants will die and make room for other, stronger plants.

Diseases can create space, but to fill the space you need strong healthy plants. So the use of disease resistant cultivars is vital.

Since 1994 Barenbrug Research has started to include more disease tests in its breeding programmes. As a breeder we are always pleased when there is a disease in the field – like a doctor who sees an interesting disease as a challenge – but sometimes we have to wait for the optimum conditions to study the disease.

At the moment the Barenbrug research lab can screen under laboratorial conditions for red thread, fusarium, dollar spot, leaf spot and brownpatch. It took some years to find the best method of doing this and the various methods required for each disease. All these diseases are spread by spores, but each one behaves in a different way. Optimum temperature, humidity and day-length also vary.

Initially we did a lot of work to find the best testing method for each disease, and we worked closely with many experts all over the world. As a breeder, we need to be sure that the test is as close as possible to natural conditions, so with the introduction of a fungus, such as dollar spot, we have to accurately create what could happen on a golf green or fairway. The test should give more resistant material to help the end-user achieve turf which is free of dollar-spot.



▲ Dollar-spot on golf course

DOLLAR SPOT

This disease can cause big problems in a very short time. Turf management can help to reduce the effects of the disease, but a strong attack is very difficult to treat. Dollar spot will appear when days are hot, nights are cool and when fertiliser levels are low in nitrogen. Dew is a very important transport medium. The construction of a room with more or less these conditions was the first step.

The second step was to multiply the disease fungus so there was enough to spray over the plants. Sometimes spraying is the best way, or the fungus can be put in a medium and dropped close to the plants. Dollar spot is a patch disease and as breeders we have to work with mini swards in the climate room. These swards can be as small as 3 cm². New turf and old turf show different diseases, which means it's very important to get the right information about the age of the tested plants.

Under these controlled conditions Barenbrug tests new populations of species like fine fescue and perennial ryegrass. The tests can be done in the winter or synchronised with outside turf trials. There is also a possibility of testing plants to find more resistant plants and start new crossings.

Like most diseases, dollar spot can change its habits. A resistant cultivar could lose its resistance in 10-15 years. This is not only a disease found in the United States and more warmer countries, there are more strains and for the test a mix is used to get the best overall result.

RED THREAD

This is a common disease in fine fescue and perennial ryegrass lawns. It will turn the leaf colour from green to yellowish brown and the red thread mycelium can be seen as red needles.

Many tests are themselves tested to develop a working test. Sometimes the disease fungus grows better on the plastic of a small greenhouse than on the plant. When we start a test like this the conditions for the fungus should be so good that it will attack the plant and not stay in its medium, or on the plastic.



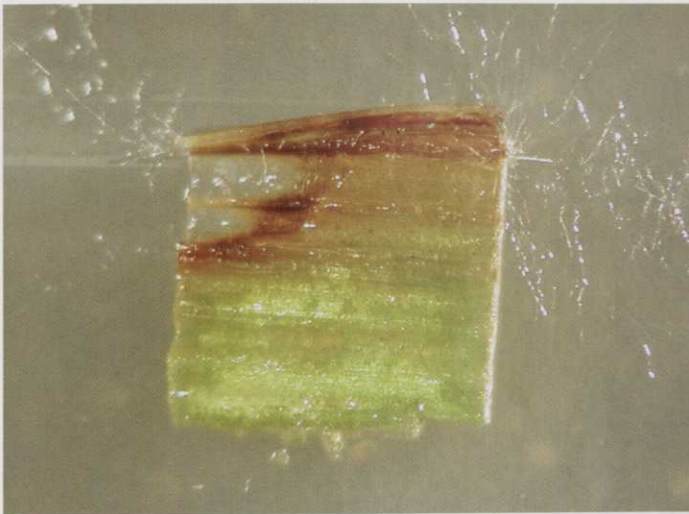
▲ Red thread in perennial ryegrass field

There is a huge variation in red thread resistance between cultivars within the species. In red fescue this is more visually obvious than in perennial ryegrass. More resistant cultivars show a better turf quality. The present test we use shows the same results as on the trial field.



▲ Mini sward

After six days under the most ideal conditions, the disease is visible on the plants and on the mini sward. The leaves are still green, but after a few days they turn brown.



▲ Fungus on petri-dish

Parts of the fungus are connected to special medium which spreads it around the plants or on the mini swards.



▲ Mini sward after six days

Normally we will wait a few more days for a screening. In that period the fungus has had a chance to kill the leaves. Red thread will normally not kill the whole plant, but just parts of the leaves.

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▲ Red thread screening

The resistant plants will be used as parents for new varieties or for new crossings.

BROWNPATCH

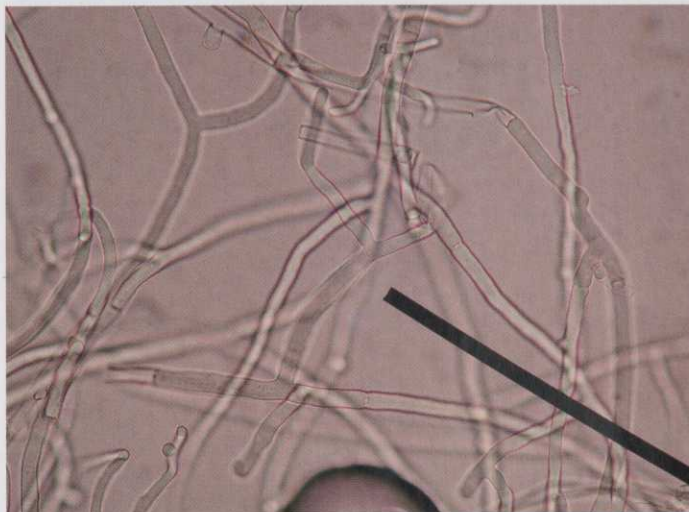
This is another disease which is becoming more and more common in Europe. Warm nights with enough water can be enough to destroy turf over just a few days.



▲ A plant with brownpatch

The next stage is large patches of dead plants.

The screening will take place when the first plants are dying. With these test you can't wait too long, or all the material can die. Normally there are many more screenings in a trial, so the researcher can trace back to the best discriminated observation.



▲ Brownpatch mycelium

Brownpatch propagates via a mycelium. A different laboratory test is conducted for this disease. First the leaves show some brown areas, not spots like leaf spot.



▲ A brownpatch test

All the different disease screening tests will be a great help in developing more resistant varieties which are less risk for the end-user. In this fast changing world we always make sure that everything is kept up-to-date. The Barenbrug R&D laboratory staff are always pleased when a new diseased piece of turf arrives. Firstly a screening for the disease is carried out, then the fungus is isolated and the disease propagated.

The laboratory is also a gene bank for turf diseases. The material is stored in a specially conditioned room and used when necessary. This process is becoming an increasingly important part of the whole grass breeding programme and will increase still further as we put more pressures on our turf.

The search for higher levels of disease resistance plays a significant part at Barenbrug Research. We are continually learning and improving our methods to develop more resistant cultivars.

Gerard van 't Klooster is Barenbrug Product Development Manager for Europe



▲ A leaf with brownpatch

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Notts Golf Club Takes the Initiative



Andrew Wood of the STRI's Ecology Unit outlines the initiatives of the four runners up in the New Initiative Category of the BIGGA Golf Environment Competition followed by that of the winner, Notts Golf Club.



Golf Environment
Competition

With the presentation of the 2003 BIGGA Golf Environment Competition prizes at BTME & ClubHouse fast approaching, it is time to announce the results of the Best New Initiative Award. The majority of clubs that entered the 2003 competition had undertaken at least one initiative within the last year. From bat box erection to guided ecology walks for members, each initiative was a credit to the club that put it forward. Yet there could only be one winner and after much deliberation the judges decided it should go to a club that has recently introduced Hebridean Sheep to the course, as part of its heathland restoration programme.



▲ The Minchinhampton Mix

MINCHINHAMPTON GOLF CLUB'S WIND-ASSISTED COMPOSTING

Several clubs in the competition this year had composting programmes in place to recycle their organic waste. On many courses, the composting takes the form of a large heap that breaks down over many years in a hidden-away part of the course. However Paul Worster, Courses Manager at Minchinhampton, has addressed the issue of composting in a totally different way and the result has gained a place in our top five new initiatives.

The first clever move on Paul's part was to seek advice from the Compost Association who made a visit to the club and suggested creating a system that would speed up the composting process. The base of the composting area has been specially constructed so that a fan can draw air through a perforated plastic pipe located beneath the heap. The fan, which is operated for just a few hours each day, greatly increases air movement within the heap and this has two positive effects. The first is that the extra oxygen moving through the pile is utilised by the microbes, which break down the organic waste into soil. The second is that the air movement

prevents the pile from getting over wet, enabling it to be left uncovered without fear of nutrient run off or leaching.

Due to the increased rate of organic breakdown, the composting process has been found to now only take a matter of months rather than years. Therefore all the club's organic waste can be dealt with in a relatively small area. This even includes the club's waste cardboard from the clubhouse and pro-shop. Previously, this cardboard was costing the club £1,500 per year to dispose of. Now it is stored in a cage next to the heap and periodically the contents are fed into the Amazone Groundkeeper, which shreds the cardboard before it is mixed into the pile. The end product is of good quality and the club uses it as mulch on flower beds and around shrubs and trees. However, this uses just a fraction of the output and so the compost has been made available to the members at 50p per bag with proceeds going back into the greenkeeping budget. In addition to this, the £1500 saved in waste disposal more than pays for the small amount of electricity needed to power the fan.



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COTTESMORE GOLF AND COUNTRY CLUB'S HABITAT CREATION

This golf club did not figure as a regional winner in this year's traditional Environment Competition, yet by no means did this rule it out from figuring in the best new initiative section. In terms of habitat creation, the Cottesmore course is like a showroom for 'Boxes-R-Us' as there are man made homes for many different wildlife species on this course. Bats, birds of all sizes, hedgehogs and harvest mice are just a few of the wildlife species encouraged on the course. All boxes are thoughtfully positioned with careful consideration given to feeding grounds, climatic and human influences and potential predators. That said, there are a few bird boxes in positions, which are highly visible to the membership. This is a good method of publicising the greenkeeping team's commitment to the nature on the course. Another aspect of this initiative that the judges admired was the value for money of the initiative. An old corrugated tin sheet placed in a cove for use by reptiles costs nothing, as does an old tennis ball on a stick which makes a perfect nest for a harvest mouse. A great deal of ingenuity was evident at Cottesmore which has proven that it is not just golf clubs with big budgets that are in the reckoning for this prize.

LOCH LOMOND GOLF CLUB'S RHODODENDRON CLEARANCE

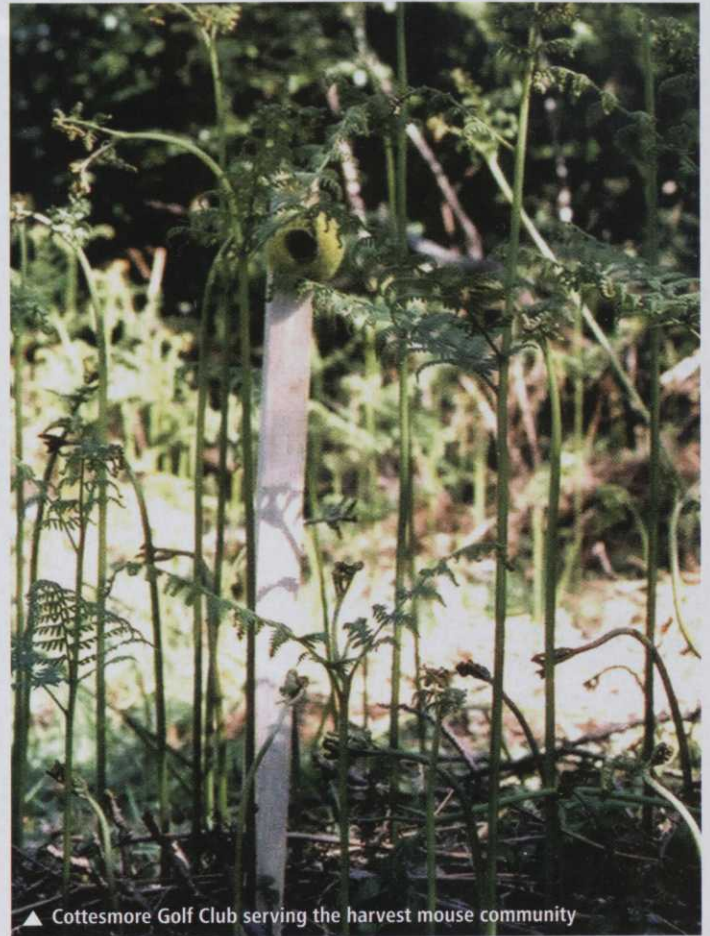
The first of two splendid initiatives in Scotland was at Loch Lomond Golf Club, where a large scale project to clear an area of woodland of the non-native rhododendron has commenced. Historically, the unwanted rhododendron has been removed physically by chainsaw and operator. This process was followed by herbicide applications of either Imazapyr or Glyphosate over two seasons to prevent re-growth.

The aim of the Loch Lomond's initiative was to investigate whether the rhododendron could be cleared in a way which was less labour intensive, less physically demanding and less dependent on the use of follow up chemicals. Therefore research commenced on finding a rapid technique to remove as much of the rhododendron as possible, including roots, in order to eradicate the plants and avoid the need for follow-up spraying.

In 2002, the Club located a contract team who possessed a flail chipper and mulching machine, which could be utilised to extremely good effect to eradicate rhododendrons. The machine was brought on to the site during September 2002 and June 2003 and a total area of between four and five hectares was cleared. This work will continue over the next two seasons or so, where it is envisaged a further seven hectares will be cleared. A major benefit of this equipment is the extent of work that can be carried out during any one operation and the reduction in the large amount of aftercare work that would otherwise be involved. The Club, however, are not sure as to the effect of leaving chippings over the surface and are setting up a series of trials to look at the benefits of leaving chippings and



▲ An area of the rhododendron clearance at Loch Lomond Golf Club



▲ Cottesmore Golf Club serving the harvest mouse community

waste as compared with clearing and re-scraping back to the underlying humus layer.

Unfortunately, even though the areas of woodland have been cleared of the rhododendrons their legacy is a high level of toxicity in the soil that will inhibit the ability of native grasses, trees and flowers to regenerate. However, over time, a large-scale improvement in the ecological value of this woodland will occur due to both the research and practical work that the Loch Lomond Club have carried out.

ST ANDREWS LINKS TRUST'S DRIVE FOR SUSTAINABILITY

St Andrews Links Trust has undertaken not one but many special initiatives within the last year. For this part of the competition they have been grouped collectively as initiatives which promote the Trust's drive towards greater sustainability.

Only a few years ago the Trust was, dare I say, playing catch-up in this area. Yet, perhaps due to the self-evaluation required to enter this competition and the Committed to Green programme, the Trust has turned this weakness into a real strength. In 2002 the Trust requested an energy efficiency audit, which was subsequently carried out by the Scottish Energy Efficiency Office. By 2003, 95% of the recommendations published in the audit were completed. The work had involved using more energy efficient lighting, improving gas regulation and use, and improving the way in which the irrigation-pumping stations operate. Out on the course, sprinkler heads were changed from 360° to 180°, the petrol/diesel buggies have been replaced with Yamaha electric buggies and a free shuttle bus is now in place to transport golfers between the clubhouse and different site facilities. This will not only ease congestion but will significantly reduce pollution.

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