



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.



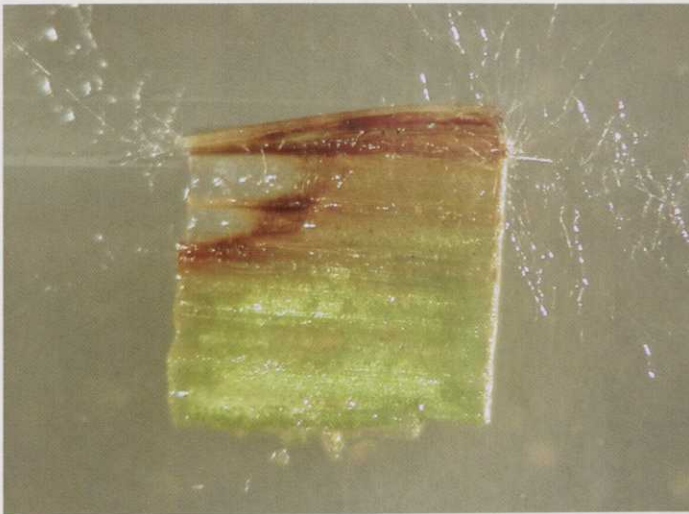
▲ Red thread in perennial ryegrass field

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

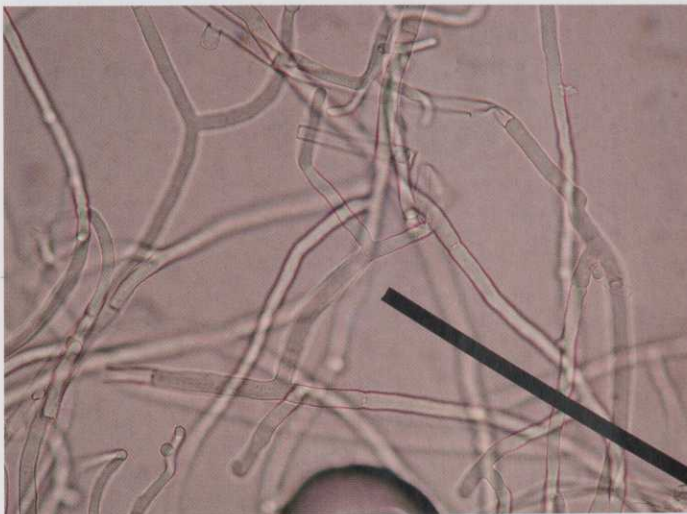
This is another disease which is becoming more and more common in Europe. Warm nights with enough water can be enough to destroy turf over just a few days.



▲ 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.

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▲ A leaf with brownpatch