

From his base near York, Robert Laycock, an independent agronomist, charts the history of the use of acidic compounds on the golf course

THE

THEORY

Greenkeepers have been deliberately acidifying their greens for the last 60 years. Perhaps this is the time to stop. The fairways and rough of golf courses are often rich in fine grasses, but rarely the greens. Driving down the pH has not had the desired effect. It may have worked at first, but in many cases acidification has gone too far.

The history of the Acid Theory

The Acid Theory originated in the 1920s as a result of research work in the USA by Oakley and later at other universities, such as the University of Rhode Island. Broadly speaking, it had the aim of creating the acid conditions which research had shown favoured the desirable fine fescues and browntop bent at the expense of coarse grass and broad-leaved weeds. This was achieved largely through the use of sulphate of ammonia.

Apparently the theory as practised came about as a misunderstanding of Oakley's research. Oakley had established his experimental turf from seed and kept it clear of weeds by the use of acidifying materials. He did not start with weedy turf and then rid it of weeds as was attempted by greenkeepers subsequently.

In the UK the Acid Theory appealed because it simulated the acid soils where the fine fescues and bents of acid heathland golf courses could thrive. The acid conditions also worked against the needs of certain weeds (remember this was before the invention of selective hormone herbicides, which first became available in the late 1940s). It was also before the days of pop-up sprinklers and the overwatering which they all too often brought.

The acceptance of the theory was widespread. In certain cases it was

very successful. I G Lewis, writing in his book 'Turf' in 1948, stated that the Acid Theory:

"...left in its wake hundreds of ...golf greens infinitely better than before while causing severe damage to others." (My italics).

(It is interesting to note that I G Lewis was one of the first agronomists to leave Bingley to set up his own independent turf advisory service, in the 1930s.)

In 1931, Beale wrote:

"There are fashions in fertilisers as with everything else, the latest being the "acidity theory" which is so American that one feels almost compelled to spell sulphate sulfate as they do.

... In brief the theory is this: it is claimed that if turf is dressed exclusively with sulphate of ammonia in conjunction with neutral compost, free of lime, once a month from March to October, both inclusive for five years, the soil in most cases

Are you missing?

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The rain in the UK is naturally acid, so there is a tendency for golf green soils to become more acid over time. Will there come a time when they become too acid for healthy plant growth?

will be rendered sufficiently acid as to exclude the growth of all weeds and coarse grasses and promote solely the growth of the very finest grasses..."

There was a backlash against the theory (which had been overdone in the 1930s) and the very low pH values which were caused had to be corrected by liming in some cases.

A J MacSelf wrote about the heyday of the Acid Theory:

"Any remark made which implied doubt [of the soundness of the Acid Theory] was attributed to stubborn prejudice and foolish adherence to old-fashioned and unscientific ideas."

Observations on golf green turf

We see few broad-leaved weeds on old golf greens. However, if the Acid Theory really worked we would expect to find that golf greens on acid soils are composed solely of fescues and bents. The only fescues which I see on the soil based greens of old inland courses are from recent overseeding or, in a very few cases, where they have managed to hold on against the odds. Bent is more common, but rarely manages to occupy more than a small percentage of the area of a green. The annual meadow grass which the technique is intended to oust is always the dominant species. Perennial ryegrass is also commonly found.

Many of the old greens I come across have a turf consisting pre-

dominantly of annual meadow grass on soils of pH 4 to over 7. In other words the annual meadow grass seems to do better than the bent and fescues at all pH levels. In other words the Acid Theory does not work.

The effects of repeated acidification can be seen in many of our old golf courses. Earlier this year I received soil samples from the greens of a well known golf course (not a regular client). The pH values were between 4.4 and 4.8. The turf was annual meadow grass, the rootzone anaerobic and thatchy. Experience has taught me that a factor in the development of greens like this is the use of acidifying materials. My recommendation was that the greens should be limed - I do not expect for one moment that they will be. But what would be the adverse effect of liming greens like this? What could be worse than their current condition?

Using lime on golf greens

I do not often advise the application of lime to golf greens, but in some cases it is necessary to correct the effects of years of over-acidifying. In these cases the benefits of lime are significant. Greenkeepers are often shy of using lime.

There is a widespread view that lime is harmful to golf greens. What about earthworms? If we let the soil pH rise won't there be worm problems? Clearly there is a danger in this, particularly if lime is used to excess. However, in my

experience, the increase in worm numbers is small if advice from a qualified agronomist is followed carefully. It is less likely to happen when starting from a very low pH.

What about fusarium patch disease? Won't that be worse if lime is applied? Again, my experience is that the turf on very acidic greens is less prone to fusarium after liming. In one case the two greens which were limed had no fusarium while the rest of the greens on the course did. My explanation for this would be that the calcium in lime is an important component of the cell walls of the turfgrasses, and plants need it to reduce the likelihood of infection.

Management

There comes a time when everyone should ask themselves: "What are the problems on our greens? What is causing them and what can we do to put them right? Are they the same as ten years ago? If not should we change our management policy?"

It is very easy to get into a rut and apply the same management programme to the golf greens this year as last year. This approach assumes that there are no long-term cumulative effects of the management programme. In the case of Acidity Theory - what are the long term effects of constantly acidifying the soil? The rain in the UK is naturally acid, though not so much as it was before the Clean Air Act, and so there is a tendency for golf

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Many plants are quite specific about the conditions they like. Not so annual meadow grass. It will survive at all levels of acidity. Why is this? The reason is that it is not just acidity that affects annual meadow grass survival. It is the over-watering, incorrect feeding and poor drainage of too many golf greens that make annual meadow grass the best adapted grass for golf greens, whatever their pH.

Some of the best old fescue-bent greens occur on links courses where the pH may be over 7 due to the sea shell content of the sand on which they are built. Why are these greens not full of annual meadow grass? One of my clients has greens of this type but on one of the 18 there is a significant annual meadow grass content. It is no coincidence that this is the only green on the course with pop-up irrigation. This leads me to conclude that it is over watering, not acidity, which is the main factor in encouraging annual meadow grass on the golf course.

Worse than the use of ammonium sulphate, which with iron sulphate is the usual acidifying material, there are some disreputable individuals who promote the use of granular sulphur, getting repeat orders by checking pH on a deep soil sample and ignoring the fact that the surface of the soil is

extremely acid. Since this is where the turf has most of its roots, it inevitably suffers. Each time the sulphur is applied it lingers in the soil, acidifying it over a very long time. Remember when using sulphur that the chemical reaction which occurs in the soil produces sulphuric acid, the effects of which on plant material we know from our school science lessons.

There are dangers from using any material as powerful as sulphur or lime to excess. If you intend to use them be careful and understand exactly what you are doing. Use moderation in all things. Use sulphur. Use lime. But only do it when you know exactly what you are doing or have an independent advisor who you can trust.

Robert Laycock has worked in turf research and agronomy since gaining an MSc from Imperial College, London, in 1974.

Following six years of research at STRI, his career has included periods involved with turfgrass breeding and grass seed production, as well as the production of cultivated turf and golf course management and agronomy. He now practices as an independent agronomist from his base near York, advising golf courses of all types around the UK.

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