TURF TISSUE

How turf tissue analysis is used to grow healthy golf greens. Robert Laycock reports.

Turf grasses take up nutrients from the soil and their tissue can be analysed to determine its content of nutrient elements. Used in conjunction with soil analysis, the nutrient content of grass clippings (collected from the grass box of the mower) gives a more complete picture of nutrient usage than the conventional simple soil analyses usually used for this purpose.

Who uses it? Tissue analysis has been part of decision making in agriculture and horticulture for many years and now is becoming more commonly used on golf courses around the world. My own clients include golf courses which are old and new – 9 hole courses as well as championship courses – who use tissue analysis on a regular basis.

Why use it? The thinking turf manager, interested in an integrated approach to managing his greens learns that by reducing turf fertiliser applications or applying nutrients in the appropriate proportions it is possible to avoid lush production of turf at the wrong times thereby cutting fertiliser costs and improving the health of the grass.

What does it add to what we already know from soil analysis? It is well known that the nutrients which can be extracted from the soil by turf grasses interact both in the soil and within the plant, This affects their availability for biochemical processes in the plant, and turf grasses often take up more of some nutrients than they actually need for growth. This may not be a problem unless the high level of that element affects the content of others. One of the best known examples of this, well-known to grassland farmers, is that adding high levels of potassium fertiliser to grass depresses its magnesium content. Using tissue analysis this can be seen happening in turf. Other less well known interactions also occur, and it becomes clear that maintaining the nutrients in balance is essential to the good health of turf.

Criticisms of tissue analysis

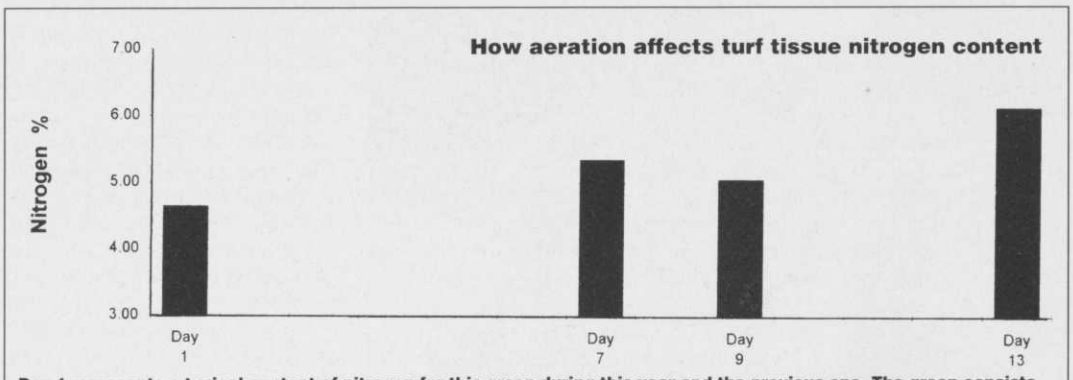
Common misconceptions exist about the usefulness of tissue analysis and its use has been criticised for several reasons. Some of these criticisms are valid, but experienced users are aware of them and take them into account in their interpretations. It helps to have a good grasp of plant biochemistry and physiology and for this reason interpretation of the results by an experienced and qualified agronomist is essential.

Firstly, tissue must be clean. No analysis procedure can distinguish top dressing particles, insects, or bud scales from trees from grass clippings and these must be removed before analysis. This is a very obvious factor, but one remarked on by a number of researchers in this field.

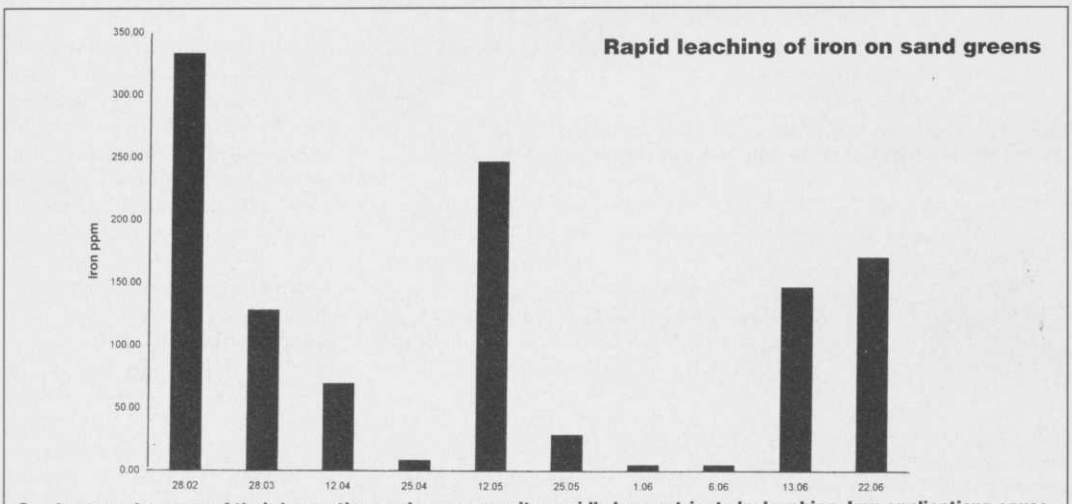
Tissue must be reasonably fresh. In practice, unless the golf course is within easy reach of the analyser, first class post can be used to ensure a fresh sample is analysed. The effects of decomposing plant tissue on analysis results are well known and documented (surprisingly enough) and again, experienced interpretation of the results will tell whether the sample is too old for analysis to give sensible results.

Results of tissue analysis must be interpreted in the context of soil analysis from the turf area. This means that a more detailed soil analysis is required than that often used by agronomists. How-

ANALYSIS



Day 1 represents a typical content of nitrogen for this green during this year and the previous one. The green consists mainly of annual meadow grass and is in good condition. Feeding causes the nitrogen level to rise above 5% by day 7. Aeration on day 8 results in an increase in dead plant material and therefore a fall in tissue nitrogen in the grass clippings on day 9, but in the space of four days the nitrogen content of clippings on day 13 has risen to 6.15% (excessively high) due to improved growth of the roots and access to previously unobtainable nitrogen in the rootzone.



Sand greens, because of their low cation exchange capacity, rapidly lose nutrients by leaching. Iron applications cause peaks in the iron content of the grass clippings. Regular light applications maintain iron levels more satisfactorily on this type of construction.

ever this is not a bad thing and in itself adds to the background information made available to the greenkeeper through his agronomist.

Tissue nutrient levels vary throughout the year. This is not necessarily a disadvantage, and provided frequent testing is carried out can be used to advantage by the turf manager. It is often overlooked that availability of nutrients in the soil varies with the season, particularly on modern constructions, so variation in the tissue is to be expected.

Other factors also affect the results, notably the age of the tissue and the species of grass being analysed.

Some of these supposed disadvantages are in fact helpful. For example, knowing that the levels of the various nutrients change through the year gives a better understanding of the way the turf plants in the greens work. Fertiliser composition can then be selected to suit, reducing waste and cost.

There are many complications in interpreting analysis results and laboratories with little experience of turf tissue analysis should be avoided.

Effects of turf management on tissue nutrient content

Tissue nutrient content is affected by a number of factors. Fertiliser application is the most obvious. However, other management practices also affect the results of the analyses. For example, vertical mowing introduces older tissue into the sample, causing an increase in those elements associated with older tissue, such as calcium, and a decrease in nitrogen.

Aeration increases oxygen supply to the roots and thus enhances growth of roots into parts of the soil previously untapped. The result of this is the same as giving a dose of fertiliser. This is why on old greens aeration can encourage fusarium patch disease around the tine holes, a phenomenon often seen on golf courses. By integrating aeration practices and fertiliser use through the season, it is possible to cut down on fertiliser inputs and make a more healthy, less disease-prone turf. This effect is illustrated below with results taken from an actual green. Because of this it is advisable to perform tissue analysis regularly, so that changes in nutrient content can be followed throughout the year and variations due to factors like these can be identified.

Modern technology means that results can be supplied very quickly. In my own case, I results of analyses are faxed back on the day I receive the sample, which means that the tissue results can be used to decide immediate fertiliser needs, for example.

Advantages

There are two ways for a golf club to use tissue analysis. A single analysis, made in conjunction with soil analysis, can detect an imbalance in nutrient uptake by the turf which can be corrected. This approach can be used to help determine why, for example, two greens on a course are behaving differently. However, I have found by far the most popular way of using the technique in practice is as a management tool in long term nutrient tracking to monitor changes in nutrient content of the turf. This enables fertiliser applications to be planned and the response of the turf to be followed during the course of the year. In doing this, the turf manager learns the optimum amounts of particular nutrients to apply without putting on too much at a time and to regulate applications to avoid under or oversupply of fertilisers.

Some nutrients are more dynamic throughout the year. Iron (see graph) and nitrogen are examples of these, in healthy turf responding positively to applications of fertiliser which contain them. With experience, the turf manager can use tissue analysis to avoid alternating peaks and troughs of nutrient content, at the same time producing a more healthy turf, less prone to damage from disease or environmental stress.

The final question is: "Is turf tissue analysis essential to good golf course management?" The answer of course is "No, it is not essential" – but it is a major help in decision making. Once Course Managers have used tissue analysis they tend to continue to do so, finding it improves their understanding of the way the grass on their greens interacts with fertiliser applications and other management practices, and thereby improving the standard of their greenkeeping.