

Why, When and How

Simon Barnaby advises on nutritional input for fine turf management.

In recent years, I believe there has been a shift towards a more 'naturalistic' approach to managing turf - especially on golf courses - with a backlash against the 'green is God' attitude. However, this type of approach does not mean there is a need to sacrifice healthy turf and good quality playing conditions. In fact many would argue that this approach is essential to achieve this aim.

WHY DO WE NEED TO APPLY FERTILISER AT ALL?

- To supply essential nutrients for growth.
- To encourage healthy turf and aid recovery.
- To replace nutrients removed (clippings).
- To encourage uniform surface conditions.
- To enhance turf appearance.
- To balance soil nutrients.

WHAT IS MINIMAL INPUT?

The term 'minimal nutrient input' is regularly seen in agronomic reports or articles on turf management - but what does that actually mean? It doesn't necessarily mean a small or low amount of nutrient inputs.

The minimal amount of nutrient input is the lowest amount possible to create healthy turf and good playing conditions. The difficult part is working out what that minimal amount is to achieve this aim. The person best placed to answer this question is the turf manager.

We know that there are a number of essential nutrients (16 in some text books, less in others) that the grass plant must have in order to survive. These are split into two main groups - macronutrients are the ones needed in the greatest quantities, and micronutrients are needed in varying lower amounts.

MACRO	MICRO
Nitrogen	Iron
Potassium	Zinc
Phosphate	Copper
Calcium	Manganese
Magnesium	Molybdenum
Sulphur	Chlorine
	Boron
	Sodium
	Silicon

WHAT IS THE MINIMAL AMOUNT?

Essential nutrients are all as important as each other; it's just that some are needed in far greater quantities than others. It is also true that many of the essential trace elements are already present in soil rootzones in large enough quantities. However, if you are considering sand construction rootzones, then micro as well as higher amounts of macro nutrients may have to be applied.

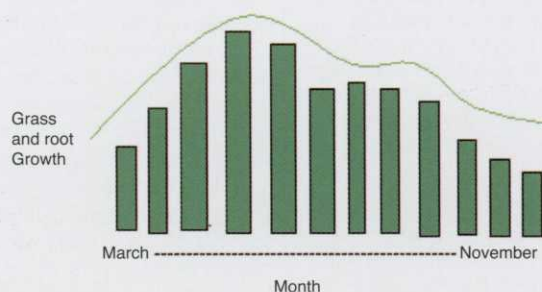
Typical recommendations for nutrient (N) input for golf greens are as follows:

- New USGA green construction - 200 - 250kg/N/Ha/Yr
- Older USGA green construction - 140 - 180kg/N/Ha/Yr
- Soil based green - 80 - 150kg/N/Ha/Yr

When to apply – a guide

Match nutrient timing with growth peak

(Application times vary depending on location and weather conditions)



When considering other essential nutrient inputs, the usual NPK ratios are something like 4:1:3 - 3:1:2. Although there are always influencing factors, for example timing. An autumn application may have an analysis such as 2:0:2 - 2:0:3 - 2:1:3 (or no nutrient at all). However, there are obviously a number of factors that need to be considered before specific nutrient input advice can be given. These include:

- Sward species composition
- Rootzone/soil type and construction
- Climatic conditions
- Maintenance level - budgets
- Timing
- Turf manager's objectives

The last point (turf manager's objectives) is a crucial factor - all of the others are fairly standard pieces of information that allow a decision to be taken or advice to be given. Even as long ago as 1920s, experts recognised this fact:

"A common mistake in turf management is to imagine that because one form of treatment benefits one course, that it will necessarily benefit another," stated Dr. A. Mackenzie, in 1920.

The turf manager's objectives may be as simple as maintaining current sward conditions, although he may want to embark on a new maintenance regime that attempts to eradicate *Poa annua* and increase bent grass. These two different objectives may/should influence the type and amount of nutrient inputs for that particular turf area.

HOW DO YOU KNOW HOW MUCH TO APPLY?

Soil/tissue/sap analysis can help the turf manager to make up his own mind. Fertiliser programmes are only really ever a guideline. When you are working in a natural environment it is inevitable that natural factors will affect the amount of nutrient needed, for example rainfall, irrigation, temperature, sunlight etc.

One of the buzzwords at the moment is to 'balance' soil nutrients and this is a very important part of nutrient input management. Too much of one nutrient can restrict the uptake of other nutrients (e.g. Potassium and Magnesium).

Another influential factor is pH. Excessively low or high pHs can influence nutrient availability, and this can sometimes be overlooked when it comes to formulating fertiliser programmes.

Having discussed the above, the bottom line is: 'if it isn't broke, don't fix it'. It's an old adage but one well worth remembering. I see a lot of soil analysis that can appear as if there should be problems with the turf, and that vast amounts of nutrient are needed to rectify deficiencies. But the actual turf surfaces are very good.

In this situation the advice is to keep doing what you're doing. Soil analysis really only comes into its own when there is a problem with the turf, or it's generally not performing as well as possible and you want to make sure it's got all the nutrients it needs to achieve your aims.

WHY IS IT BAD TO APPLY TOO MUCH NUTRIENT?

- Waste of money - product and labour.
- Detrimental to turf health.
- Soft growth susceptible to wear, reduced root growth.
- Encourages turf disease.
- Poor playing conditions.
- Environmental implications.

Within the next five to 10 years it's possible that nutritional/fertiliser input will become as regulated as chemical input. In agriculture, this has already started with the introduction of Nitrate Vulnerable Zones (NVZs), which place restrictions on timing, types and amounts of fertiliser that can be applied.

Environmental damage caused to watercourses through nutrient pollution is one of the biggest concerns of authorities today. If too much nutrient is applied, excess Nitrate and Phosphate in watercourses can cause Eutrophication leading to decreased diversity, increased weeds, etc. Scotts research has shown that when applied correctly, leaching risks are minimal on golf course turf.

WHY IS IT BAD TO APPLY TOO LITTLE NUTRIENT?

- Waste of money - product and labour.
- Detrimental to turf health.
- Poor playing conditions.
- Poor or slow growth susceptible to wear.
- Encourages turf disease.

When we consider turf health, one of the things we are taught early in our careers is that too much nitrogen, especially at the wrong time of year (e.g. late autumn), can encourage soft, lush growth which can cause turf disease - especially fusarium patch (*Microdochium nivale*). This is true, but it is also true to say that too little nutrient at certain times of the year can also encourage disease. Research has shown that certain trace element deficiencies (e.g. manganese) in sand construction greens can influence the occurrence of Take All Patch (*Gaeumanomyces graminis*) disease.

Experts, such as Dr. Ruth Mann, STRI, and Dr. Entwistle, Turf Disease Centre, agree that UK and Eire are seeing more unusual diseases and pests over the last few years and well-known diseases, such as Anthracnose (*Coletotrichum graminicola*), appear to be on the increase.

Anthracnose is a disease that attacks grass plants when they are under stress, so any factor that causes stress to the plant will increase the likelihood of disease attack. Anthracnose mainly affects *Poa annua* in UK and Eire (basal rot, not foliar). If this disease is increasing, it would indicate that *Poa annua* is under stress.

One theory could be that with changing climatic conditions we are seeing more grass growth going into the winter months. If there isn't enough nutrient for the turf to grow in a healthy way, this may be putting a stress on the turf resulting in disease attack, especially in autumn and spring. This is a tricky situation to deal with, because if you apply more nutrients in the autumn you will run the risk of encouraging Fusarium patch disease.

HOW SHOULD NUTRIENT BE DELIVERED?

There are lots of different ways to feed turf - it's really a case of what works best for you in your particular situation. Options include liquids, water solubles, conventional granulars, slow release, controlled release, etc. Liquid and foliar applications are becoming more popular as they can be easily tank mixed and give the turf manager flexibility with inputs and allow maximum control of growth. Granular products are still seen as the main approach to apply nutrient by many turf managers.

The main points to look for when using granular products are:

- Rapid breakdown
- Consistent spread pattern
- Granule uniformity/Particle distribution
- Homogenous granule
- Good longevity
- Ease of application/handling
- Performance
- Value for money
- Proven through research

The last point is particularly important.





OTHER 'MACRO' NUTRIENTS

Oxygen, carbon and hydrogen are macronutrients obtained from air and water, and they are the building blocks for grass plant growth. These three essential nutrients, when combined in the presence of chlorophyll and light through the process of photosynthesis, form carbohydrates - the sugars used to provide plant growth.

Plants are therefore not obtaining food directly from the soil mineral nutrients. These nutrients are just the raw materials used to manufacture food via photosynthesis. While it is well known that low oxygen levels will have a detrimental effect on turf health, recent research from Gange (2004) suggests that low carbon levels in golf green turf may also be responsible for poor turf health.

CONCLUSION

I have always maintained that the most important nutrient is oxygen. Much effort can go into trying to get the perfect balance of nutrient, irrigation, Integrated Pest Management (IPM) and chemical inputs, although without oxygen none of the above really matters. No other inputs can work effectively without a healthy, free-draining rootzone that can support a thriving soil microflora population. Therefore to summarise:

- Keep turf maintenance as simple as possible.
- All essential nutrients are as important as each other, just some are needed in greater quantities than others.
- Use soil, tissue, water analysis occasionally to ascertain current nutrient status - especially useful as a diagnostic tool.
- Practice some form of IPM, including considering use of proven bio products as part of the overall maintenance programme.
- Consider effects of irrigation inputs.
- Don't forget - oxygen is the most important essential nutrient.

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