Spring interaction!

Andrew McMahon, fertiliser product manager for Rigby Taylor

We are all aware of the significant impact global warming is having on the sea levels, the ice caps and temperatures and the Met Office graph to the right shows how UK spring temperatures have risen over the last 50 years.

Encouraging root development early can help with nutrient and moisture uptake going forward, and as root growth begins at approximately 5°C, the Met Office data shows this temperature is being reached in late winter or early spring.

There are many fertilisers that can help with root development, especially those that contain a bio-pack, which includes lignite and seaweed. A bio-pack is an excellent source of humic and fulvic acids, auxins, cytokinins, gibberelins, betaines and complex carbohydrates. Root development, both length and root is improved, and stresses, both biotic and abiotic, are reduced. If there is a calcium deficiency, root development will be compromised and this is particularly pertinent in soils with a pH level of less than 5.0 and in sandy soils and rootzones with a low Cation Exchange Capacity (CEC). Calcium deficiency will also increase disease pressure so ensuring the levels are adequate is very important.

Aeration, undertaken when conditions allow, in conjunction with these products, will ensure optimum development and in fact is the most important job on any sports surface. The Rigby Taylor Fineturf BiO range of fertilisers contains a bio-pack that delivers the equivalent of eight applications of a standard liquid seaweed when applied at 35g/mt², as well as calcium, magnesium and iron.

Spring recovery from winter conditions is limited by the amount of carbohydrates the plant has stored in the previous autumn as the plant uses this energy for root and shoot development. Spring recovery is starting earlier due to a rise in temperatures, but also the requirements and expectations of members mean they demand the highest surface playing quality earlier than ever. Potassium plays a key part in carbohydrate storage, but is very mobile within the soil profile, so deficiency can be a problem, especially after a wet winter as it impacts upon carbohydrate storage.

Potassium is also involved in the uptake of CO_2 in photosynthesis by regulating the opening and closing of the stomata. Any reduction in this essential process impacts on the production and availability of ATP, see figure 2.

This means that the transport of sugars (using ATP) around the plant in the phloem slows down, and since more sugars are left in the leaf, photosynthesis is reduced and light utilisation in the darker months is affected.

Applying the correct nitrogen sources in late winter/early spring will also help with encouraging some growth, and assist with the recovery of disease scars. Nitrogen is only available to the plant in nitrate and ammonium forms but mainly nitrate. Depending on the source, it will have to go through a process to become available.

Nitrification is the process by which sulphate of ammonia becomes plant available. This is the oxidation of ammonia or ammonium to nitrite, followed by the oxidation of the nitrite to nitrate, see figure 3.

The optimum working temperature for this process is 27°C (80°F). The colder it gets, the more this process slows down. Below 15°C (59°F) nitrification falls rapidly and at 12°C (54°F) it is reduced by more than 50%, see figure 4.

The optimum working temperature for urease is 16°C, but enzyme activity slows the colder it gets, so not only will it take longer for the urea to be converted, it also has the same problem during nitrification for becoming plant available. The conclusion, once again, is that urea will work at lower temperatures, but the availability to the plant is greatly reduced in cold conditions, see figure 5.

Nitrate however only needs to be solubilised to be available to the plant; once solubilised it can be taken up by the roots and the healthier the root system, the more availability. However, there are some limitations as the plant needs to be photosynthesising and the ground can't be frozen. This indicates that nitrate is the perfect nitrogen source for cold conditions, certainly below 7° to 8°C, when ammonia is slowly converted to become plant available.

However, high inputs of nitrate can encourage soft growth and heighten disease pressure. A formulation of nitrate with ammonia, or nitrate with ammonia and urea should be the preferred options. These formulations allow for temperature fluctuations, while still giving an initial quick response from the nitrate, followed by the uptake of the ammonia, or ammonia/urea mix. These true 'cold start' fertilisers are perfect for applying when topdressing as they will encourage growth through the dressing, thus reducing disease pressure.

Fertilisers containing iron and magnesium will also help produce the surfaces required.

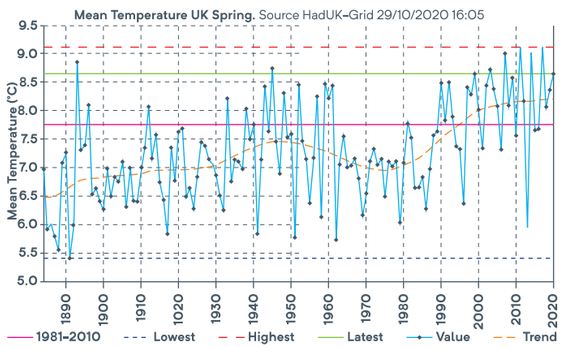
The iron will give an almost instant visual response once applied, as it is required to produce chlorophyll. Iron will also help to harden the plant against early season disease pressure, reducing the chances of scarring. One thing to be aware of with high iron analyses is that they can cause blackening and damage to any moss in the sward, see figure 6.

Magnesium, unlike iron, is part of the chlorophyll structure, and is in fact key to chlorophyll production and so essential for photosynthesis, see figure 6.

This will have a three-fold benefit to cold-start fertilisers containing nitrate and iron: the plant takes up nitrate when it is photosynthesising, even at cold temperatures, so by adding magnesium will ensure optimum uptake; it will also provide natural colour and has the added bonus of increasing the plants ability to utilise iron.

Producing the surfaces required and expected at such an early time of the year is difficult, but there are now multiple options available, many that will address the points outlined here, plus other products that will help.

Figure 1: Mean Temperature UK Spring



Fineturf BiO pack

Figure 2: Adenosine Triphosphate (ATP) is the energy source that drives all metabolic activity of plant cells

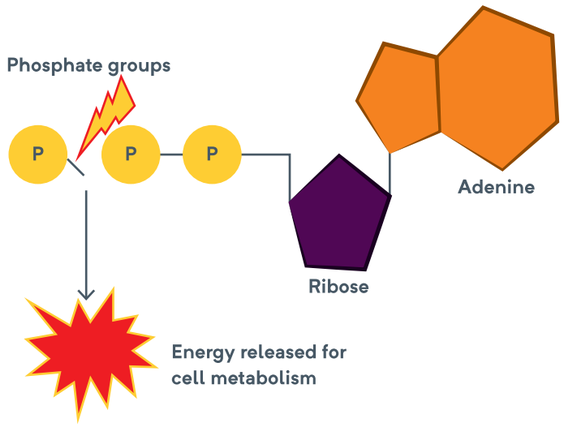


Figure 3: Nitrification process - relies on soil bacteria, nitrosomonas and nitrobacter.

Figure 4: This graph indicates that although ammonia will eventually be plant available at cooler conditions, does it make it the ideal cold start nitrogen source?

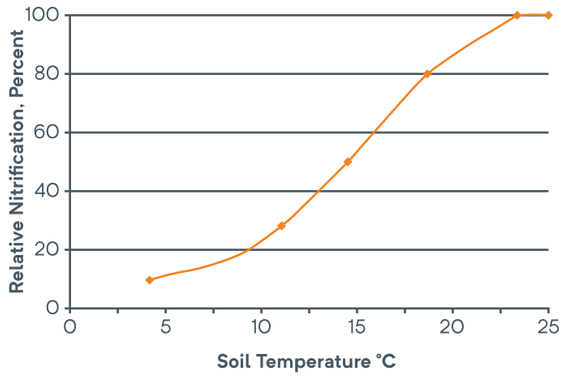


Figure 5: Nitrogen Conversion Process: Urea relies on the enzyme urease for the oxidation into ammonia, after which the nitrification process begins.

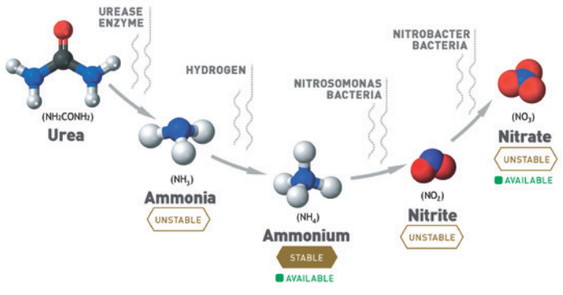
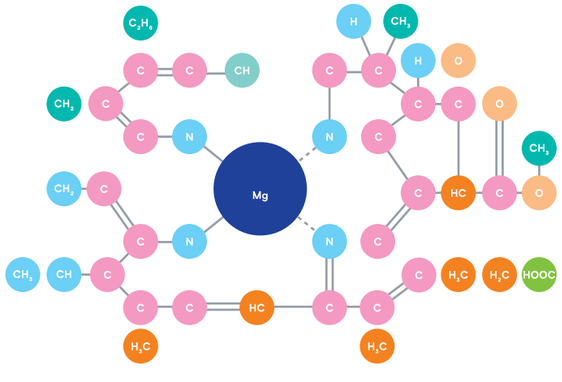


Figure 6: Chlorophyll molecular structure showing the magnesium atom



Courtesy of Greenkeeper International