

GRASS CLIPPINGS

June 2007

In this issue we will continue where we left off in Grass Clippings 10 i.e. discussing fertilising and fertilisers. Fertilising, as such, has two components

- promoting growth
- replacement of the elements used up by the grass plant or leached past the root zone

This issue will be confined to identifying the elements in the soil which are essential for grass plant growth and how to apply them.

As mentioned in G.C.10 these elements (or nutrients) are the vitamins of the grass plant. Currently 13 mineral elements within the soil are recognized as being essential for plant growth. Although amounts of these elements found within the grass plant may vary considerably they are all important to the plant. They are grouped into -

- macro-nutrients
- secondary nutrients
- micro-nutrients

1 Macro - nutrients

1.1 Nitrogen (N) - Required in greatest quantities. It is an essential component of amino-acids, proteins, enzymes (refer Defence Mechanism G.C.10) and other plant substances It will stimulate leaf and root growth.

It is important that the GKP regulates his application of (N) in such a way that it is neither excessive or too little as both can have serious repercussions. (ref. G.C.10 - excessive application of (N) can cause so much growth and in the process use up so much energy that the Carbo-hydrate reserves are depleted with all the concomitant problems which accompany such depletion.)

Nitrogen (N) is available in two forms-

- Organic - This would include N derived from Animal deposits. Urea and sludge
- Inorganic -Salts like Ammonium Sulphate. Magnesium and Potassium Nitrate

The inorganic salts are favoured because of their availability and price

1.2 Phosphorous (P) - Provides the plant with a means to conserve or transfer energy to those parts needing the energy at that time. While P is very mobile in the grass plant it hardly moves in the soil.

Because it is relatively insoluble in water it is difficult to get it to the root zone unless the GKP applies it just after aeration and scarifying when the green is bare.

Potassium (K) - Potassium is second only to N in the amounts required to sustain turfgrass growth. It is a catalyst for many processes which occur in the grass plant

It improves turfgrass wear tolerance and supports the grass plant through periods of stress

Deficiencies will reduce resistance to stress, increase the incidence of diseases and general reduction in growth.

On the other hand excessive amounts of K will inhibit the absorption of Calcium, Magnesium, and other nutrients.

K is very soluble and leaching losses can be considerable in sandy soils.

Note Most of the soil potassium is fixed and unavailable to the grass plant. The plant is, therefore, almost wholly dependant on the K provided by the green keeper.

2 Secondary Nutrients

2.1 Calcium (Ca) - Very common in our soils. Assists with cell production in the grass plant and with the absorption of many nutrients. As a constituent of lime it can be used to increase the soil pH.

2.2 Magnesium (Mg) - Is an important constituent of Chlorophyll and, also, assists with the absorption of Ca.

2.3 Sulphur (S) It is a component of many proteins and amino-acids in the grass plant. Elemental Sulphur or as a Sulphate of some elements can be used to acidify the soil.

Note - While Ca and Mg are very soluble and easily leached through the soil S is not readily found in the soil but rather found in organic matter which has to decompose for the S to become available.

3 Micro-Nutrients-

Although micro-nutrients (or Trace Elements) are found in small quantities in the soil it does not imply that they are of lesser importance.

These micro-nutrients are - Iron, zinc, Manganese, Copper, Boron, Molybdenum, and Chlorine.

With the exception of Iron and Manganese direct application of these elements may not be necessary.

Their main function is as catalysts in the production of enzymes, amino-acids and proteins.

Application of excessive amounts of these trace elements (except Iron) can lead to serious turfgrass injury.

Micro-nutrients are sensitive to radical changes in pH. They can become highly insoluble in alkaline soils and then at the other end of the scale may be toxic to the turfgrass in highly acid soils.

On bowling greens Iron is not really a trace element but can be regarded as a Secondary Element because of its presence in chlorophyll and with frequent defoliation much of the iron can be lost with the clippings and has to be replaced

Iron (Ferrous Sulphate) must be applied frequently but in small quantities because of its rapid conversion to an insoluble form- in this respect it is probably more economical to apply the more expensive Chelate form which takes much longer to convert to an insoluble form.

Application of Fertilisers

Our problem is to ensure that what we apply to the surface of the green is eventually absorbed by the grass plant

We are not dealing with a Human being where vitamins are included in his diet with the assurance that after absorption into the blood stream they will find their way to where they are needed We are dealing with a grass plant which has no ready-made circulatory system by which the GKP can supply the elements directly into the plant. We can only make them available to the plant and after that it is up to the plant to take them up.

Even then just making them available to the grass plant does not guarantee that they will be absorbed -

- Leaching losses if the green is excessively irrigated or if it rains soon after fertilising. Leaching losses can be considerable in sandy soil whereas clayey soils can hold the fertilisers for some time. The GKP's objective is to ensure that the fertilisers he has applied to the surface of the green makes its way to the root zone and is then kept there for as long as possible

- Gaseous losses - much of the Nitrogen which is absorbed is in the form of Ammonia Gas. Some of this can be dissipated into the atmosphere if the fertilisation has taken place in the heat of the day or the green was not irrigated soon afterwards.

- The pH must be in the correct range for most of these elements to be absorbed

- The bacteria and fungi in the Soil play an important part in the conversion (oxidation) of the elements into an acceptable form for their passage from the soil through the membranes of the grass root into the plant.

- Salinity - The process whereby the roots is by **osmosis**. To make this possible the concentration of salts inside the roots must be greater than that existing in the soil immediately adjacent to the roots. In cases of high salinity, either in the soil itself or the water supply making the soil saline the concentration of salts outside the roots can be higher than inside the roots resulting in a reverse osmosis, To avoid this the GKP might have to resort to regular applications of Gypsum to extract the sodium ions - to mix his fertilisers in rain water - and apply it more frequently and in lower concentrations..

Let us now look at how we are going to get the fertilisers to the root zone or the leaves..

Methods -

It must be emphasised that whatever method is used the GKP must be present when fertilisers are applied to the green in case of spillage. The whole process must not take long and must be easy to set up.

1 Root Absorption - Make the fertiliser available in the root zone for the roots to absorb - Three Methods -

- Granules applied to the surface of the green. Most fertilisers can be purchased in granular form and then spread on the surface of the green by means of rotary spreaders or drop-type spreaders.

Whilst they are easy to apply it is often difficult to ensure an even spread - must be watered in afterwards

- Liquid Fertilisers dissolved in water and applied as a spray to the surface in sufficient quantities for the fertiliser to reach the root zone. - Easier to handle and to get an even distribution.

- Fertigation - Is the application of fertilisers through an irrigation system. While this allows for frequent small doses of fertilisers being applied it has the disadvantage that unless the irrigation is uniformly spread over the whole green there will be doubling up where the sprays overlap.

2 Leaf Absorption - Foliar Feed Apply the fertilisers directly in small quantities and such a fine spray that the droplets adhere to the leaves and the fertiliser is absorbed directly through the leaves. The GKP must be careful to ensure that after spraying the droplets stay on the leaves and are not disturbed by anybody walking on the green for a few hours. The person applying the fertiliser must walk backward.

Note - Foliar feeding should only be resorted to where the GKP is dealing with high salinity.

Tests

How will we know what quantities of each nutrient we have to apply? And having applied it how do we know how much of these nutrients were actually absorbed by the grass plant?

We have to resort to Soil Analysis and Leaf Analysis

- Soil Analysis - This report will tell us what nutrients are present in the root zone but not what is in the grass plant..

- Leaf Analysis - Will tell us what quantities of each nutrient is present in the leaf - more expensive

1 Soil Analysis - This is one of the basic practices of turfgrass management.

It will provide information on the relative levels of nutrients, organic matter, pH, soluble salts, and Cation Exchange Capacity. In the sample Cores are taken from a number of sites on the green to ensure uniformity. The GKP must first confirm the root depth and then take the sample to that depth. A total of about 2 Kgm. Unfortunately variations occur between testing laboratories and analysis techniques and it is advisable that the GKP stick to one Laboratory to detect changes in the soil chemistry of his green.

The GKP should also select a laboratory which specialises in Sports Turf rather than a general laboratory also handling crops as the needs of turfgrass might differ from those of other crops.

Leaf Analysis - If there is any doubt in the GKP's mind that because of problems in the soil (pH, Salinity) all the nutrients are not being absorbed then he should resort to Leaf Analysis although it is more expensive.

A handful of grass clippings is removed from the mower bin every now and then while mowing. By so doing the GKP will ensure that the sample he is sending is representative of the whole green. These clippings must be shade dried for a few days and then sent away (about 0.5 Kgm would suffice).

Note The GKP should wait at least two weeks after fertilising before taking a soil or leaf sample.

Next Issue

In Grass Clippings 12 we will be dealing with merits or otherwise of the various fertiliser or combinations