GRASS CLIPPINGS 12

In this issue we are going to concentrate on how to apply the nutrients and how much to apply at any one time.
When fertilising the GKP has three objectives

- To replace any of the elements used by the grass plant.
  13 mineral elements within the soil are recognized as being essential for plant growth. The GKP should ensure that they are, at all times, available in the soil.
- To rectify any imbalances which might be revealed by the Soil Analysis report or by other reports.
- To use certain fertilisers to stimulate growth

Before the GKP can proceed further he must first obtain certain information from -
  The Soil Analysis
  The Player Count

1.0 SOIL ANALYSIS

1.1 pH Turf grass performs best in a slightly acid medium. A pH between 5.5 and 6.5 (HCl) would be considered ideal and the GKP would only be expected to keep it at that level.

A reading below 5.5 would require the inclusion of some liming material. A mild adjustment could be achieved by using LAN (Limestone Ammonium Sulphate) as the main source of Nitrogen whereas a more drastic adjustment would require the use of Lime, Dolomite, or Magnesite in the fertiliser programme

Decreasing the pH is more difficult. A pH in excess of 6.5 often occurs as a result of the application of liming materials or the use of alkaline irrigation water or top-dressing. A mild reduction could be achieved by the use the Sulphates of Ammonium and Iron.
More drastic reductions would require the use of Elemental Sulpher (about 20 Kgms per green year.

1.2 Cation Exchange Capacity - In the Soil Analysis report the laboratory will provide the GKP with –

- The total C.E.C. or T-Values
- The relative percentages of the main elements – Calcium (Ca), Potassium (K) , Magnesium(Mg and Sodium (Na)

1.2.1_ <u>C.E.C.</u> This is a measure of the ability of the soil to "hold" the elements in the root zone for absorption by the roots.
It is known that there exists an electro-static attraction between negative and positively – charged entities. In the soil a negatively-charged anion will attract a positively-charged cation.
These negatively-charged anions can be found attached to "sites" on the surface of the particles which make up the soil. Cations already present in the soil will become attached to them.
Once attached these cations cannot be removed by leaching water **but they can be replaced or "exchanged" by other cations**
When the GKP applies the nutrient elements to the surface of the green and they are carried into the root zone dissolved in water the positively – charged cations of Calcium (Ca), Magnesium (Mg), Potassium (K), Copper (Cu), Manganese (Mg), Zinc (Zn), and Iron (Fe) will replace many of those cations already attached to the anions.
The number of cations which can be so exchanged per unit of dry weight is called the Cation Exchange Capacity of the soil. - and is measured in **milliequivalents (mEq) per 100 gms** of the soil
The C.E.C. of a soil sample is directly related to the surface area available on the particles and, therefore, related to the texture of the soil – the smaller the particle the greater the number of particles and total surface area which could harbor sites for the anions.
Clay particles have negative charges scattered all over their surfaces. Each one of these negative charges will attract cations and hold them in an exchangeable form eg CEC = 30+
Sand particles also have negative charges on their surfaces but because their total surface area is so much less than that of clay they would have much fewer anions and, therefore, "hold" fewer cations. Therefore, sandy soils have a much lower C.E.C, eg CEC=0-4
Organic matter also contains many sites of negatively-charged anions where cations can be held in an exchangeable form eg the C.E.C. of Pine bark can be 268
The CEC well tell the GKP how often he has to fertilise his green.
If he applies a whole months supply of fertilizers to a sandy green at one time the chances are that there would not be enough exchangeable Cations available to take up all the cations of the elements in the fertilizer thus allowing some of the elements to be leached through to the "nether" regions
He will, obviously have to resort to fertilizing more frequently ,or, add organic matter to the soil to increase the CEC
A possible "rule of thumb" would be –
C.E.C. below 10 - Fertlisers every week.
C.E.C.. 10 - 15 –Fertilizers every two weeks.
C.E.C. above 15 –Fertilizers every four weeks.

Note A point to remember is that while clayey soils have a high C.E.C. and could, therefore , be fertilized only once a month the GKP must remember that, because of the clayey soil the root system will be shallower and, if ,in addition the mowing height is in the lower range of the mowing height tolerance for that grass the GKP would have to resort to frequent fertilizing to enable the fewer roots to absorb all the nutrients

1.2.2 Relative Percentages - The elements can overshadow one another and suppress their absorption if there is an imbalance in their presence in the soil sample.

The Calcium to Magnesium ratio is important and should be between 2 and 5.

If below 2 apply Calcium in the form of Gupsum, and if above 5 then larger amounts of Magnesium Sulphate will have to be applied.

The recommended percentage range for these elements would be –

Calcium	65 – 75 %
Magnesium	12 - 20 %
Potassium	5 – 15 %
Sodium	below 5 %

1.3 Other Values

Phosphorous (P) – Of all the chemical tests the phosphorous tests show the greatest variations with laboratories being evenly divided between Bray 1 and 2, Citric, Olsens, and Colwell.

The Lab must indicate which test they have used.

It is fair to assume that coastal soils show high P levels while deficiencies are often encountered inland.

In spite of the high values at the coast it can often be said that most of the P is bound up and unavailable to the grass plant and an annual application of P in a mix of 3 – 1 – 5 during renovation would not go amiss.

When applying P the GKP must remember that P does not move easily in grass and the only time he should apply P would be after scarifying when the green is relatively bare.

Trace Elements Most laboratories include trace elements in their report Any obvious deficiencies must be rectified.

While the elimination of deficiencies is essential the GKP must remember that while not doubting their importance in the soil they are, after all, trace elements and the GKP should avoid being too liberal when applying them.

2.0 THE PLAYER COUNT

In Grass Clippings the wear caused by the players was discussed and it was also pointed out that most of the wear was concentrated on the perimeter of the green – so much so, that we came to the conclusion that the green should be divided into two distinct entities with the perimeter being treated differently.

When fertilizing the GKP would be well advised to apply more fertilizers to the perimeter than the central part of the green.

This aspect was fully discussed in Grass Clippings 10. including the need to know how many players use the greens every month.

3.0 TYPES OF FERTILISERS

Fertilisers can be divided into different groups

3.1 Soluble Fertilisers – These are the most commonly used in the RSA because the nutrients are readily available and quickly converted to plant-available form and relatively cheap.

3.2 Organic Fertilisers Normally the by-product of other industries eg Chicken Litter, sewage. The nutrient content can vary between products. Their benefits are increased water-holding capacity and ease of absorption but they can be expensive and unless regularly analysed the GKP cannot say with certainty what he is applying to his green.

3.3 Slow Release Fertilisers –Have been developed recently but the release of the fertilizer is still dependent on external factors such as pH. Moisture content and temperature – not recommended on a bowling green.

3.4 Liquid Fertilisers - Normally used where foliar fertilizing is recommended . They have the advantage of quicker uptake and leave no residue

3.5 Granular Fertiliserss – Many GKP's still apply their fertilizers in the form of granulars. Although easy to apply using a rotary spreader I do not think one gets the even spread if the size of the granules varies

4/0 EQUIPMENT

4.1 Boom Spray Consists of a 200litre drum connected to a pump and then by a hose to a mobile boom spray which can be pushed (or pulled) backwards and forwards across the green giving it an even distribution over the whole green .Having calculated how much fertilizer the whole green needs the GKP will put it into the 200 litre drum and fill it with water. If the greens assistant walks at a constant speed the 200litre will just be enough to fertilise the whole green.

4.2 Foliar Feeding If the GKP wants to use the Boom Spray as a foliar feeding he must ensure that –

- The sprays are very fine
- He only sprays about 50 – 70 litres on the whole green
- The operator walks backwards so that the droplets on the leaves are not disturbed.

4.3 Granular Spreader Either drop-type or rotary spreaders can be used. .Operational efficiency is low because there cannot always be the assurance that the fertilizer was evenly spread over the whole green.

4.4 Fertigation By adding the fertilizers to the irrigation water thus applying small quantities evenly every time the green id irrigated..

4.5 Mix Nozzle Based on the venturi system The device is attached to the end of hose .A thin pipe leading from a pail of fertiliser in solution and attached to the device will draw up fertilizer and mix it with the water emerging from the hose – it works but the assistant is occupied for most of the day.

General The basic conditions which could apply to fertilizing are–

I- It must be easy to set up

2 It must not be labour – intensive

5.0 THE PROGRAMME

5.1 Nitrogen (N) The GKP must decide, at the outset how mush "stimulation" the grass needs. As a standard we and the Australians have always advised applying 53 – 55 Kgms of pure N per year divided into 10 monthly (or more frequent)applications..

The source of Nitrogen would probably be Ammonium (Sulphate or Nitrate (LAN))

Ammonium Sulphate is only 22% N (LAN is 26 %) and the rest is the carrier i.e. in every 100kgms of Ammonium Sulphate there are only 22 Kgms are actually pure N– therefore if you intend applying 5.3 Kgms of pure N every month you would have to apply 25 Kgms of Ammonium Sulphate

Note While Ammonium Salts are commonly used the GKP should remember that Ammonium is basically volatile and in hot weather some of the Nitrogen could easily be lost into the atmosphere as Ammonia gas. – do not fertilise with Ammonium in the heat of the day.

Urea contains 45% Pure N – You would only need between 11 and 12 Kgms of urea/month

5.2 Potassium (K) You would be applying about 35 Kgms of pure Potassium (About 2/3 of Nitrogen) annually Potassium Sulphate (or Chloride) contain 50 % pure K

Your monthly requirement would, be 3.5 Kgms of pure K (7 Kgms of Potassium Chloride.

Potassium Nitrate is 38 % K and 13% N

5.3 Phosphorous (P) The amount of pure P required is about one tenth of that for N but as there might be enough P in the soil already you would have to take note of the soil analysis. It is, however fairly safe to apply 25 Kgms of 3-1-5 annually with renovation

3 -1-5 is made up as follows – 3 parts of N – 1 part of P and 5 parts of K. The active ingredient in 3-1-5 is 46 %. Therefore the N in a 100 kgms of 3 – 1- -5 would be 3/9 = 15.3 Kgms , P would be 1/9 = 5.1 Kgms and K would be 5/9 = 25.6 Kgms . If 25 Kgms is applied the you would be applying N = 3.8 , P = 1.3 and K = 6.4.

If you intend applying 3 -1 – 5 at renovation you would have to reduce the amount of N and K in the monthly application An alternative would be to apply Superphosphate or MAP.

5.4 Magnesia (Mg) Magnesia is usually given as Magnesium Sulphate or Magnesium Nitrate. The active ingredient in Mag.Sulph. is 9.9 %. The amount given would depend on the soil analysis.

5.5 1 – 0 – 1 Equal amounts of Nitrogen and Potassium – the active ingredients are 14 % which means that in a 100 kgms there would be 7.0 Kgms of N and 7.0 of K. A very popular and ready made mixture for the "lazy" GKP

Note The GKP could get the same effect if he mixes the Nitrogen and Potassium himself – eg.50 Kgms of 1-0-1 would yield 3.5 Kgms of N and K.

16 Kgm of Ammonium Sulphate and 7.0 Kgm of Potassium Chloride would yield the same amount of N and K and cost much less.

Remember if you buy a ready-mixed product from a fertilizer firm he is going to charge you for mixing the product.

5.6 Iron (Fe) Normally applied as Ferrous Sulphate especially if the soil is slightly alkaline. The monthly dose varies between 1.0 and 2.0 Kgms.

Because there is the possibility that iron might be converted into an insoluble form in the soil an alternative would be to use Iron Chelate (300 – 400 gms) which is more expensive but absorption is more assured.

5.7 Manganese (Mn) It's occurrence in our soils is fairly constant and the GKP could safely apply about 2.0 Kgm of Manganese Sulphate every month.

6.0 COMMENTS

Most GKP's rely on the programme sent to them by the Laboratory. This is all, very well as long as the Lab specializes in sports turf analysis but very often these Labs are agriculturally orientated with the result that their recommendations are based on the needs of crops rather than the grass used on a bowling green .eg Crops like Lucerne flourish in an alkaline environment while sports turf prefers an acid medium.

At the same time many so-called experts are more interested in selling their own mixtures rather than suggesting a programme which would suite the needs of the bowling green and is less expensive.

The following programme could be applied all over the RSA where the soil is slightly alkaline

<u>Per Month</u>

Ammonium Suplhate	25 – 30	Kgms
Potassium Chloride	9.0	Kgms
Ferrous Sulphate	2.0	Kgms
Manganese Sulphate	2.0	Kgms
Magnesium Sulphate	5.0	Kgms

- The GKP would be wise to alternate Potassium Cholide with Potassium Sulphate
- If the pH is between 5.5 and 6.5 then the GKP could apply 12 Kgms of Urea instead of the Ammonium Sulphate.
- The GKP might have to adjust the amount of Magnesium if the soil analysis shows an imbalance with Calcium.

7.0 CONCLUSION

We have now allocated three Grass Clippings to this subject and I can assume that some of you are more confused than ever before – I would suggest you read it again.

Fertilising is not something you can leave to your assistants and yet it must not be complicated otherwise you would tend to put it off

There are many things one has to bear in mind when working out your own programme but once all the thinking is over it should be straightforward it must not be something you can put off.

In these issues of GC 10 , 11 and 12 I have stressed a few things which bear reperating.

- Fertilsers or Nutrients are the "vitamins" of the grass plant – they do not provide the energy required to make the grass plant grow.
- If you want you car to go faster you press the accelerator but the car will only go faster if there is enough fuel to cope with the increases demand

  If you stimulate the grass plant to grow faster you can only do so if there is an adequate supply of Carbo-hydrate to sustain that growth i.e enough leaf area.
- Your bowling green is not a single uniform entity – the perimeter is exposed to much more wear than the centre and needs much more stimulation and tender loving care than the centre – remember the Player Count and the need to "distribute the load " effectively.

I hope that many of you will accept the basic tenets contained in these articles and end up with a new perspective on what is embodied in the word **fertilizing.**