INFORMATION ON NUTRIENT ANALYSES

Soil texture describes the relative proportions of sand, silt and clay particles in a soil. Soils containing a high proportion of silt and clay are said to be ‘heavy’. They hold more water than light, sandy soils, providing better moisture reserves during dry periods, and have a greater capacity for retaining nutrients. However they are more prone to waterlogging, are generally more difficult to cultivate and warm less rapidly in the spring. Loam soils are considered the most suitable for gardening. They exhibit properties which lie between those of ‘heavy’ and ‘light ’ soils. Loam soils which contain predominantly more clay particles than sand or silt are described as clay loams, those with predominantly more sand particles, sandy loams and so on.

Organic matter, reported in the results as a percentage by weight, is an essential component of any fertile soil. It helps form good soil structure, releases nutrients as it slowly breaks down and provides a source of food for many of the organisms that live in the soil. Its level depends on the use the soil has been put to in the past and how it is managed at present. Generally speaking a medium to high level of organic matter should be aimed for, although levels will tend to naturally increase under cool, wet conditions and decline when the soil environment is warm and moist. Soil which is rarely dug usually has higher organic matter levels than that which is cultivated regularly.

Soil pH describes the level of soil acidity or alkalinity. It affects uptake and availability of nutrients and toxic elements, regulates microbial activity and influences soil structure. A scale of 0 to 14 is used to express pH where 0 is extremely acid, 14 extremely alkaline and 7 neutral. In the soil environment it is rare to experience a pH value outside the range 4 to 9. Most garden plants do best at pH 6.5 although ericaceous plants like rhododendrons, azaleas and camellias prefer more acid conditions.

There are a number of chemical elements essential for healthy plant growth. Of those needed in quantity, the most important are nitrogen, phosphorus, potassium and magnesium.

Nitrogen, which is needed for leaf and shoot growth is commonly in short supply in garden soils. Nitrogen levels fluctuate greatly during the year, therefore the results of nitrogen analysis are rarely meaningful and are not included here. It is good horticultural practice to make annual applications of organic matter which release nitrogen slowly throughout the season. Supplementary quick-acting nitrogen fertiliser applications, using either inorganic products or an organic form such as dried blood, will benefit many crops during the growing season. Ensure the applications are made to moist soil and do not feed the plants late into the summer to avoid production of soft growth susceptible to early frosts.

Phosphorus is needed particularly for sturdy root growth. Some forms of phosphorus are unavailable for plant uptake. The analysis performed measures the portion that is available to plants. The results are given in milligrammes per litre (mg/l) and as an index using a scale of 0 to 9 where 0 is low and 9 is very high. Phosphorus is relatively immobile in the soil but deficiencies may arise after continuous cropping or where new gardens are established on old pasture.

Potassium is needed for the movement of nutrients through the plant, to maintain healthy tissues and for the production of quality flowers and fruit. Deficiencies tend to occur in acid soils and through displacement by other elements such as calcium and magnesium. As with the analysis of phosphorus, the analysis measures available potassium, and the results are presented in both mg/l and as an index.

Magnesium is an essential component of the green pigment chlorophyll in plants. Deficiency usually shows first as a yellowing of the older leaves and commonly occurs in free-draining, sandy soils or as a result of displacement by higher levels of other nutrients such as calcium and potassium. The results are presented in mg/l and as an index.

The following report is divided into fruit, vegetable, ornamental and lawn fertiliser recommendations, depending upon which were originally requested. Comments relating specifically to soil sent in for analysis are printed in bold italic text. Rates and timing of fertiliser applications are given at the end of each section.

Fertiliser recommendations are given for the widely available inorganic fertiliser ‘Growmore’ (NPK 7.7.7). This provides a supply of nitrogen, phosphorus and potassium in one application. Where magnesium is needed, a seperate recommendation is given. It is quite feasible to supply the required nutrients using alternative organic dressings, bearing in mind that most organic nutrient sources tend to release slowly over time.

In certain cases ‘straight’ fertilisers, such as sulphate of potash, Epsom salts and bone meal, have been included where more concentrated applications of individual nutrients are required or where a potassium/phosphorus imbalance needs to be corrected.

Where ‘base dressing’ is mentioned, this refers to the application of fertiliser to soil followed by incorporation to root depth. It is usually carried out when preparing soil prior to planting or sowing. ‘Top dressing’ refers to application of fertiliser to the soil surface, and is generally used around established plants where incorporation is more difficult. It is important to ensure soil is moist before any fertiliser is applied and that gloves are worn when handling any fertiliser materials.

FERTILISER RECOMMENDATIONS

FRUIT

Garden grown fruits can be divided into two groups for the purpose of fertiliser recommendations; tree fruits which include apples, pears, plums and cherries; and soft fruits such as raspberries, blackberries, currants and strawberries. Within these divisions, it is necessary to differentiate between areas of established crops and land being prepared for new plantings.

There was a moderate amount of organic matter in the soil from your garden. Further applications of organic matter such as well rotted compost or farmyard manure are recommended to increase the fertility of the soil.

Established fruit crops grow best at pH 6.0 to 6.5. If lime is required to raise the soil pH before planting, it should be applied accurately and evenly to ensure a uniform effect. Correction of soil acidity takes time, especially in established plantings where lime is difficult to incorporate. It is therefore important to take prompt action as soon as lime deficiency is observed. If the soil pH falls below 5.5, trace elements become more available for plant uptake and can reach toxic levels. If the soil is over-limed, trace element deficiencies can develop such as lime induced chlorosis which is a symptom of iron and manganese deficiency. Raspberries and blackcurrants are most susceptible to extremes of pH and for these crops in particular the soil needs to be maintained at approximately pH 6.5. The choice of liming material is important in fruit cultivation. Generally, ground limestone or ground chalk are quite satisfactory for raising the soil pH, but where magnesium is known to be in short supply as well, it is advisable to use Dolomite limestone. This not only increases the pH but also acts as a slow-release source of magnesium.

Your soil pH was measured at 5.9. An application of liming material is necessary to bring the pH within the desired range for tree and soft fruits. The lime must be thoroughly incorporated into the top 40cm (15 inches) of the soil at least three months prior to planting. In established orchards and beds it is very difficult to correct soil acidity. If the plants are suffering, it may be necessary to re-establish on newly prepared sites.

Phosphorus requirement varies with the type and age of the fruit crop. Low soil phosphorus observed prior to the establishment of a fruit crop is relatively simple to correct since fertiliser can be incorporated easily at this stage. If this is done well it will provide an adequate supply for the first three years of the crop, as long as the ground surrounding the fruit is kept clear of grass and weeds. Once a crop has been established, movement of phosphate in the soil is slow and treatments need longer to take effect.

The level of phosphorus measured in your soil is considered borderline for fruit cultivation and there is a risk of phosphorus deficiency on acid sandy soils. Where possible correct phosphorus deficiency before planting. For fruit which is already established an adequate level of phosphorus in the soil can be achieved by top dressing once every two years at twice the annual recommended rate.

Potassium deficiency primarily affects fruit development and is most common on light sandy soils. Symptoms of deficiency vary between different crops but the main characteristics are scorching to the margins of lower leaves, thin, spindly growth, poor fruit development and incomplete ripening. Correction of potassium deficiency requires care since excessive use of potassium containing fertiliser can interfere with magnesium uptake leading instead to magnesium deficiency. As with phosphorus, areas of fruit receiving potassium fertiliser on planting will have an adequate supply for the first three years of their development providing the surrounding ground is kept free from grass and weeds.

The soil from your garden has a low level of potassium which may lead to potassium deficiency in fruit crops. Before fruit is planted, potassium fertiliser should be applied as a base dressing. The fertiliser should be incorporated thoroughly and the soil well watered to avoid damage to young roots of newly planted crops. In established orchards, the application of potassium containing fertilisers should be made to the soil surface as incorporation of the fertiliser will damage the roots. High levels of potassium fertiliser are needed to correct deficiencies in soft fruit. It is recommended to use sulphate of potash on raspberries, redcurrants and gooseberries, when very high levels of potassium are to be applied.

Magnesium deficiency in fruit crops commonly occurs on light, free draining soils or on soils where excessive levels of potassium containing fertilisers have been applied. Deficiency symptoms vary from crop to crop. Generally it is characterised by yellowing between veins on lower leaves which leads to dead brown tissue forming in the same areas. In apples, susceptibility also differs with cultivar, for instance ‘Cox’s Orange Pippin’ is very susceptible whilst ‘Bramley’s Seedling’ is rarely affected. Soft fruit show a range of symptoms including the above, as well as purple leaf tints in blackcurrants and purple-red banding around the leaf edges in gooseberries. Treatment involves either a fast-acting foliar application of Epsom salts during the growing season, or top-dressing in early spring with Dolomite limestone instead of lime. If deficiencies are treated prior to planting with a base-dressing of either Epsom salts or Dolomite limestone, fruit should not require further magnesium for at least three years provided plants are grown on open ground.

There is adequate magnesium in your garden soil for most fruit crops. No magnesium fertiliser is necessary but extra magnesium from other fertilisers or liming materials will cause no harm and will in fact help to maintain the magnesium levels in your soil at their present level.

Recommendations

Your soil pH was measured at 5.9. The level of available nutrients in your soil was determined at Index 2 (Medium) for phosphorus, Index 0 (Low) for potassium and Index 3 (Medium) for magnesium. The fertiliser recommendations for tree and soft fruits are as follows :

An application of liming material is necessary to bring the pH within the desired range for tree and soft fruits. It is suggested that 766g per square metre (27 ounces per square yard) of lime is applied. The lime must be thoroughly incorporated into the top 40cm (15 inches) of the soil at least three months prior to planting. In established orchards and beds it is very difficult to correct soil acidity. If the plants are suffering, it may be necessary to re-establish on newly prepared sites. The lime requirements of your soil must be attended to before considering fertiliser applications. As the magnesium rating of your soil is borderline, the use of a magnesium containing liming material e.g. Dolomite limestone, is recommended.

Fruit Trees - before planting

Prior to planting, incorporate 100 g per square metre (3.5 ounces per square yard) of Growmore (NPK 7-7-7) as a base dressing. However, as the level of soil potassium is low in relation to the level of phosphorus, it is recommended that this application is supplemented with 30 g per square metre (1 ounce per square yard) of sulphate of potash making sure the fertiliser is mixed thoroughly into moist soil.

Established Fruit Trees

Apply, 114 g per square metre (4 ounces per square yard) of Growmore (NPK 7-7-7) as a top dressing. However, as the level of soil potassium is low in relation to the level of phosphorus, it is recommended that this application is supplemented with 40 g per square metre (1.5 ounces per square yard) of sulphate of potash and mixed thoroughly into moist soil.

Soft Fruit

Cane and bush fruit should be given 157 g per square metre (5.5 ounces per square yard) of Growmore (NPK 7-7-7) during the cropping season. A base dressing, before planting, of half the recommendation is suggested, followed by the rest as a top dressing during March. However, as the level of soil potassium is low in relation to the level of phosphorus, it is recommended that this application is supplemented with 25 g per square metre (1 ounce per square yard) of sulphate of potash and mixed thoroughly into moist soil.

VEGETABLES

There was a moderate amount of organic matter in the soil from your garden. Further applications of organic matter such as well rotted compost or farmyard manure are recommended to increase the fertility of the soil.

Vegetables require a soil pH of about 6.5 for optimum growth. Different crops vary in their sensitivity to soil pH and under extremes of pH, restrictions to growth may occur.

Your soil pH was measured at 5.9. This soil is fairly acidic and would normally require some liming to bring the pH up to 6.5. Most vegetables will be affected by the soil acidity at this pH and growth may be poor. It is suggested that lime is applied in the autumn or winter. The liming material should be applied to the soil surface after the vegetable crops have been removed and thoroughly forked in to ensure even distribution throughout the top 15-25 cms (6-10 ins) of soil.

Some soils have the ability to lock-up phosphorus, making a deficiency of this nutrient difficult to correct. To make best use of phosphorus fertiliser apply it so that it lies in close proximity to germinating seeds and young plants. Certain crops respond better to phosphorus containing fertilisers than others. Carrots, lettuce and spinach require high doses of phosphorus containing fertilisers whereas most of the cabbage family and parsnips have a lower requirement.

The level of available phosphorus measured in your soil should be adequate for most vegetables. A low level of phosphorus containing fertiliser is required for crops that are considered to be sensitive to phosphorus deficiency such as carrots.

Potassium deficiency in vegetable crops generally occurs under intensive growing conditions where the demands for growth are high. It can also occur under conditions of drought and where high levels of other nutrients (for instance high levels of nitrogen fertiliser) have been applied. These deficiencies are corrected by regular fertiliser dressing but potassium is also released slowly from clay minerals breaking down in the soil.

The level of potassium in your soil is very low and could cause a reduction in the growth of vegetable crops. Vegetables are likely to suffer weak growth, early die-back and leaf yellowing. Fertilisers rich in potassium should be applied generously. However, when applied to seed beds the fertiliser must be thoroughly worked into the soil to avoid reduced germination and damage to the seedling's developing root system.

Magnesium deficiency is most common in free-draining sandy soils especially when the crop is growing rapidly. It can be corrected with magnesium containing fertilisers, but the choice of fertiliser is important since Dolomite limestone, a popular magnesium fertiliser, also has a liming effect on the soil. Only apply Dolomite limestone if the soil pH is lower than optimum. If the soil pH is satisfactory, use Epsom salts instead.

The level of magnesium measured in your soil is adequate for most vegetable crops. Any fertilisers containing magnesium will help to maintain the magnesium content of the soil. Vegetable crops generally do not require further addition of magnesium at this soil index.

Recommendations

Your soil pH was measured at 5.9. The level of available nutrients in your soil was determined at Index 2 (Medium) for phosphorus, Index 0 (Low) for potassium and Index 3 (Medium) for magnesium. The fertiliser recommendations for vegetables are as follows :

It is suggested that 383g per square metre (13.5 ounces per square yard) of lime is applied in the autumn or winter. The liming material should be applied to the soil surface after the vegetable crops have been removed and thoroughly forked in to ensure even distribution throughout the top 15-25 cms (6-10 ins) of soil. The lime requirements of your soil must be attended to before considering fertiliser applications. The best liming material to use is powdered limestone or chalk.

The amounts of fertiliser suggested in the recommendations are based on rates used by professional growers to maximise yields. Gardeners may decide to reduce the amounts of fertiliser they apply but must accept that this may affect the size of the crop produced.

The recommendations have been split into three broad categories : those vegetable crops classified as heavy feeders, those with medium nutrient requirements and those which require low levels of fertiliser.

HEAVY FEEDERS : Brussels sprouts, celery, cabbage, leeks, maincrop potatoes

Broadcast 330 g per square metre (11.5 ounces per square yard) of Growmore (NPK 7-7-7) one month before sowing or planting and incorporate into the top 30 cms (12 ins) of soil. However, as the level of soil potassium is low in relation to the level of phosphorus, it is recommended that this application is supplemented with 28 g per square metre (1 ounce per square yard) of sulphate of potash making sure the fertiliser is mixed thoroughly into moist soil.

MEDIUM FEEDERS : broccoli, beetroot, cauliflowers, courgettes and marrows, early potatoes, lettuces, rhubarb, spinach, sweetcorn

Broadcast 294 g per square metre (10.5 ounces per square yard) of Growmore (NPK 7-7-7) one month before sowing or planting and incorporate into the top 30 cms (12 ins) of soil. However, as the level of soil potassium is low in relation to the level of phosphorus, it is recommended that this application is supplemented with 34 g per square metre (1 ounce per square yard) of sulphate of potash making sure the fertiliser is mixed thoroughly into moist soil.

LIGHT FEEDERS : beans, carrots, onions, parsnips, swedes, outdoor tomatoes, turnips

Broadcast 250 g per square metre (8.5 ounces per square yard) of Growmore (NPK 7-7-7) one month before sowing or planting and incorporate into the top 30 cms (12 ins) of soil. However, as the level of soil potassium is low in relation to the level of phosphorus, it is recommended that this application is supplemented with 25 g per square metre (1 ounce per square yard) of sulphate of potash making sure the fertiliser is mixed thoroughly into moist soil.

ORNAMENTALS

There was a moderate amount of organic matter in the soil from your garden. Further applications of organic matter such as well rotted compost or farmyard manure are recommended to increase the fertility of the soil.

There is a vast range of ornamental plants grown in gardens, each with its own specific needs. To specify fertiliser and lime requirements similar plants have to be grouped together and generalisations made. A major distinction lies between the pH requirements of different ornamental plants. The vast majority grow most vigorously at pH 6.5, and many tolerate more alkaline conditions up to pH 7.5. Some plants however need acid soils and will not thrive at soil pH values above about 5.5. This group includes ericaceous plants such as azaleas, *Calluna, Enkianthus, Erica* (certain forms), *Gaultheria, Kalmia, Pieris,* rhododendrons, and other acid lovers such as camellias, magnolias and skimmias. Under alkaline conditions they are prone to iron and manganese deficiency which leads to an interveinal yellowing of the leaves known as lime induced chlorosis. It is, therefore, important to know the pH of your soil before selecting ornamentals and if ericaceous plants are grown, use of liming materials should be restricted.

Your soil pH was measured at 5.9. This is fairly acidic. An application of lime to bring the pH of the soil up to 6.5 is necessary if the ornamentals you are growing need a higher pH than that measured in your soil. If however, the border is being used for the cultivation of ericaceous (acid loving) plants, the soil pH is correct and no lime needs to be applied.

Phosphorus requirements for ornamental plants have to be made in generalised terms because in most cases information regarding individual needs is limited. Phosphorus deficiency can be difficult to correct because in some soils, phosphorus is rapidly locked up once applied as a top dressing. Careful placement of fertilisers in the seedbed and around roots is necessary. Dressings of well-rotted manure and compost will reduce the risk of phosphorus deficiency and improve the soil's structure and organic matter content.

The level of phosphorus in the soil from your garden is just adequate for most ornamental plants, but should be supplemented by the use of standard compound fertilisers.

As with phosphorus, only general recommendations can be given regarding potassium requirements for ornamental plants. Soil potassium status has to be maintained at an optimum level to ensure good flower development and colour. Incorporation of well rotted manure and compost into borders will supply some potassium and reduce the amount of additional fertiliser you need to apply.

The level of potassium in your soil is very low and deficiency may occur in most ornamentals. Symptoms include weak growth, early die back and leaf yellowing. Potassium fertilisers should be applied as recommended. Care must be taken when applying high levels of potassium fertiliser to the soil where young plants are growing. High concentrations of potassium fertiliser in close proximity to the root can lead to root death and leaf scorch. The fertiliser should be incorporated thoroughly when the soil is moist.

Magnesium deficiency occurs most frequently on sandy free draining soils. Symptoms vary but a common characteristic is interveinal yellowing on the older leaves which leads to scorched brown patches forming. It should not be confused with iron deficiency which causes interveinal yellowing on the young growth first. In a similar fashion to potassium and phosphorus, only general recommendations can be made regarding magnesium requirements for ornamentals. Application of the magnesium fertiliser Dolomite limestone increases soil pH as well as supplying magnesium, so should not be used where soil pH is already above 6.5 or where ericaceous plants are grown. In these cases, Epsom salts should be used to supply magnesium instead.

The magnesium status of your soil is adequate for most ornamental shrubs and flowers. Any magnesium derived from fertiliser applications will help to maintain the soil magnesium status and will not be harmful to plant growth. Magnesium levels will however decline in subsequent years requiring future applications of this nutrient.

Recommendations

The fertiliser recommendations for ornamentals grown in the garden differ from the practices of commercial horticulture. The rates of fertiliser, calculated for your soil, are based on requirements for a good garden display of ornamental species.

Your soil pH was measured at 5.9. The level of available nutrients in your soil was determined at Index 2 (Medium) for phosphorus, Index 0 (Low) for potassium and Index 3 (Medium) for magnesium. The fertiliser recommendations for the various classes of ornamentals are as follows :

An application of lime to bring the pH of the soil up to 6.5 is necessary if the ornamentals you are growing need a higher pH than that measured in your soil. It is suggested that 383g per square metre (13.5 ounces per square yard) of lime is applied in the autumn or winter. The liming material should be applied to the soil surface and raked in. If however, the border is being used for the cultivation of ericaceous (acid loving) plants, the soil pH is correct and no lime needs to be applied. The lime requirements of your soil, if needed, must be attended to before considering fertiliser applications. As the magnesium rating of your soil is medium, the use of a magnesium containing liming material e.g. Dolomite limestone, is recommended.

Annuals

Prior to planting, incorporate 55 g per square metre (2 ounces per square yard) of Growmore (NPK 7-7-7) as a base dressing.

The magnesium level in your soil will be increased by the use of Dolomite limestone, as recommended above.

Herbaceous Perennials

Enrich the soil with well rotted organic matter and apply 67 g per square metre (2.5 ounces per square yard) of Growmore (NPK 7-7-7) as a base dressing before planting. Around established plants, apply a top dressing of sulphate of ammonia (21% N) at 34 g per square metre (1 ounce per square yard) in April. Ensure that the soil is moist prior to application and avoid contact with the leaves.

Bulbs

In March, apply 34 g per square metre (1 ounce per square yard) of Growmore (NPK 7-7-7) as a top dressing. Where feeding has not been carried out or performance was unsatisfactory, apply 2 to 3 applications of a proprietary balanced, or high potash feed (e.g. tomato fertiliser) once flowering has ended, whilst foliage is still green.

Ornamental Trees and Shrubs

Prior to planting apply 75 g per square metre (2.5 ounces per square yard) of Growmore (NPK 7-7-7) and incorporate thoroughly into the backfill. Apply a top dressing of Growmore (NPK 7-7-7) at a rate of 125 g per square metre (4.5 ounces per square yard) in March around established plants and supplement this with an application of a proprietary tree or shrub fertiliser in May or June following the manufacturer's recommended rates. Uniformly apply the fertiliser over an area extending just beyond the end of the branch spread and avoid contact with the leaves and stems.

Rhododendrons, azaleas and camellias

Broadcast 75 g per square metre (2.5 ounces per square yard) of Growmore (NPK 7-7-7) as a top dressing in March followed by a second top dressing of sulphate of ammonia (21% N) at a rate of 35 g per square metre (1 ounce per square yard) in late April. Uniformly spread the fertiliser underneath the branches and extend just beyond the spread of the foliage. It is best to apply fertiliser onto moist soil before any mulch is put down. Avoid bringing fertiliser into contact with the foliage and water after application if the soil remains dry for more than a day.

Wild Flowers

Wild flower establishment is most successful where soil fertility is low. The majority of wildflower species grow on soils with a low nutrient status (field margins, uncultivated pastures, woodlands etc.). This means that for wild flowers, the fertiliser recommendations in this report would not be suitable. If you have a naturally rich soil and are determined to try to create a wild flower area, stop any organic matter or fertiliser applications, remove grass mowings or plant prunings as they are produced and try mixing the top-soil with the poorer sub-soil beneath. This will all contribute to a natural decline in fertility over time.