Fertiliser and Nutrient Management

A Good Advice Guide for Gardeners

The Garden Clubs of Australia Inc.

The topic of nutrient and fertiliser management in the garden is unlikely to contain any major surprises, however, for the Australian gardener, a basic knowledge of fertilisers is essential in producing and maintaining healthy, attractive and productive garden plants.

Unlike many notable world gardening locations, Australia is an extremely old country and most of our soils have lost their natural richness many thousands of years ago and are often just a thin layer over very infertile bases. Some sandy soils can be deficient in mobile nutrients such as nitrogen, potassium and some micronutrients due to leaching. All too often our homes are built on soil that has been misused by builders who either introduce poor quality soil to create a quick level surface or scrape away quality top soil to create a level surface, thereby leaving the home owner with less fertile sub-soil for the lawn and garden area.

To promote good growth in our gardens, a considerable effort needs to go into soil development and part of that effort includes the use of fertilisers and other nutrient materials. Garden plants can suffer from nutrient deficiencies (too little) or toxicities (too much), so a clear awareness of the basic requirements is valuable.

Right: A *Liquidambar styraciflua* leaf showing the signs of interveinal chlorosis. This is caused by the plant being unable to produce enough chlorophyll, probably because of a nutrient deficiency.
(Photo courtesy of Wikimedia Commons)

The Basics

In general, plants need 17 elements for normal growth: carbon, hydrogen and oxygen are found in air and water. Nitrogen, potassium, magnesium, calcium, phosphorous and sulphur are found in the soil. These six elements (macronutrients) are used in relatively large amounts by plants.

There are eight other elements that are used in much smaller amounts (micronutrients) also found in the soil – iron, zinc, molybdenum, manganese, boron, copper, and cobalt [1]. Both macronutrients and micronutrients are needed for healthy plant growth.

All fertilisers are labelled with three numbers. These numbers give the percentage by weight of Nitrogen (N), Phosphate (P) and Potash (K). Nitrogen is important for leaf and stem growth and provides the rich green colour in a plant. Phosphorus, derived by the plant from phosphate, provides for root and flower growth. Potassium, derived by the plant from potash, helps build plant tissue and aids in the production of chlorophyll (- see photo above).

Below right: This citrus leaf is displaying a dull green tone with yellow mottling and with a deeper green 'V' shape towards the petiole. The recommended solution would be to water more regularly, feed well with aged chicken manure monthly and to spray the leaves with magnesium chelates. In winter, feed citrus with liquid seaweed at a rate of 10ml/watering can, plus liquid potassium (20ml/watering can) to strengthen cell walls and to give the plant a few extra degrees worth of protection.

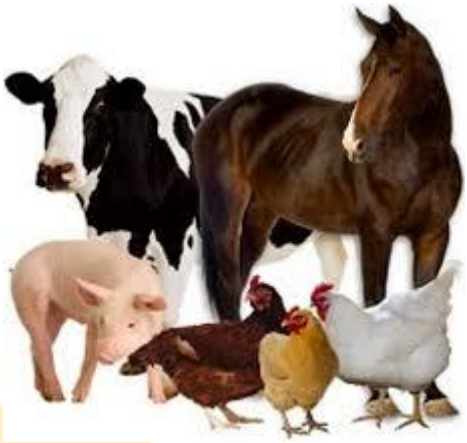
1. See The Garden Clubs of Australia website (https://gardenclubs.org.au/education/) under ***Resources*** for further information on Trace Elements.

MACRONUTRIENTS AND THEIR FUNCTIONS	DEFICIENCY SYMPTOMS	REMARKS
Nitrogen (N) – develops healthy shoot and leaf growth. Promotes fruit set and size. Part of proteins, enzymes, chlorophyll and growth regulators.	Reduced growth, dull green leaves, yellowing (chlorosis); reds and purples may intensify with some plants; poor growth flush and stunting. Poor fruit set and heavy shedding.	Excess will yield all leaf and stem growth with poor flowers and little fruit. Nitrogen is quickly leached in sandy soils and needs annual replenish-ment.
Phosphorus (P) – important in developing leaves, flowers and quality fruit. Has a role in carbon, hydrogen and oxygen metabolism; respiration and photosynthesis.	Reduced growth, colour may intensify, foliage turning dull bronzed green or brown or purple in some plants; thin stems, loss of lower leaves, reduced flowering and fruiting, low juice content.	In very acid or alkaline soils, phosphorus will be unavailable. Helps to store energy. Important in maintaining the balance between nitrogen and phosphorus.
Potassium (K) - important in starch formation, sugar translocation, water relations, disease resistance, chlorophyll development, fruit size and quality and root formation.	Reduced growth, shortened internodes, marginal burn or brown leaf edges, dead spots in the leaf, reduction of lateral breaks and tendency to wilt readily. Small fruit.	Large amounts of potash are needed by most plants most especially in light and sandy soils. Helps to keep cells plump and turgid to manage climatic changes.
Magnesium (Mg) – essential in producing chlorophyll; important in disease resistance, energy utilisation, enzyme activator.	Reduction in growth; yellowing between veins, also can occur in middle or lower leaves; reduction in seed production.	Interferes with calcium uptake if used in excess. Deficiency can be severe in sandy soils. Use dolomite or Epsom salts in tropical areas.
Calcium (C) – important in cell wall structure, cell division, enzymes and as an enzyme activator.	Inhibition of bud growth; death of root tips; cupping of mature leaves; weak growth.	Too much calcium will result in high pH causing many of the micronutrients to become unavailable to the plant.
Sulphur (S) – part of protein, amino acids, vitamins; very important in respiration.	Symptoms are a general yellow-ing of the affected leaves of the entire plant; leaves are small with rolled down edges; some pigmentation.	Sulphur is usually derived from the atmosphere (dissolved in rain) and organic manures.

Table above adapted from a publication by University of Virginia/Virginia Tech.

A fertiliser is said to be complete when it contains nitrogen, phosphorus and potassium. An incomplete fertiliser will be missing one of these major components.

Slow-release fertilisers release nutrients over an extended period of time if the temperature is average. They can break down faster in hotter temperatures and in cold temperatures can delay or not release nutrients as expected.



Animal manures, blood and bone and composts are examples of organic fertilisers. They usually contain relatively low concentrations of nutrients, but they perform other functions which chemical fertilisers do not, such as increasing the organic content of soils, improving the physical structure of soils and increasing worm, bacterial and fungal activity.

There is a large range of liquid fertilisers available

commercially which can be used as a quick and effective way to nourish established plants in pots or in your garden. Liquid fertilisers go to work almost immediately, assuring continued growth and quick recovery for those that are tired and undernourished. Many liquid fertilisers include minerals, trace elements, enzymes and other important natural components.

When it comes to fertilising, **more does not mean better**. It is possible to overfeed your plants. Too much fertiliser can damage and maybe even kill your plants. Often gardeners are advised to have soil tested before applying fertiliser. This allows you to select the type of fertiliser which best suits your plants' needs. Conservative use of fertilisers, particularly inorganic fertilisers, is always preferred.

Remember, excessive use of fertiliser will not be taken up by your plants and could eventually end up polluting rivers and streams. A little fertiliser used regularly is better than a burst of it once a year.

Most cases of nutrient deficiency are usually due to the soil conditions being unsuitable for the plant to take up the nutrient, as happens with low pH, drought or waterlogging, rather than there not being enough of the nutrient in the soil. An example of this is irregular or insufficient watering resulting in inability to move calcium from the soil into the plant. This leads to blossom end rot in tomatoes (- see picture right) and bitterness in fruit because the demand for calcium in the fast-growing fruits' cell walls can't be met.

Right: A tomato showing the signs of blossom end rot due to insufficient or irregular watering. (Photo courtesy of Wikimedia)

In the early stages of deficiency, or in mild deficiencies, the only sign of the deficiency is poor growth. More severe deficiencies can be difficult to diagnose because symptoms can vary between plant species and because most nutrient deficiencies (particularly iron, magnesium or nitrogen) also result in chlorosis (leaf yellowing) when chlorophyll is not being produced.

An acid soil leads to the leaching of cations when there is an excess of water in the soil. In most soils, the cations most likely to be leached are calcium and magnesium. Note that micronutrients become less available as the soil becomes more alkaline. Therefore occasional testing and controlling the pH of the garden soil is the best way of controlling the nutrients and using appropriate fertilisers.

N	The leaf and stem maker and improver	
P	The flower, fruit and root developer	
K	The flower inducer & root maker and for healthy growth	

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