

## FERTILISATION

The major nutrients are obtained by plants from water, air and sunshine. Trees getting these three sources will survive. The daily watering routine in an open planting medium pushes stale air out of the planting medium and draws fresh air in behind the water as it moves downwards. When they have a restricted root run as in a bonsai pot, other foods have to be provided for optimum health and rejuvenation.

The root system uses up the store of food in the small volume available to it more rapidly than if it had an unrestricted volume to reach through in search of its needs. Furthermore, the water which escapes through the drain holes in the pot, takes with it some of the dissolved food. The amount of these nutrients in the medium at re-potting time is mostly used up within six weeks when the plant/tree is actively growing. The answer is to replace these nutrients after the passage of this initial period.

The nutrients in highest proportion according to need are; nitrogen (N), phosphates (P) and potash (K). [Potassium]

Manufacturers of proprietary brands of fertilizer are required to list these items in this same order NPK as ingredients. Nitrogen is used by the plant to extend growth of buds leaves and twigs. Phosphates are mainly used up in root growth and potash in the formation of flowers and fruits. Other elements are added in smaller quantities to fertilizers during manufacture. These include calcium, sulphur, iron, zinc, copper, molybdenum, sodium and some other traces, even vitamin 'B'. These vary from brand to brand and are sometimes absent from the cheaper products.

A balanced fertilizer is one which has fairly equal percentages of the main three ingredients NPK and which would be labelled 10:10:10 or 5:5:5. This is what we would mostly use for our potted plants/trees during the main growing period from March to Mid-September. After that, as the cooler weather approaches, growth slows down and hardly any nitrogen is used, also, the current year's growth needs to be hardened to withstand winter temperatures. This can be achieved by using a formula ratio of 0:10:15 or other low N high K combinations which are often found in tomato fertilizers. When people make up their own fertilizer, they can include the trace elements by adding a pinch of **frit** which is made for the purpose. Another ingredient which has become popular recently is humate, a residual from the decomposition of organic substances over a long period.

Growers will adopt a fertilizer of their own choice which fits in with their management routine. Pelleted, powder, liquid and cake forms are available.

My own routine is to use a liquid feed at fortnightly intervals from the end of March to late October. Specimens of this type include Phostrogen, Miracle-gro and B and Q powders which are dissolved in water before use. All these products have varied formulae to fit in with the requirements of the paragraph above.

Plants with various degrees of lime intolerance, namely ericas, azaleas and some needle trees are better catered for by an ericaceous formula, which increases the acidity of the planting medium. In other words reduces the ph value.

An off-white powdery residue at the base of a tree's trunk or on the top, inside edges of the pot are often an indication that the ph has risen and deposits of lime salts are being left behind. These can be avoided by the use of one of the ericaceous fertilizers, chelated iron or even a drink of black tea on occasion.

If leaves display yellow patches in the middle, it may be an indication of a deficiency which can usually be corrected by watering with a solution of Epsom salts - 1 teaspoonful to a pint of water usually does it for me. Some people use this on a routine basis at two to three month intervals whether or not it seems to be necessary. It does no harm anyway.

Some plants/trees which are kept indoors during the winter continue to grow at a reduced rate and

these should be fed with a half strength solution at monthly intervals only. Ones which are completely dormant of course, require no supplemental feed. Just the moisture content of their growing medium has to be maintained.

Contra indications.

Do not fertilize medium which has dried out. Water well before application.

Do not fertilize weak or sickly plants/trees which would be unable to utilise it.

Do not fertilize within six weeks of re-potting or root pruning. (risk of damaging root tips)

Do not fertilize deciduous varieties in Spring until signs of growth are observed.

Do not use a stronger mix than recommended, rather err on the side of higher dilution.

Plant nutrients.

Magnesium.

This is the central constituent of chlorophyll and helps plant enzymes to do their jobs. New chlorophyll cannot be manufactured without it so a shortage cause's colour loss on the leaves starting from the insides and spreading outward. Not nice to see yellow in the middle of the leaves, or even white in the case of severe deficiency. Along with calcium, nitrogen and sulphur it is also active in making protein to create cells and allow growth to take place. Loss of chlorophyll in the middle of leaves, particularly the older ones, is the sign that supplementation is needed. A dilute solution of Epsom salts sprayed onto the leaves is readily absorbed and corrects the shortage very quickly indeed.

As a measure to avoid a shortage, I have added a little to my water two or three times during the growing season. If there are any adverse effects from a surfeit of Magnesium, I have not experienced any.

Nitrogen.

Vital in regeneration and growth, being an essential part of the amino acids, which combine to make proteins, the building blocks. A shortage may be caused by a lack of bacteria which fix it in the medium, excessive leaching by heavy rainfall on very open mediums or failure to fertilize a sterile medium such as Akadama alone. The symptoms of a shortage are; slow or stunted growth, older leaves turning yellow and reddening of the leaf petioles and veins.

The normal bonsai procedure of feeding at fortnightly intervals with half strength balanced fertilizer during growth periods is adequate insurance against a deficiency of this essential nutrient.

Phosphorus.

Links together with fats and oils to make cell walls, which are capable of allowing the passage of moisture and nutrients into the interior. It is active in chromosome formation and photosynthesis. It acts like a programme driver in a software package, determining the amount of various foods and minerals to be taken in by the roots to create a correct balance. Root and bud growth, leaf colouration and maturing of tissues are controlled by this wonder constituent. As it helps to make chromosomes, a dearth means that genetic material is not

formed so fruiting is stopped, along with the manufacture of new cell walls and growth regulators. Like nitrates, it is absolutely necessary.

A slight bonus from a low level might be better autumn colour.

Calcium.

Puts the 'bones' into the twigs and branches in the form of stiffening membranes in the cells. It also helps to control membrane permeability, (Mentioned in the first sentence in phosphorus above). Like a 'bouncer' it decides which elements to let into the cells. Even ericaceous, (lime hating), plants need some of this. A complete absence would result in rotting margins in new leaves, no buds and die back of root and shoot growth points.

Sulphur.

Works along with nitrogen etc. by actually linking the amino acids together to make building blocks. Like a lack of nitrogen, insufficient sulphur results in yellowing of leaves but this time the younger ones.

Oxygen.

Being essential to most living things, it is needed round the roots as well as the leaves, hence the open, porous, planting mediums which are so beloved of bonsai. These allow the passage of air behind the draining of water, which also contains oxygen. It also has a structural role and controls the use of energy which allows the roots and leaves to work.

Potassium.

It nips in and out of cells to control the amount of water in the plant tissues, keeping everything turgid and under pressure. Also the action of stomata is regulated by this policeman to balance fluid losses. It controls the operation of enzymes, which make protein although it doesn't actually do any building itself.

There are other elements, which are only used in tiny amounts, such as boron, chlorine, copper, iron, manganese and molybdenum. The presence of too much molybdenum inhibits the uptake of copper.

These and other trace elements may be found in Frit; available from bonsai retailers.