# Bonsai Fertilisers

Executive summary

* Bonsai do best if regularly fertilised during growing seasons. Some may struggle to survive without fertiliser.
* There are lots of fertilisers, none of which is perfect. Seaweed extract is good enough for beginners.

Why we care about fertilisers

* Bonsai are typically grown in small pots, without access to a larger soil volume and broader ecosystem to provide scarce nutrients. The soil thus needs “amendment” to provide the right nutrition.
* In the training stage, bonsai are grown in organic soils or in the ground, for rapid growth. However, if the soil happens to be poor in one or more key nutrients, this can limit the tree’s growth or reduce its vigour.
* In the refinement stage, bonsai are typically grown in nutrient-poor inorganic soils (clays, pumice, sand, etc), since this helps restrict their growth. However, it is possible to restrict growth *too* much!
* A major reason for practicing bonsai is to learn “silvics”: tree science. Controlling a bonsai’s nutrients carefully and seeing how the tree reacts can give us insight into how these soil components affect a wild tree’s growth.

## Fertiliser components

* “Primary macro-nutrients”
  + Elements: **Nitrogen** (N), **Phosphorus** (P), **Potassium** (K)
    - Nitrogen is important for chlorophyll manufacture in leaves. Deficiency leads to leaf yellowing. Excess (“toxicity”) leads to leaf death around edges and in gaps between veins.
    - Phosphorus supports growth of roots, trunks, seeds and fruit, as well as general health. Deficiency leads to darkened – often purpleish – leaves due to poor transport of photosynthesised sugars. Excess leads to leaf discoloration around edges and in gaps between veins.
    - Potassium supports general plant health – especially water uptake – and encourages flowering / fruiting. Deficiency leads to yellow or purple tints at leaf edge. Excess causes symptoms of other nutrient deficiencies, particularly nitrogen and magnesium.
  + Quoted on many fertilisers as an “N:P:K” ratio – e.g. 5-5-5 (balanced) or 10-1-3 (nitrogen-heavy).
* “Secondary macro-nutrients” and micro-nutrients
  + Secondary macro-nutrient elements: Calcium (Ca), Magnesium (Mg), Sulfur (S)
  + Micro-nutrient elements: Copper (Cu), Iron (Fe), Manganese (Mn), Molybdenum (Mo), Zinc (Zn), Boron (B), Silicon (Si), Cobalt (Co), Vanadium (V)
  + These have a range of effects on tree health. Typically, if your leaves go a funny colour and you can’t spot any pests, it’s worth considering micro-nutrient deficiency or toxicity as a source.
  + If you’re using an organic fertiliser, it’s relatively rare for bonsai to develop a serious micro-nutrient deficiency. Toxicity is slightly more common, e.g. if field-growing a tree in contaminated soil.

What makes a good bonsai fertiliser

* Balanced – e.g. NPK ratio of 5:5:5 or 7:7:7.
  + Most fertilisers focus more on Nitrogen and Potassium, since these encourage green growth (e.g. for grass) and small fruit (e.g. for strawberries). Bonsai practitioners want these things… but they want strong root and trunk growth too!
  + Phosphorus tends to linger longer in the soil than the other two macro-nutrients… but bonsai trees’ soil gets replaced typically every 1-3 years!
* Slow-release
  + We typically want fertilisers that will release nutrients over an extended period rather than all at once, so the tree can absorb them before they wash away.
  + This usually means solid rather than liquid fertiliser for most of the year. Liquid fertiliser may be used as a top-up in peak growth seasons.
  + Note: solid fertilisers can often be liquefied by sticking them in a mesh grocery bag or similar and leaving it in a full watering can. (The mesh is needed to stop chunks of fertiliser clogging the can’s rose.)
* Hygienic
  + Some fertilisers – most notably human faeces – pose a health hazard to users. The product of e.g. composter toilets should be used with care, by experienced gardeners only.
  + Some fertilisers – e.g. oilseed rape pellets – can be attractive to rats, especially in an urban environment. Not only is this is a disease risk but, if a rat is getting the nutrients, the tree isn’t!
  + Some fertilisers just smell absolutely awful. These may be useable for outdoor bonsai, but certainly not for indoor trees!
* Non-synthetic
  + Production of synthetic fertilisers can have a higher environmental footprint than purely natural fertilisers.
  + Natural fertilisers generally have enough micro-nutrients that no further amendment is needed.
  + Be warned: the label “organic” on fertilisers can be used to describe a mix of non-synthetic and synthetic fertilisers.
* Animal-friendly
  + Many fertilisers are made of animal byproducts: either bone meal, blood, or just manure.
  + Ethical vegetarians / vegans may not be comfortable using some or all of these products in their work.
  + More pragmatic practitioners may still wish to ensure that byproducts are from well-treated animals. Notably, Japan has a shaky record on animal welfare, so exported specialist fertilisers can be suspect.

## Common fertiliser types

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| Type | Description / pros & cons | Popular brands |
| Chicken manure pellets | Best brands are fermented, both for hygiene and to avoid leaf burn.  Naturally slow-release; some brands are also balanced.  Possible ethical issues re chicken welfare for imported brands.  Smells *horrible* if left in drip tray too long! | BioGold (Japanese) |
| Synthetic pellets | Offers more precise control over macro- and micro-nutrients.  Doesn’t always provide the full range of micro-nutrients, so further amendment may be needed. | MiracleGro |
| Seaweed | Typically liquid.  Can be harmlessly micro-dosed – i.e. add a few millilitres to the watering can every time you water.  Tends to be low in macronutrients, particularly phosphorus. |  |
| “Worm tea” | Worm manure – don’t drink this tea!  Tends to be low in macronutrients, particularly potassium. | Walworth Gardens |

## Environmental considerations

* Fertiliser run-off is a major environmental problem, leading to issues with water quality and toxic algae blooms. Whilst a handful of tiny trees won’t have a *huge* impact on this state of affairs, it’s best to keep good habits.
* Whatever fertiliser you choose, be aware of where the run-off is being carried when you water the tree. Onto a flower-bed or lawn is generally fine – the nutrients will be taken up by the local plants.
* If your trees are watered over a walkway or drain, you may want to use a drip tray, which you can occasionally rinse off onto a flower-bed.

## When and how to fertilise

* Be careful not to over-fertilise in Winter as dormant trees take up little or no nutrients – the fertiliser will just linger in the soil or form an unpleasant crust around the edge of the pot.
* Over-fertilising