



What to pot Bonsai trees in

(Besides a nice pot)

G.Hartley 2018

Foreword:

What I have written in this article has come from a number of sources. I have read many of the “Old School” Bonsai books written by well respected British and American authors. As newly published books have become less frequent and have been replaced by online articles and blogs I have also read many of these. I have seen that practices have changed over time. I have also referred to my own ongoing experience with growing Bonsai. The advice and ideas discussed are by no means Gospel and I’m sure my own views on the subject will change and adapt as time passes, experience is gained and new practices come into being. The key to ongoing success is to review new ideas as they occur, be willing to give things a try and if successful be willing to change your current practice.

Soil

What do most people think of when they hear the word “soil”? I instinctively think of the almost black stuff which turns very gooey and muddy when wet. I think most people will think of the same. It’s the stuff things grow in. It’s in the flower beds in the local park and it’s in our borders in the garden. It’s what we see when the farmer has ploughed his field. We are used to seeing plants growing well in it and grass loves it! However, what we have instinctively come to think of as soil and what I am describing is “Top Soil”. And to be more specific we are thinking of a good quality loamy top soil with a balance of silt, sand, clay and humus. It probably looks like this;



Here’s the Oxford English dictionary’s definition of “Soil” .

“The upper layer of earth in which plants grow, a black or dark brown material typically consisting of a mixture of organic remains, clay, and rock particles.”



So, our instinctive mental reference to what we think of as “soil” turns out to be correct, at least according to the Oxford English Dictionary.

However, when we think more about it and look at it from a horticultural perspective we soon begin to realise that the word “soil” isn’t that useful especially if used as an answer to “what do plants **need** to grow in?”. Plants can and do grow in many other substances as well, which we wouldn’t perhaps ever think to call “soil”. Think of orchids grown as a houseplant in nothing but a cup full of chipped pine bark. It is organic but is it soil? There are succulents which grow quite well in nothing but Alpine grit. Grit is not organic, and we wouldn’t describe it as soil, but never the less a plant can grow in it.

When it comes to growing Bonsai specifically, the word “soil” as it is known in the West is even less useful and can be unhelpful, especially to beginners. This is because;

BONSAI DO NOT GROW WELL IN SOIL

It may sound like a bold statement and it’s meant to be a statement for discussion, but let’s look at the two essential things that a tree needs at root level to survive and therefore what the potting mix must be able to do.

1. Ability to hold water.

We all know that our trees need access to water at their roots to survive. More specifically they require water when **they** want it i.e. when the tree is transpiring water out through its leaves and the concentration of water outside of the roots is greater than the inside, causing osmosis to take place. If this water isn’t available and the tree continues to lose water from its leaves, irreparable damage and even death can occur. However, when a tree is not actively growing and transpiring water, excess water at the roots can begin to be a problem. A condition called Root-rot can begin to occur because the excess water is preventing oxygen from being taken up by the roots. The roots essentially begin to suffocate, decay occurs, and the roots are badly damaged.

A balance must be achieved between holding enough water for the tree to survive between watering’s and holding too much water.

2. Ability to provide oxygen

As leaves need carbon dioxide for photosynthesis to occur, roots require oxygen for cellular respiration to occur. The oxygen is supplied by an air flow throughout the potting mix. As the roots draw in water, air is pulled through the potting mix from the outside environment and remains in any air-spaces within the mix. A very compacted potting mix does not have available air spaces within it and therefore the ability to allow an air flow through it is drastically reduced, restricting cellular respiration and the growth of the tree.



If we refer to the bold statement I made earlier that Bonsai do not grow well in soil, we can now begin to discuss why. We know that a Bonsai is a tree (or shrub) growing and living quite satisfactorily in a small pot. Laypeople often ask us “How can that tree survive in such a small pot?” The answer is because we have encouraged and enabled the tree to grow a very efficient root system. And when we do this, the tree not only survives, but thrives for many years. To do this in such a small available space, every element of the potting mix must be adding something positive to the mix. If an ingredient is doing nothing, or even worse, if it is reducing the efficiency of the mix, we are wasting the available space this takes up and holding back the development of that all-important efficient root system.

A pot of soil will hold far too much water for too long than is required by the tree. On top of this, wet soil becomes very compacted very quickly, so we end up with two conditions in the pot which prevent oxygen getting to the roots and root-rot quickly occurs. Of course, experienced horticulturalists and Bonsai growers have known this for many decades and would never pot a Bonsai in soil alone even though they used the term as a heading in their books;

The renown British Bonsai Nurserymen of the 1970's and 80's such as Peter D. Adams “The Art of Bonsai” 1981 and Dan Barton “The Bonsai Book” 1989 to name just a couple used the terms “soil” and “compost” in their books when describing what they pot their bonsai in.

The early British Bonsai nurserymen were adding other elements to their “soil mix” although they remained mainly organic in nature;

Peter D. Adams' potting mix- “leaf mould, peat, rotted pine needle and grit in equal parts” (1981)

Dan Barton's potting mix- “Mark one compost- Two-parts Irish Moss Peat, Two-parts coarse grit, One-part garden loam (essentially loamy topsoil)” (1989)

However, Dan Barton was at the time experimenting with another potting mix which he called his “Mark two compost”- “One-part coarse grit and One-part horticultural pumice”. He stated how unlikely a growing medium this was, being totally free of any loam or other humus-based components but stated that everything he had planted in it so far was thriving, had more compact leaf growth and improved colour.

Bonsai enthusiasts were of course limited by what potting materials were available to them at the time and coarse grit was the readily available material of choice to add drainage and reduce compaction in their potting mixes.

Today, the Bonsai enthusiast is faced with an almost bewildering array of materials and products to pot their Bonsai in. Most of these products aimed at the Bonsai grower are not organic in nature but are various types of rock which vary in their porosity, mineral content, colour, hardness, PH value and particle size. I'll go through the uses and the pros and cons of individual ingredients later.

However, even today, well-respected Bonsai outlets such as Kaizen Bonsai still offer for sale Bonsai Potting mixes described as “Bonsai Soil Mixes” and “Premium Bonsai Compost” when in actual fact they contain no soil or compost at all. They are doing their own product (which is actually very good) a gross injustice and at the same time causing confusion amongst Bonsai growers and especially beginners. The only organic element found in these mixes is chipped pine bark.



You can also find for sale the “ready mixed” bonsai soils-often seen for sale alongside the mass produced “Bonsai” found in garden centres. Most experienced growers know that this commercially mass produced product is often little more than some compost mixed with a little white perlite and is practically useless as a Bonsai potting mix. It’s marginally better than the clay mud these mass produced “Bonsai” come in, but is best left well alone.

So, if soil and compost are no good for potting Bonsai in and the terms are misleading and unhelpful, what do we use instead?

Potting Media / Medium / Mediums?

Another term for what we might grow Bonsai trees in (besides the pot) is “**Bonsai potting medium**” used by Mark Kennerley of Green Dragon Bonsai 2006.

It doesn’t roll off the tongue quite the same as “Bonsai soil” but I think it’s something we need to get used to and for clarity it is what I’m going to use from now on.

Ok, so what Bonsai Potting Medium should I pot my Bonsai in?

This is where things get a bit complicated as I’m afraid there isn’t one easy answer. You will get varying advice off everyone you ask and every book or website you have ever read. All is good advice to some extent especially when you can see the quality of trees produced by the person providing the information. However, there are too many variables in play for there to be a “one size fits all” answer. Here are some of the variables we need to consider and a short explanation of why they are important.

1. Genus and Species of Tree

To keep things basic lets just state that different trees require different conditions at root level for them to remain in optimum health. Some trees, privet as an example, are very thirsty trees and will draw water from the potting medium very quickly. Other trees, Japanese White Pine as an example, don’t like having continually wet roots so good drainage is paramount. We can adjust our watering regimes to some extent and perhaps this should be our first consideration but the potting medium we use may also be adjusted to reflect the needs of the tree.

2. Size of Tree

A Mame Bonsai will exhaust the water supply in its pot much faster than a large Bonsai of the same species. A Mame Bonsai which is watered fully in the morning but left out in very hot sun all day without further watering can suffer extreme damage or even death. This may be allowed for by careful positioning of the tree and adjustment to the watering regime, but the potting medium is also a serious consideration regarding its water retention capabilities and particle size.

3. Geographical Location



Two people keeping the same tree in two different locations with all other variables remaining the same may choose two slightly different potting mediums. Japan has much drier winter conditions than the UK and north of Tokyo it gets colder for longer periods of time with prolonged snow coverage. In the UK, the winters are much wetter with more temperature variation causing much more freeze-thaw conditions. We can control how much water a tree may receive in winter and reduce temperature fluctuations to some extent by providing winter protection for the tree but some of our trees are left out all winter. A potting medium in the UK may break down much faster than the same medium used in Japan due to more wet weather and freeze-thaw conditions in winter. Even in the UK there are regional differences in the weather which may warrant slight differences in potting media. The South-East is much drier year-round than the North-Western regions.

4. Growers watering habits / regime

The different lifestyles of Bonsai growers could affect the potting medium they choose to use. There is probably a bonsai grower somewhere who knows they are regularly away from home on business for a few days a week and has no-one they can rely on to water their trees for them. This person may have learnt to adjust their chosen potting medium to be more water retentive than normal. It may not provide the absolute optimum condition for the health of their trees, but this person still has a right to keep Bonsai and has adjusted their potting medium to suit their specific needs. Similarly, a retired person keeping Bonsai who loves spending time out in the garden may be able to water their trees at any time of day and could even be prone to overwatering. A more free-draining potting medium may be more suitable in this case.

Substances which can be used in a Potting Medium

Here I shall list some products which are used or sold as ingredients for Bonsai potting mediums and describe their pros and cons. The list is by no means exhaustive and some of the information is copy and pasted (with permission) from an article by Graham Potter of Kaizen Bonsai entitled "Choosing soil for Bonsai".

AKADAMA

A naturally occurring volcanic sub-soil from Japan. Produced commercially for bonsai cultivation and other specialized horticultural disciplines.

Available in various grades (particle sizes).

Has a high C.E.C and neutral pH with excellent drainage characteristics and water absorbency if carefully graded. Has a very attractive brown colour.

There are two major drawbacks with this material, the first being cost. Wage costs in Japan are high and it has to be transported half way around the world. The second, and most significant, failing is



that the product is not frost proof, in a climate like that of the U.K. Akadama can be reduced to dust after just a couple of severe winters and this will render it useless for cultivating bonsai. (Kaizen Bonsai. Jan 2011)

HORTICULTURAL GRIT

This is basically crushed stone, normally quartzite or granite. Generally used for digging into heavy clay soils and opening up the soil in raised beds.

Probably the heaviest material you could find to fill a bonsai pot with. Grit is heavy, cold and tends to offer very little drainage. It has no absorbency and no nutrient holding capacity. Probably the cheapest material you will find to fill a bonsai pot and **in our experience absolutely the worst potting medium you can buy**. Often it's mixed with other products like Akadama to make them go further. We think that's seriously false economy. Use for dressing bench tops and filling pot standing beds or humidity trays only. (Kaizen Bonsai. Jan 2011)

JOHN INNES MIXES

John Innes mixes are popular in the U.K. These are carefully formulated loam or peat based compost mixes designed for general horticultural use. They work well in conventional flowerpot style containers. Their popularity for bonsai use probably stems from a time when little else was available here. However bear in mind that most commercially produced pot grown plants are designed for planting out within 1-3 years of production. John Innes composts are not designed for long term containment of plants. Because of the composition of these products (peat/sand/loam) their drainage in a bonsai pot will be extremely limited. Whilst it is possible to achieve reasonable success using a John Innes mix and grit, which is an immensely heavy mix, the risks are hardly worth taking. Modern bonsai growing mediums are so easy to use, light and airy, and guarantee success, that it seems **pointless to use this old problematic product**. (Kaizen Bonsai. Jan 2011)

MULTI PURPOSE COMPOST

These are commonly available at garden centers and hardware stores everywhere. Generally available as peat based or peat free formulations. Because of their ultra-fine fibrous nature they are completely unsuitable for use in bonsai containers and **should be avoided at all cost!** (Kaizen Bonsai. Jan 2011)

PEAT

Many old books and magazine articles recommend the use of peat. The usual advice is to sieve and grade thoroughly using only the small nuggets or chips left at the end. This is immensely time consuming and difficult considering that peat is normally shipped in a slightly damp highly compressed form. By the time you have sieved modern peat products you will have less than 10% to use. All of those little pieces will end up, after a few weeks, in exactly the same condition as the material you have sieved out. Peat is simply old, densely packed composted sphagnum moss. Its



primary feature is that it holds a lot of water; it is after all the material responsible for 'peat bogs' and their unique wet environment. Our recommendation is to **leave it where it is**, supporting a very important eco-system. (Kaizen Bonsai. Jan 2011)

MOLAR CLAY (G.Hartley)

Very hard, orange coloured, irregular shaped granules from 1mm -8mm. This is a fired calcined clay product made from diatomaceous earth (diatomite) or montmorillonite- naturally occurring clays formed from ancient algae deposits. It has brand names such as Biozorb and Terramol. Due to its highly absorbent nature, it is used as an industrial spill clean-up agent, as a cat litter and for horticultural use. I can highly recommend that you read an article written by Harry Harrington for his website bonsai4me.com entitled "Cat litter as bonsai soil". As cat litter it can be found in the UK as Tesco's Low Dust cat-litter which comprises of particle sizes from 1mm-4mm (good for smaller Bonsai) and Sanicat Pink which has larger particles of 4mm-8mm. One concern amongst enthusiasts is that molar clay sold as cat-litter contains de-odorizers and that the product is not guaranteed safe for horticultural use. I've found that the Tesco cat-litter is very perfumed and quite dusty. I have a bucket with very tiny holes drilled in the bottom in which I pour half a bag of cat-litter and then run water through until the water coming out runs clear and the perfume smell has gone. This can take quite a while (not good if you're on a water meter) and so I have also left the bucket out for a few weeks over winter for the rain to do the same job. After this thorough rinsing, I can smell no perfume and the contents are dust-free. I have found the Sanicat Pink cat-litter to be far less perfumed and not as dusty. I've bought both these products myself and used them as part of my potting mix, both with other ingredients and "neat" and seen no adverse effects to my trees.

You can, of course, buy molar clay from Bonsai outlets. Remember the sellers have a vested interest in warning people away from buying molar clay as a cat-litter product, but their product is produced for horticultural use so is guaranteed safe for use with plant material. There is also no need to pre-rinse it. It is however much more expensive to buy plus delivery costs are high due to the weight. There is always a local Tesco's or pet shop nearby! I suppose it comes down to convenience and the individuals' attitude to risk with the safety of their Bonsai. There's no point saving £20 if you're repotting a £1000+ Bonsai!

Here's a quote from Harry Harrington who uses Tesco's Low Dust cat-litter;

"At the time of writing (August 2017), I have been using molar clay sold as a cat-litter for 13 years. I still use it as the main ingredient for ALL of my bonsai, from vulnerable raw yamadori to show quality trees. It should be noted that I nearly always use a surface dressing of a more naturally-coloured soil/substrate.

In the past 13 years of using the product, I have yet to lose a tree that can truly be attributed to the use of molar clay. And I have several trees that have not been re-potted/have been planted in the same molar clay mix for well over a decade, and are still incredibly healthy."

The pros;

- Holds its own weight in water whilst still allowing good air circulation within the pot.
- Being frost proof it does not break down and can be sieved out of old soil and re-used time and again.



- Promotes drainage. Is warm and light weight.
- Holds onto nutrients from fertiliser.
- Significant colour change from dry to wet aids in knowing when to water.

The cons;

- Orange in colour- perhaps unsuitable for the surface of the pot when showing the tree.

CHIPPED PINE BARK

Amongst the top Bonsai artists and growers around the world, good quality chipped pine bark is one of only a couple of organic ingredients still accepted for use in the potting medium. (G.Hartley)

Chipped bark should have very little fines (dust) and offers a high AFP (air filled porosity). It will have very little inherent nutrient and poor nutrient-holding capacity, but holds moisture well, provides a warm airy rhizosphere and a nice springy soil mix that will help to bring your bonsai through a hard freezing winter. Bark also seems very good at encouraging mycorrhiza to flourish. (Kaizen Bonsai. Jan 2011)

FRESH (LIVE) SPHAGNUM MOSS (G.Hartley)

Some bonsai growers like to add an amount of finely chopped fresh sphagnum moss to their potting medium.

Pros;

- It is known to contain a natural rooting hormone and so is beneficial to the recovery of recently root-pruned Bonsai.
- It can hold up to 20 times its own weight in water so is added to the potting medium when perhaps only one other ingredient is used such as Akadama or Molar clay in order to increase the mediums water retention capabilities.

Cons;

- Only a fairly temporary ingredient to the potting medium as will break down fairly quickly.
- Cannot be collected independently as must be bought from a renewable source.

LAPILLO

A product available from Kaizen Bonsai, here's what they say about it:

Lapillo is formed during violent volcanic eruptions and is the term used for small particles (2-65mm) that explode into the atmosphere and cool on their descent back to earth. This violent formation creates a fine honeycomb structure which is perfect for cultivating plants.

The porosity of the material averages 50-60% by volume.

Lapillo has high levels of iron, magnesium and other minerals vital to plant health.

100% frost proof, Lapillo can be sieved out and reused many times.



Mix with other products to create a free draining, long lasting mineral rich growing environment for your bonsai trees. The very attractive colour is also great for top dressing.

A fantastic product that is produced from natural deposits with a minimum of processing and transportation.

Available in a fine grade (1-5mm) and a medium grade (5-10mm)

Summary

It's worth noting that some enthusiasts may be worried about potting a tree in a totally inorganic media such as molar clay, Akadama or Lapillo for example as they see this inorganic environment as being a bit "too sterile" for a healthy root system. After all, a healthy root system should be a mini ecosystem of its own, with some fungi and bacteria being an essential part of the environment. Without going into the subject too much, when a totally inorganic potting mix is used, the tree should be fertilized regularly with an organic granular feed. The organic feed breaks down by the action of watering but also by bacterial action. This creates humus in the pot, which is what is needed to support helpful fungus such as mycorrhiza.

Here are some final pointers I would be thinking of when repotting my Bonsai;

- Sieve your chosen media so you can use smaller particle sizes for smaller bonsai and vice versa.
- Adjust your medium to reflect the needs of the tree species and your own watering habits by increasing or decreasing the organic content (if you choose to include it in your medium). You will get the ratio of ingredients correct through experience. Write down the ratios used for that particular tree. If you find over time that it is drying out too quickly or staying wet for too long then you've gained some experience and you can adjust the ratio when the tree is next re-potted. As a rule though, it is suggested that the organic content should be no more than 1/3rd the total volume.
- If you are including an organic element in your medium, seriously consider only using chopped pine bark. (Plus a bit of chopped live sphagnum if it takes your fancy)
- Use better products in place of horticultural grit such as some form of molar clay and/or Lapillo
- Bear in mind the drawbacks of Akadama- that it will likely break down to dust in just a couple of years, is expensive and has a high carbon footprint.
- Use organic granular feeds.

So there we have it- as clear as muddy soil!