Bonsai and infections, pests, and environmental illnesses

Most species of shrubs or trees commonly used for bonsai cultivation, rarely succumb to disease if looked after carefully and given the correct environment to grow in.

Experience shows that 95% *or more* trees that are affected by disease or bugs are also in poor general health. Under or over watering, under or over feeding, poor growing conditions (including poor, compacted soil), poor positioning of the bonsai, all cause stress to a tree, leaving it more susceptible to infection from disease and bugs.
Bugs can attack trees randomly though you quickly learn which are likely to become infested at a moments' notice! Whilst healthy, vigorous trees are unlikely to be attacked, they will also be better able to survive attacks from bugs and diseases. Trees in poor health or trees that are under stressful growing conditions will be more affected by any external attack on its weakened
Precautions such as regular spraying with contact insecticides and fungicides can be useful though should not be relied upon. Systemic remedies work better by being sprayed onto the foliage and root system, which digests the treatment into the sap stream of the plant where it is distributed throughout the entire plant.
Attacks of fungi or bugs are quelled when they attack the plant and are exposed to the treated sap. However, systemic treatments are not 100% effective and regular spraying is expensive, environmentally unsound; repeated use can also reduce the effectiveness of treatments when they are actually needed. In my opinion, it is far better to use systemic insecticides or fungicides on trees that are known to suffer problems at certain times of the year.

FIRST AID
Primarily, try to identify what has happened to your tree. Has it lost foliage? Do any of the leaves have discoloration or holes? Closely examine the tree and the foliage, is there any evidence of pests either on the tree itself, on the surface of the compost or around the surface on which the pot itself is standing.

Secondly, once (hopefully) the pest or disease is identified and dealt with it is important to identify if there is any way that you could prevent re-occurrence in the future. Some problems such as caterpillars and aphids are difficult to guard against though you should be able to anticipate which trees in your collection are more likely to be attacked.

YELLOWING LEAVES/DROPPING LEAVES
There are only 3 ways that a healthy tree with healthy foliage will suddenly lose leaves or have leaves that suddenly turn dry and crispy (over just 2 or 3 days):
1. Frost, where a tropical and subtropical species being exposed to frost or even cooler weather.
2. Poison, where the bonsai is exposed to a poisonous chemical either in the soil or the air (directly onto the foliage). Though very rare, it isn't unknown for a tree to be badly affected when accidentally exposed to drifting spray from weed killer use.
3. Under watering is by far the most common reason for the sudden drying up and death of healthy foliage. Once there is no moisture left in the soil of the bonsai, the leaves will die within hours.

> Was the soil allowed to dry out completely? Was the soil watered thoroughly enough the last time the tree required water? Was the soil dry but looked wet because you misted the tree and the surface of the soil?
>
> Less severe under watering can also lead to yellowing of the leaves; see below.
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> Yellowing leaves and/or dropping leaves can occur for a number of different reasons;

The trouble we encounter with our trees can be split up in to two types: those caused by the **environment** (these are non-infectious) and those caused by **organisms**. Examples of the former include **sunburn**, **drought**, **nutrient deficiencies**, and **toxins**. Examples of the latter include **funguses**, **insects**, **viruses**, and **bacteria**.

In general, the non-infectious problems are related to how we care for our plants. By paying attention to the trees we can catch these early (usually) and unless there is death in the tissue of the plant, fixing the environmental issue will solve the problem.

Sodium damage, for example, is often caused by **over fertilization**. The damage shows up in the older leaves first and the tissue on the leaves dies around the edges of the leaf, all the way around the entire leaf, working its way in. You can prevent sodium damage by not over-feeding and you can get rid of the salt in the soil by leeching it; watering the soil so that the water runs out the bottom and wash away the salt. Be sure not to leave the plant in a water tray, or it will suck the salt back up.

Sunburn occurs when a shade loving tree gets too much sun (or a tree that's been in the shade for a long time gets moved into too much sun, just like humans). The tissue between the veins of the leaf turns yellow and then dries out and dies. This happens anywhere on the leaf, not just the edges, and affects any leaf exposed to the sun (not just older leaves like sodium damage).

Toxin in the soil kills the leaf down the vein and is often fatal. Leeching helps, but by the time you see it may be too late.

Drought kills tissue and desiccates it so that it looks flat and dull. This happens when you let a tree dry past its wilting point (shame on you!).

Chlorosis is caused by a mineral deficiency and is due to a lack of magnesium, manganese or iron. Normally it only affects acid loving species like Azaleas. Administer a liquid fertilizer that contains trace mineral elements easily available at all garden centers. **Nutrient deficiencies** come in several forms. **Iron deficiency** results in color loss in the foliage and always in the new growth. Leaves look washed out and whitish. **Manganese deficiency** looks just like iron deficiency but it's always in the old growth. The solution for both of these is to spray the tree with iron or manganese topical sprays. **Zinc deficiency** is often called 'little leaf' and results usually from too much organic material in the soil and results in small, shriveled looking leaves. You can spray the tree with a zinc topical spray to solve this.

Mildew,rust and black spot are all common to weak and stressed trees. If a tree is affected by these diseases it is important to try and discover the cause of the underlying weakness in the bonsai itself.

Then there are the 'infectious' problems caused by organisms of some sort.

There are many **funguses** that affect our trees. **Leaf spotting** is a result of too much water on the leaves (they must stay wet for hours) and results in leaf drop. The solution here is to water your trees in the morning so that they can dry out throughout the day. As with most fungal problems (esp. those that create leaf drop), cleaning up dead leaves from around your trees will help tremendously to control the spread of the fungus, is a fungus that produces its spores on the underside of the leaf that cause raised, brown or orange areas to develop. These burst through the skin of the leaf on the underside and makes the leaf look rusty. Rust is fond of Rose **Beech** and **Birch** trees. Rust is dealt with by removing affected leaves and applying fungicide, again, good air circulation will help trees avoid infection. **Rusts** are fungal diseases on the underside of leaves (which can sometimes be seen from above the leaf) particularly on Beech and Birch species. Rust is not only unsightly but causes loss of vigor to the plant. As with Mildew, Rust is dealt with by removing affected leaves and applying fungicide, again, good air circulation will help trees avoid infection.

Powdery mildews are host specific and do not need moisture and typically prefers warm days and cool nights. On **oak** it appears as a brownish 'felt' on the under side of the leaf and attacks new summer growth. One method of control is to avoid pruning in summer (which creates new growth when the days are warm). Topical fungicide can control this fungus.

Mildew is a fungus that thrives in damp, poorly ventilated conditions causing the presence of a white mould to form on foliage. The fungi extract sap from the host plant causing loss of vigour, distorted growth and dieback.The fungus over winters in buds so that young foliage emerges in spring already infected. Spores are produced that can be spread to healthy foliage via water; hence mildews can spread quickly during warm, rainy periods. Confusingly though, whilst water droplets can aid the dispersal of the mildew spores, water stress brought on by lack of water to the root system in hot weather, reduces the natural resistance of the tree to

infection. Once affected, it is not possible to rid a leaf of mildew. Infected shoots and leaves should be removed as soon as possible and healthy foliage should be sprayed with fungicide to prevent further infection.

Sooty mould looks like what it sounds like: black mold that rubs off as if it were soot. This is caused by insects (like **aphids**) that leave sugary excretions which then grow mold. Often these insects are herded by ants. The mould does not affect the plant, though it does block out sunlight. It's more of an indicator that the tree has insect problems and should be treated with insecticide. Wash clean with liquid soap mixed in water.

Water mould moves up the tree from the roots. This is caused by placing large rocks in the bottom of pots resulting in **poor drainage**. When we put large material at the bottom of the pot we might think we're improving drainage, but that's not the case. In order for water to drain through the holes in the pot, the soil adjacent to the holes must become fully saturated. When we cover the holes with large material, all of the soil surrounding the larger material must become fully saturated, which results in pockets of water that can grow fungus. Don't put large material in the bottom of your pot, and always make sure you water your trees until the water runs through the bottom of the pot.

When you encounter problems with your trees, before you react and give it more water or put it in the sun, investigate and find out what's causing the problem. More water or more sun might be the thing that puts your ailing tree over the edge.

Die-back and yellowing leaves nearly always end up dying and falling off the tree unless the cause is Chlorosis, this is likely to be dieback of the foliage. Die-back of large areas of the tree can occur when a tree is traumatized for some reason and the tree responds by dropping any foliage that is not required for its survival. The cause is often due to damage to the root system by root rot through over-watering or lack of watering which has allowed the root system to dry out. Some species (particularly tropical indoor varieties) can also become stressed by moving a tree to a new position, and they will loose their foliage. (See sections on root rot and under-watering.)

Natural wastage some trees such as Pyracantha/Firethorn and Ulmus/Elms will develop new growth from leaf axils and will then naturally discard the now redundant leaf. Check to see if new growth is appearing from the point of leaf loss.

Evergreen trees will have periods each year where they drop old foliage as it is replaced by new. If leaves are yellowing and dropping from old inner areas, this is likely to be the case. However to ensure that this growth is replaced, make sure that light and energy are given to old, inner areas of the tree by pruning the apical growth. Similarly, deciduous varieties that are left un-pruned will shed inner growth at the expense of new growth at the ends of some of the branches.

VISIBLE PESTS ON LEAVES, BARK OR ROOTS

Aphids on A JUNIPER

If there are visible pests on the leaves, identify them and take the appropriate action. Also be aware of flaking or peeling bark as many pests hide and breed here under.

Black Fly and Greenfly are both common forms of aphids. They suck sap from the tree and in large numbers can cause dieback of new or unripe growth. On trees in poor health, this can

eventually lead to death if not dealt with. Aphids can also carry virus diseases from one plant to another. Trees are normally attacked by a few aphids, which within a few days can multiply to very large numbers. Fortunately, once detected, aphids are easily dealt with. Small numbers of aphids and their eggs can be dealt with by rubbing them off with fingers. Larger infestations can be quickly killed off by using one of any number of insecticide sprays. Soapy water can also be used if sprayed onto infested areas. Some trees such as Acers are particularly susceptible to aphid infestation and systemic insecticide use might be worth considering during periods of repeat attack. It should be noted that the presence of ants should be looked for on trees, which are repeatedly infested by aphids. Although ants are not directly harmful to trees, they will commonly carry aphid eggs into trees, protect them from predators and farm them of their sticky, sweet excretion called honeydew, while the aphid benefits from sapping the tree. If ants are spotted, they should also be dealt with!

Caterpillars are very destructive to leaves and young growth leaving holes in leaves and in some cases completely stripping them altogether. Often very difficult to spot through excellent camouflage, close inspection of leaves, stems and in particular the underside of foliage is required to find and remove them by hand. Immature caterpillars will often be spotted in leaves that are folded over to protect them from predators. Contact insecticides are rarely affective though repeated problems can be reduced by using systemic insecticides.

Slugs and snails are also very destructive and quickly cause large areas of defoliation. During periods of warm, damp evenings they are particularly prevalent causing holes around the edges of leaves, this can be so extensive as to completely strip all leaf from its stem. The most common telltale sign of slugs or snails is the silvery trail that they leave behind them.

Slugs and snails are only active when temperatures reach 10°C or more becoming active at night and can be picked off by hand at night time or killed by using proprietary slug bait in the form of pellets or liquid solution.

Cuckoo spit is evident by globules of white froth on the surface of leaves and stems. Inside the froth are larvae known as froghoppers, these feed on the sap of plants in the same way as aphids do, causing dieback and distortion of growth. Cuckoo spit can be removed by hand and by insecticide.

Vine weevils are probably the worst enemy of bonsai! Unlikely to be actually seen on the plant, their presence can be determined by irregular notches taken out around the edge and centre of leaves. Far more destructive to bonsai are the larvae of vine weevil, which feed on the root system commonly causing the eventual death to the plant. Adult vine weevil is 8-10mm in length, black with white/yellow markings running the length of their bodies. Vine weevils are unable to fly but are excellent climbers and can occasionally be seen on the underside of infected plants.

Adult vine weevils are easiest removed from affected plants by shaking or brushing the foliage from which grazing adults will be dislodged.

Vine weevil grubs are approx. 10mm in length, white with a red 'head'. They feed on the roots of plants over winter and by early Spring pupate into adult vine weevils which are all female and can go on to lay up to 1,000 eggs over the course of the year. Vine weevil eggs are spherical, brown and less than 1mm in diameter. Larvae that hatch in the warm summer months can become adults by autumn. The presence of larvae is most frequently discovered when repotting in spring or when trees suddenly die from a lack of roots!

Vine weevil grubs can only be dealt with at present by removal by hand or by a small number of proprietary chemicals on the market. Most effective is "Bio Provado Vine Weevil Killer" which is used as a soil drench protecting the foliage against adult vine weevil attack for a month and vine weevil larvae attack for 6 months.

Scale insects are sap sucking insects that attach themselves to the bark of bonsai and cover themselves in a protective shell brown shell. These are best removed by handpicking, as contact insecticides are unable to bypass the protective covering.

Red spider mites are very tiny sap-sucking insects that attack trees (especially coniferous plants) in hot, dry periods. The mites are hard to see with the naked eye but their presence can be detected by fine webbing around the foliage. Contact insecticides are effective against affected trees and regular misting of foliage in hot, dry weather will deter infestation.

Fungus Gnat/ Scarid Fly are tiny flies that can be seen flying around trees that are kept indoors. The flies themselves are no more than an irritation; however their grubs feed on the root system of the bonsai. Fungus Gnats are drawn to overly wet soils, particularly if they contain moss. Though the Gnats are simple to kill with the use of insecticides or household fly sprays; it is also important to improve the condition and drainage of the soil as well as ensuring that the soil is not kept permanently wet.

Black Spot on Chinese Elms.

Elms can be prone to developing clusters of black spots less than 1mm in diameter on the surface of their leaves. The foliage then goes on to yellow and drop. This is caused by a virus known as Black Spot.

As with mildews and rusts, once a leaf is found to be infected, it must be removed to halt the spread of the disease. Care should be taken not to spray the foliage as water helps the spores travel around the plant. Avoid standing the tree in persistent rain. The remaining, healthy foliage should sprayed with fungicide