THE ROOTS OF BONSAI

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MICFor

Importance of roots

Bonsai tree roots are an essential part of the whole bonsai tree design.

Good roots are developed through well-timed pruning and setting out from the outset

It is key to the survival of your bonsai to sort the roots out first prior to developing the crown and branches which can always be formed later in the bonsai trees development

Roots are the key to the overall function of your bonsai tree and deserve your attention

Function of roots

1. Water uptake
2. Mineral uptake from the soil
3. Conduction and absorption
4. Anchorage
5. Tap roots resist wind rock during establishment
6. Fibrous roots have uprooting resistance
7. Storage of nutrients

Swamp cypress 2013

Root anchorage

Tap roots on many species of trees and large structural roots provide anchorage

Tap roots degrade over time

Bonsai are usually wired into their pots so the need for anchorage is removed

Storage of nutrients

Styrax japonica root pad

Root growth

Oak roots in winter

Roots and hormones

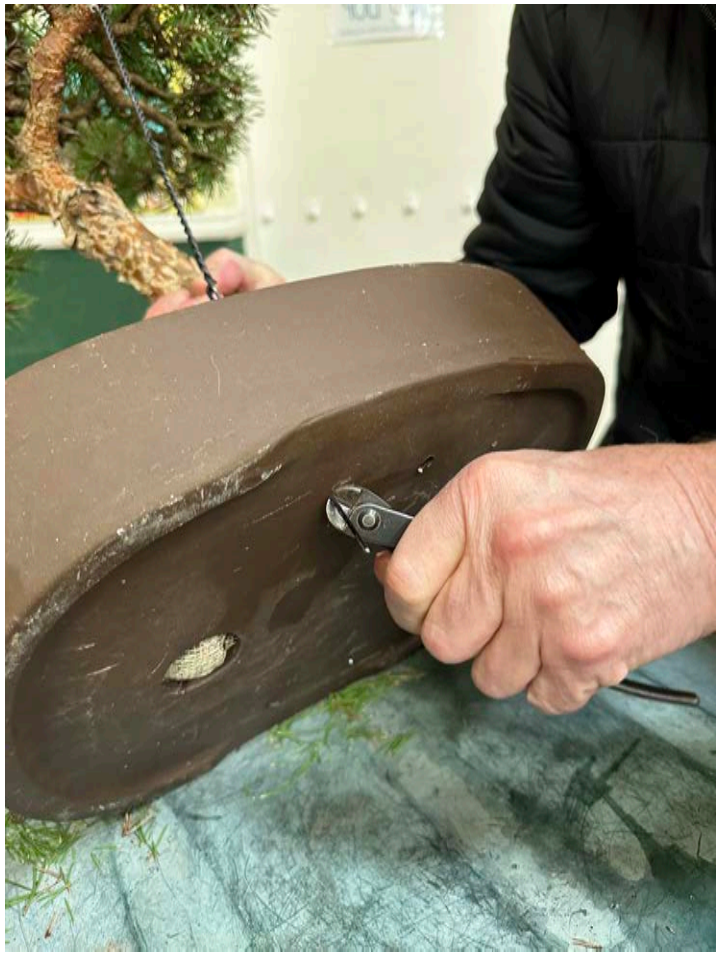
Hormones and roots

- Cytokinins stimulate cell division in root meristem
- Ethylene stimulates root growth

Nutrients involved in forming roots and root growth include:-

- Sulphur (S)
- Phosphorus (P) (Bone meal)
- Copper (Cu)

Bonsai tree roots

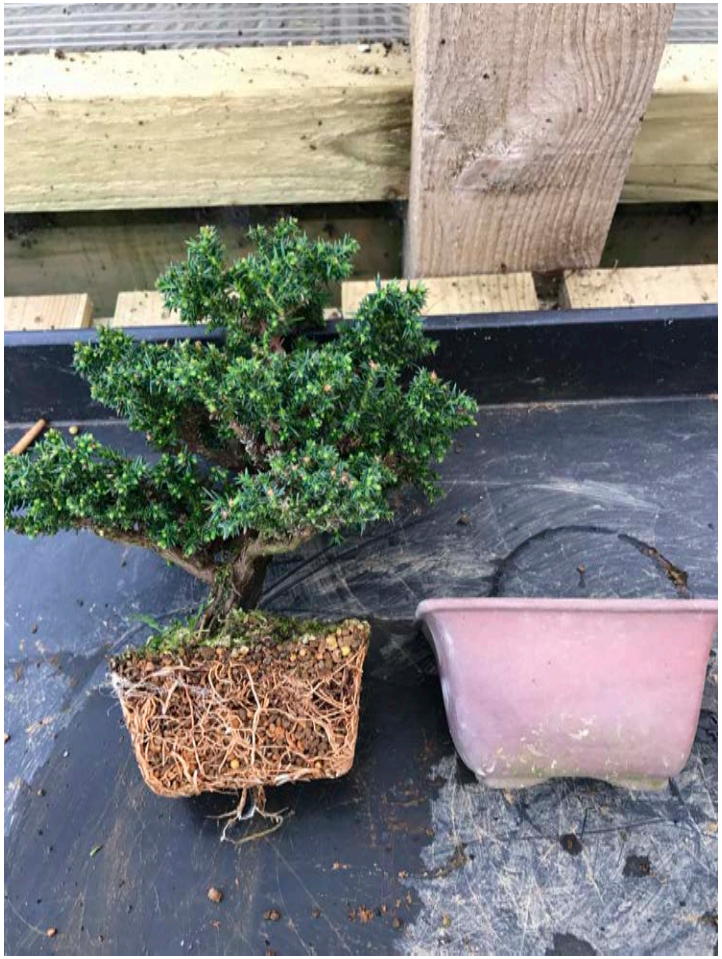


Supporting wires cut

Wires set out in pot

Root development

Nursery stock



Mame Cryptomeria

Fibrous roots

Cork bark Chinese Elm

Taiwanese Fig

Styrax japonica fibrous root system

Acer palmatum fibrous root system

Ginkgo biloba developing a fibrous root system

Tree root development

Root training on a *Ginkgo biloba*

Air pot root development
Akebia (Chocolate Vine)


2010


2012


2014


2015


2015


2015


2019

Growing in ground
European Hornbeam

2009

2023

Deep and Shallow pots
Coastal Redwood

2019

Typical root problems

- Crossing roots
- Circling roots
- Pot bound
- Large structural roots
- Dense roots
- Uneven roots
- One sided
- Deep thick roots
- Lack of fibrous roots
- Dead roots
- Root rot
- Infected roots

Chinese Elm with root problems

Poor roots

- *Anaerobic conditions*
- *Stagnant, smells and root rot occurring*
- *Waterlogged - too wet and cold, craggy*
- *High levels of bacteria*

How to know when to repot?

Root pests and problems

Pest problems of roots

- Vine weevil
- Ants
- Mealy bug
- Slugs
- Snails
- Sawfly larvae
- Cock Chafer bug larvae

Root problems

- Root rot from waterlogged soils
- Root rot from fungal pathogens
- Girdling roots
- Desiccated roots (lack of water)
- Frost damaged roots
- Damaged roots or lack of roots
- Under developed fibrous root pad
- Heat damaged roots

Ants

Ant problems

- Ants are formidable pests in several ways
- Due to their fondness for aphids, on whose excretions they feed or 'farm' them
- They convey them from one plant to another plant & protect them from predators such as ladybirds
- In order to be near their food, ants also tend to congregate in nests in the soil around the roots, causing havoc in the root system & cutting through roots as they carve out tunnels.

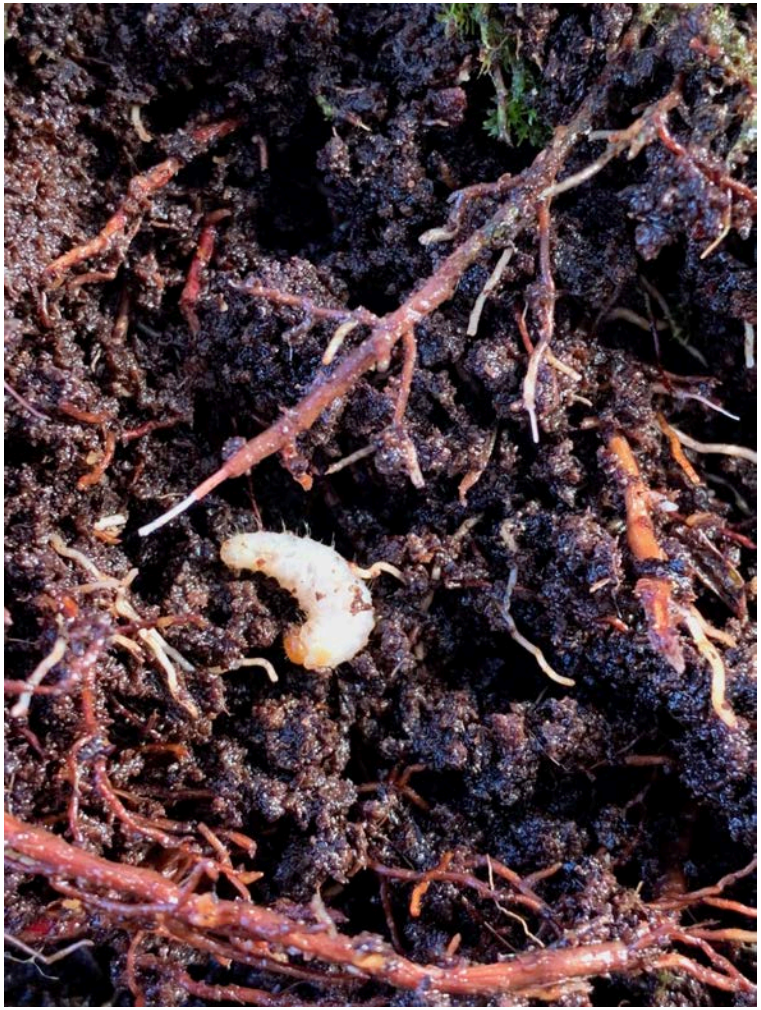
Vine weevil larvae

They are white legless and plump grubs with a brown head up to 10mm in length with a slightly curved body.

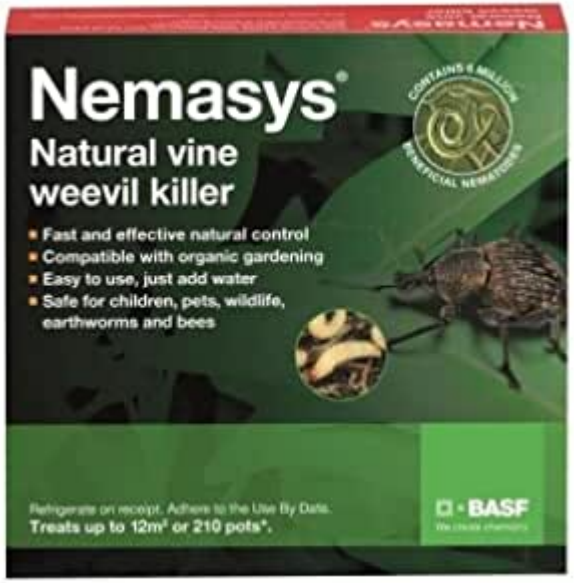
Found between early autumn to spring until beetles emerge.

Looking for Vine weevil larvae

Vine weevil damage



Vine weevil control



Other methods for Vine weevil larvae control

Nematodes

Blackbirds

Free draining gritty soil mix

Slugs and snails

Root work options

- Full re-pot of all roots
- Total root removal
- Selective pruning/ thinning of roots
- Under cutting of the roots
- Pegging or wiring of roots
- Cutting just round the edge of root plate
- Cutting out a wedge
- Adding roots via grafting

Timing of repotting

- Nursery industry - **late October through to March**
- Planting season in the UK November to March
- Containers - **Autumn to winter**
- Bare root stock **- Autumn to winter**
- Deciduous Bonsai - **late September to February** and even **into March**
- Evergreen bonsai species **- March / April**
- Tropical bonsai - **when in active growth**

Repotting

- Ensure correct soil type for species
- Take time during re-pot to sort the roots out
- Protect after re-potting
- Start feeding around 6-8 weeks after re-potting
- Re-pot flowering trees after flowering
- Timescales dependent on tree & stage of development
- Opportunity to change pots
- Opportunity to develop roots
- Good opportunity to check for pests & problem

Acer palmatum ‘Kyohime’

2014

2020

Repotting a Ginseng Fig

Repotting equipment

- Tray to retain soil and prevent making a mess
- Wire cutters to cut the wire that holds the tree into the pot
- Chopstick
- Bucket with water in it to wash the roots off
- Toothbrush to clean moss and algae off trunk and roots
- Root cutters to prune back larger roots
- Pruning scissors to prune the fibrous roots
- Prepared soil mix
- Wire to wire tree back into the pot
- Plastic tubing to protect the roots from wire marks
- Mesh to cover the drainage holes in the pot

Preparation for repotting

Selecting the right pot
Preparing the pot by cleaning it and adding mesh and wire

Repotting processes

Root pruning

Teasing out old soil from between roots

Putting new soil between roots

Keeping roots healthy

- Good watering regime
- Good re-potting regime
- Right soil with the right aeration
- Good feeding regime
- Slow release within the pot
- Liquid fertilisers – organic and non-organic
- Slow-release pellets on the surface
- Slow release cakes on soil surface
- Organic matter/sphagnum moss as part of the soil mix
- Sugar!!!

Wound sealants

Hanagen paste wound sealant

Kiyonaru liquid wound sealant

Ginkgo biloba cut putty on pruned root

Cut paste on freshly cut wounds of Privet and Maple

Occluded wounds on Maple trunk

Root pruning

Fibrous root pruning

White Akebia root pruning

Pyracantha re-pot and root pruning

Soils

Use of bonsai soils like:

- Akadama (hard-baked volcanic clay)
- Kanuma (Soft volcanic rock pH 5.5)
- Kiryu or Kiryuzuma (Hard volcanic stone)
- Pumice (Soft volcanic rock)
- Kyodama (manufactured grit)
- Larva rock (Volcanic rock)
- Fuji grit (Crushed volcanic lava ash)

Designed to be good for water retention, provide good drainage and good aeration

Provide bonsai trees with a perfect growing medium for fibrous root development

Bonsai soils can be made up of a single substrate or a mix of various substrates depending on the species

Kiryu soil

Pumice soil

Kanuma soil

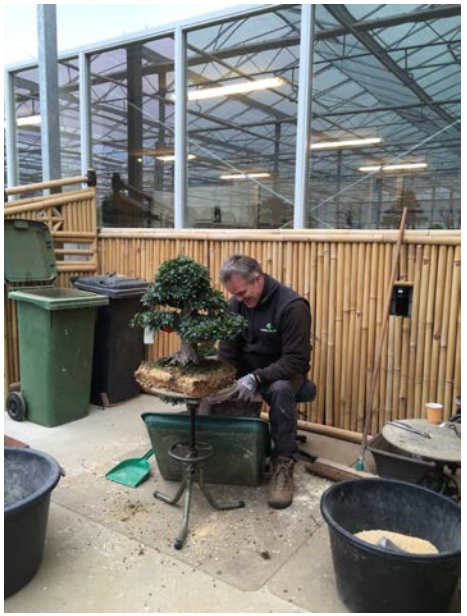
Akadama soil

Azalea in Kanuma soil

Ginkgo in Akadama soil

Azalea in freshly potted up in Kanuma soil

Azalea being repotted and root pruned before being potted up in Kanuma soil



Pinus thunbergii ‘Thunderhead’ growing in pure pumice soil and thriving with additional windbreak to the South and West, this photo was before de-candling was carried out that year

Soil grades and mixes

Ginkgo biloba fibrous root system with differing root sizes based on the grade of the growing medium. Thicker fatter roots in larger grade pumice and finer thinner roots in smaller grade Akadama and Kiryu mix

Root adaptations

Roots have the ability to survive in most environments and do this with a variety of amazing adaptations. Some of these include:-

1. Forming **adventitious roots**
2. **Buttress root**
3. **Prop root**
4. Ability to produce **runners, suckers or stolons**
5. Adaptations for increased water storage eg **rhizomes**
6. Aerial root formation
7. **Endocormic roots**
8. **Pneumatophores**

Aerial tree roots

Aerial root development on a *Ligustrum*

Aerial root development on a *Platanus*

Fig trees as bonsai and in nature

Fig trees as bonsai styled in a way to mimic nature observed in the Daliang County of Shunde in China in a place called Pinsongqiu

Roadside Fig tree on side of wall in Hong Kong showing amazing root development

Nebari

Nebari

White Beech

Trident Maple

Japanese Maple

White Pine

Trident maple

White Beech

Trident maples

Larch

Korean Hornbeam - a chance to review the nebari during repotting

Root over rock

Cotoneaster

Trident maple

Trident maple

Trident maple

Trident maple

Trident maple

Trident maple

Juniper

Juniper

Juniper

Juniper

Tree roots and fungi

Mycorrhiza fungi on the root systems of bonsai within the bonsai pots particularly prevalent with Pine species

Laccaria laccata ectomycorrhizal fungus on Korean hornbeam roots

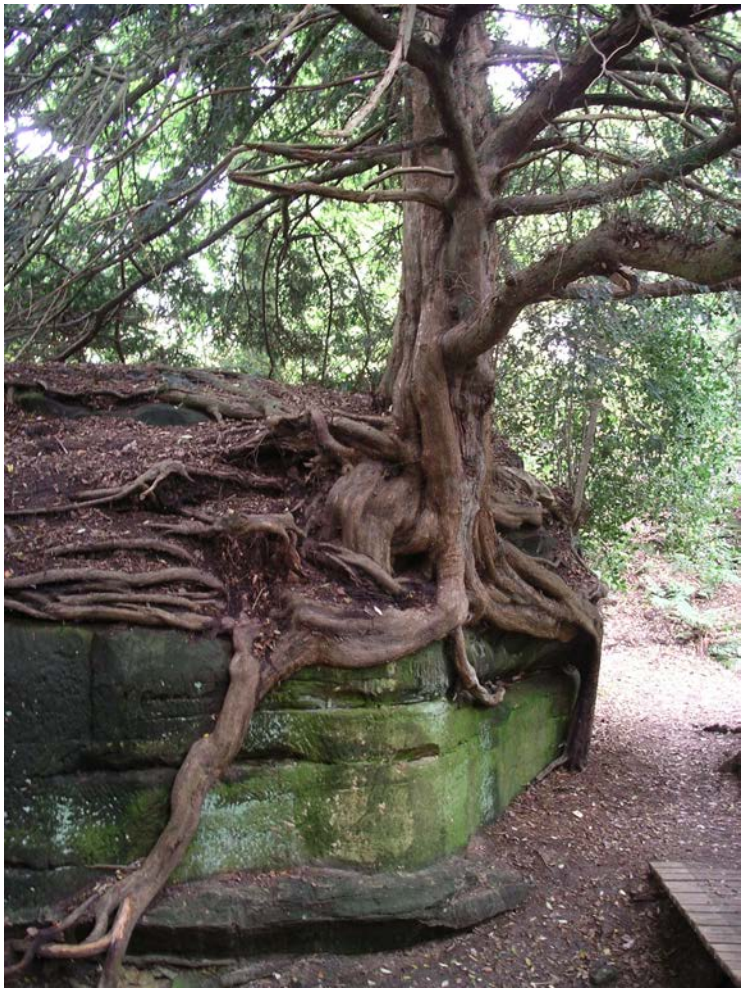
Japanese Black Pine (*Pinus thunbergii*) with advanced mycorrhiza fungus block and it has been observed to replace the root function so need to be careful when re-potting pines

Scots Pine repotting with a root pad filled with mycorrhiza fungus

Root inspiration in nature

Roots of *Fagus sylvatica* on slope interlocking providing stable root plate

Buttress root in Costa Rica



Yew over rock

Growing trees

Planting acorns

Giant Redwood as bonsai

Sequoiadendron giganteum parent tree and source of seeds in 2008

Seeds planted and germinated in 2008

Planted up and grown on window sill of flat

Developed on in raised bed from 2011 - 2014 and then dug up

2014 being developed as a bonsai

Growing from cuttings

Rooted Fig cuttings in water

Japanese Black Pine seedlings

IN SUMMARY

- Glean knowledge from everywhere possible
- Be inspired to try new things
- Have a go yourself
- Enjoy the process of learning
- Take time to observe and study
- Talk and share with other people in other disciplines like Horticulture, Forestry, Bonsai, Niwaki, Landscape, Ecology to name a few and other countries approaches
- Most importantly make connections and think outside the box

References

✦Gerrit Lodder of Lodder Bonsai BV- www.lodderbonsai.nl

✦Jake Hobson of Niwaki - www.niwaki.com

✦John Trott of Mendip Bonsai Studio - www.mendipbonsai.co.uk

✦Lee Verhorevoort of LV Bonsai - www.lvbonsai.co.uk

✦Swindon Bonsai Club - www.swindon-bonsai.co.uk

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