Planting trees too deep with the root collar buried under the soil is a common tree planting mistake. Mulch applied against the trunk can cause problems and may necessitate a root collar excavation. The root collar is where roots originate. In nature the root collar maintains its position from germination so, root collar disorders usually result from bad transplanting practices or the addition of soil or mulch that covers the root collar.

A buried root collar is a vulnerable point of entry for infection of Honey Fungus (*Armillaria mellea*). It is distinguished by brown toadstools appearing at the base of trees in autumn. Also, white mats of mycellium show under the bark of the root and root collar of infected trees. Black “bootlace-like” rhizomorphs spread into the soil and carry water from the soil to the wood. This speeds rot and decay. Once a tree is heavily infected by honey fungus there is no cure, although large trees can survive for many years.

Honey fungus attacks both living and dead wood. It can survive on tree stumps and in buried wood for many years. Infected stumps must be dug out, ground or chipped to prevent the spread of infection. Rhizomorphs can be cut and/or physically blocked with a trench or Deep Root barriers to restrict rhizomorph spread to healthy plants.

Root collar excavation (RCX) is a treatment that removes soil around the root collar using an ‘air-spade’, a compressed air lance that breaks up compacted soil with minimal damage and disturbance to tree roots. This exposes the root collar to air and sunlight, reducing moisture and increasing temperatures. Both of these factors have been shown to kill or inhibit *A. mellea* in infected wood.

Air-spade RCX has been proven to reduce the spread of Honey Fungus, preventing infections and possibly eradicking it from the soil. RCX has also been shown to combat early stage Honey Fungus infection. It causes the fungus to recede, followed by a return to normal plant growth patterns.

Using air-spade RCX is a two-pronged attack against the spread and early stage prevention of Honey Fungus, especially if the root zone of the entire tree (area under the canopy) is air-spaded.

Treatment can be further strengthened by soil amendments which are applied directly to the roots using the air-spade after the initial decompaction and RCX. These treatments and products improve tree health and speed recovery.

Additional irrigation will reduce drought stress in trees with root systems damaged by root collar disorder. Correct mulching will also help the plant retain water. At this stage it is recommended that any other pest, pathogen or abiotic problems be treated to ensure the optimal chance of recovery.
Dealing with Phytophthora

by Emma Schaffert and Glynn Percival, Ph.D.

Phytophthora is a genus of 60 species of pathogens classified as oomycetes (water moulds) that cause damage to trees and shrubs globally. Phytophthora spp. have been responsible for widespread epidemics with devastating impacts such as P. infestans that caused the Irish Potato Famine in 1845. Most recently, P. Ramorum (sudden oak death) has had a devastating effect on Japanese Larch forests (over 3 million trees felled) since 2009. The disease spread from infected Rhododendrons and other understorey shrubs.

Free water is necessary for Phytophthora to successfully infect a tree, therefore, this pathogen is most common in poorly drained soils or that receive excessive irrigation. Consequently, Phytophthora can be commonly found on newly developed sites where soil is severely disturbed or compacted by construction activities. Phytophthora is also found in hardy ornamental nursery stock. Infection usually progresses from the root collar or finer roots, into the larger roots and tree trunk. Often this infection will not directly kill the tree, but make the tree more susceptible to other infections and pathogens. Phytophthora are seasonally active organisms that are quickly displaced in plant tissues by other fungi and bacteria. They are often difficult to isolate for diagnosis. Distinguishing the exact species of Phytophthora can be problematic. Advances in molecular DNA analysis aids in identification, however, such an analysis can prove expensive.

Phytophthora is common on the following tree species:

- Aesculus
- Azalea
- Beech
- Boxwood
- Camellia
- Chamaecyparis
- Cherry
- Dogwood
- Érica
- Fir
- Hemlock
- Japanese Holly
- Laurel
- Lime
- Rhododendron
- White Pine
- Yew

Suggested Management Programme for the Suppression of Phytophthora

Management strategies should be aimed at promoting tree vitality (treat the patient, not the disease.) Bartlett management strategies would recommend:

1. Ensuring optimal tree nutrition. Sample soils for nutrient and pH levels. Based on soil nutrient analysis results fertilise with the appropriate soil nutrients.

2. Applying organic matter such as an under composed wood mulch to a 5-10cm depth. Ideally mulches should be applied to 1m beyond the canopy drip line if possible.

3. Guarding against over (and under) irrigation. Monitor soil moisture levels to ensure soil water status is optimal for tree root growth and deters Phytophthora development.

4. Using an air-spade to stimulate root growth and de-compact soil.

5. Apply phosphites in early spring. Bartlett research at the University of Reading shows that this is highly beneficial in the suppression of this disease. Treating surrounding susceptible plants on a preventative basis also is recommended.

6. Applying a systemic fungicide as a soil drench.

Phytophthora pathogens have become a widespread problem for many tree species in the UK. Control of Phytophthora is demanding. There is no “magic bullet”. Management should rely on promoting tree vitality and alleviating all forms of stress where possible. Our results indicate this will prevent infection and/or allow the tree to recover and survive infection. Many of these strategies are new to professionals involved in management of trees within our towns, cities and parks. Changes to existing management programmes are key to success. If we don’t adapt our current management systems to embrace new technologies to counter Phytophthora and other diseases such as Massaria of London plane, sweet chestnut blight, Chalara ash die-back and red band needle blight, then many of our dominant UK landscape trees may follow the way of the elm and disappear over the next 40-60 years.

Evidence of infection

Symptoms of Phytophthora Root Rot Vary

Symptoms vary depending on the susceptibility of the plant species, virulence of the specific Phytophthora pathogen and site and environmental conditions. Symptoms of infection include a reduction in shoot growth; small leaves, thinning of the crown, chlorosis, twig and branch dieback and eventually death. Diseased roots are reddish brown and brittle. These symptoms are often confined to fine roots and lateral roots. Decline occurs over a period of months or years before death. On some plant species, symptoms do not appear until root or collar rot is advanced.
How Many Leaves?

Count the total number of leaves in this drawing.

Check the answers at www.bartlett.com/puzzles or by scanning this QR code with your smartphone.

What’s a QR Code?
A type of barcode which you scan with a smart phone to immediately access additional information or a web site. In selected printed material, like Tree Tips, we may occasionally include a QR code that will link you to additional information online.

Children’s Corner – Summer Project

A Busy, Buzzy Garden
It’s a great idea to encourage butterflies and bees into your garden and you can do this by growing a few of their favourite plants to tempt them in. Many butterfly species are becoming scarce and bees are also struggling at the moment, so by growing bee and butterfly friendly plants you can help them to survive. You will need to grow your plants in a sunny place in your garden.

- Place a few pebbles in the base of your planter for drainage and then fill with a mixture of soil and compost.
- Plant the taller plants in the middle, for example: Phlox and Aster.
- Then plant Lavender, Angel’s Pincushion and Verbena around the edge.
- You could plant Blue Lobelia at the front edge so as it grows it tumbles over the edge.
- Then you will need to water your tub.
- Other plants you could use to attract butterflies and bees: Broom, Nasturtiums, Primrose, Sweet Williams, Catmint, Petunias and Delphiniums.

Honey Fungus and RCX (continued from page 1)

The resultant hole from deep RCX can be lined with material like perlite, sharp sand or vermiculite to stop soil collapse and provide a growing media around the root collar.

RCXs may require a schedule of maintenance because over time it is important that the root collar remains exposed to allow the greatest effect on reducing fungal infection.

Honey fungus is a notoriously difficult soil borne disease to control. Traditional management included the removal of tree stumps and major roots. It was an expensive and time consuming process. At present there are no chemical controls for the management of Honey Fungus. RCX does not rely on fungicides, nor does it require expensive equipment. In combination with the application of a Trichoderma based bio-control agent long term efficacy against Armillaria infection may be possible especially when applied as a preventative measure.

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A visit to Blarney Castle Gardens, the home of the world famous Blarney Stone was carried out with Head Gardener, Mr Adam Whitbourn. The purpose of the visit was to examine two lime avenues going into decline. We identified a fungal-like disease on the main Lime avenue, this was later identified in our diagnostic laboratory to be, Phytophthora citricola this was present in 90% of the older lime trees in the historic main lime avenue. Treatment for this pathogen is not practical on trees so badly infected, and many of these trees will have to be removed in order to save others on the grounds.

Bartlett Visits Blarney Castle Gardens

This option is always our least favourite, as it is our goal to preserve rather than remove trees if possible.

Following a short walk through the beautiful gardens at blarney castle including a walk through the rock close, up the wishing steps and a short marvel at the yew trees near the witches’ kitchen. We arrived at the new lime avenue and observed some stem cracking on the lower stems of all of the trees within the avenue; it became evident that the trees had all been planted too deep. Fortunately there are remedial treatments to improve these conditions. This includes immediate removal of soil and grass at and above the root collar. This may be done via manual means (i.e. trowel). Alternatively Bartlett Research laboratories recommend the use of hypersonic air excavators for this purpose as this causes minimal root and stem disturbance.

It is our privilege to attend trees and plantings at such a beautiful and historic site. We will be working hard to improve the conditions we described and preserve as many of the plantings as we possibly can.

Unfortunately, some of the diseased older lime trees can not be saved.