



# Sydney Environmental & Soil Laboratory

Specialists in Soil Chemistry, Agronomy  
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## Soils for Tree Transplanting

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## **Soils for Tree Transplanting**

### **Question:**

We had some problems with a mature fig tree transplant. Massive leaf drop occurred shortly after transplant and any new growth was deformed and yellow. The potting mix we used for backfilling was very black and smelly. Can you advise us on what to do?

### **Answer:**

The most common problem in mature tree transplanting is the incorrect use of potting mix type products with a high organic matter content for backfilling the tree in its new position. I have seen many well prepared trees either die or suffer severe setback from this problem. The problem is one of aeration and it is not necessary to have poor drainage to suffer aeration problems, all that is required is a combination of high demand for oxygen and a low porosity in the mix to supply that demand. The oxygen demand is produced by root respiration and the fact that decaying organic matter consumes oxygen, the fresher the organic matter, the higher the consumption. I was once asked what the most limiting nutrient element in urban soils was and my unequivocal reply was: **oxygen!**

A natural soil never shows appreciable organic matter at depths below 100-200 mm, and most of the nutrient pool is also contained in this surface layer. Despite this fact contractors and architects continue to recommend backfilling materials based on mixes of soil, sand, ash, and organic matter thinking that the water and nutrient holding ability of the organic matter is needed at depth. The most deadly combination is where relatively unstable organic matters with a high decomposition rate such as mushroom compost or sewage sludge is used.

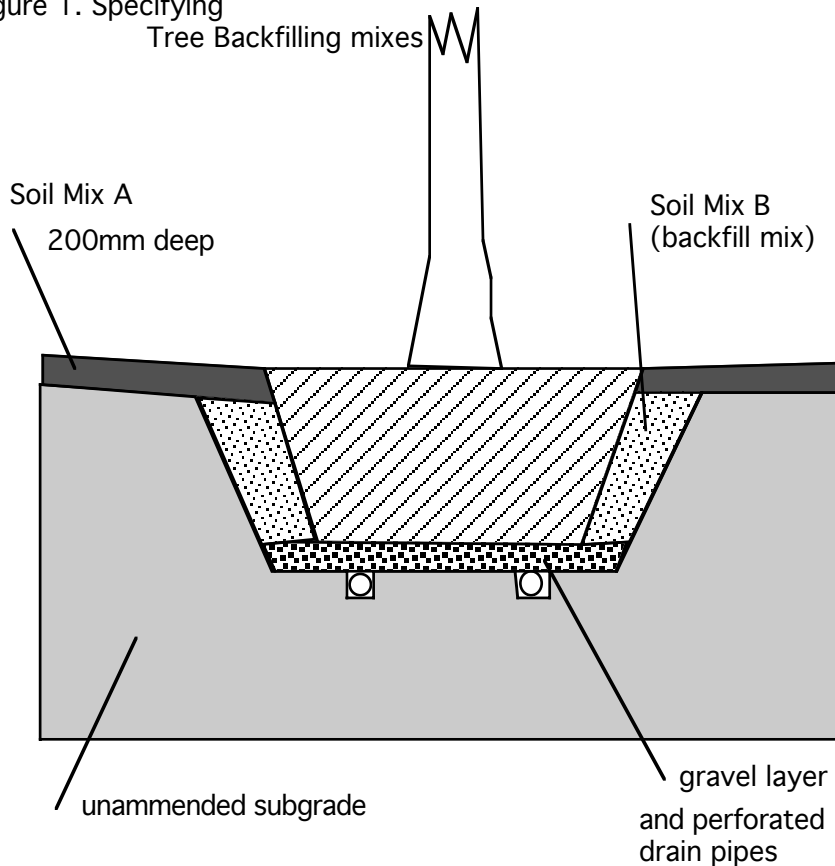
When trapped away from an atmospheric interface the 21% oxygen level in the soil air rapidly (within hours) drops to less than the magic 5% needed to support root growth. At this stage the plant wilts and or drops leaves. If the oxygen demand is severe enough a series of chemical reactions sets in causing-

1. lack of soil oxygen and high carbon dioxide levels.
2. reduction and loss of nitrogen as a gas (nitrogen deficiency)
3. root toxicity caused by reduced manganese and iron.
4. hydrogen sulphide production
5. landfill gas (methane) production.

In your case conditions were severe enough for sulphide production causing the smell of rotten egg gas and the black colour of iron sulphide. Your tree will die rapidly unless it can develop roots in areas of good aeration rapidly enough, or unless remedial action taken. You must quickly remove all potting mix to the full depth of the rootball and replace with a mix high in mineral content and low in organic matter. Materials such as sand, sandy soil, heavy soil (if used in small amounts), ashes, and clay minerals only must be used. The very surface 200mm can have an organic rich soil mix with manures etc to provide a high nutrient content.

In future use Figure 1 below as a guide to the correct backfilling method for trees over say 35 litre in size although I have even seen tubestock suffer this problem if high oxygen demand is also combined with poor drainage as water filled pore space conducts oxygen ten thousand times more slowly than air filled space.

Figure 1. Specifying



**Soil Mix A.** This is the living zone of the soil. A soil mix high in organic matter and nutrients can be specified complying with all the usual pH and salinity requirements also. In some cases it may be adequate to simply amend the site topsoil with some manure, in others a fully imported layer may be needed.

**Soil Mix B.** This mix should be specified according to the nature of the site soil, in order to minimise interface problems. Its basic requirements are for low organic matter content and free drainage. In many cases the unamended site subsoil should be used if drainage tests show that it will conduct water. In clays which will not conduct water a mixture of site subsoil and river sand will provide the necessary drainage but also provide some buffering against severe interface problems. The site clay should be amended with lime or gypsum if needed to improve stability. Where irrigation is provided pure sand may be used. No fertiliser needed although some slow release can be used above 500mm.

The basic rule of transplanting mature trees from my experience is **do not bury organic matter**. It is both unnecessary and harmful to use any organic matter at all in a backfilling mix. If better water holding is required consider the use of synthetic polymer products or, if you must, then use peat moss only, which is a stable form of organic matter less likely to cause oxygen depletion problems. By following these rules you will remove the major source of stress on new large specimen transplants.

### **Further Reading**

Craul P.J. 1992. *Urban Soil in Landscape Design*. John Wiley & Sons New York . pg 142 and pp 292...317.

Handreck K. A. and N. D. Black. 1994. *Growing Media for Ornamental Plants and Turf*. 4<sup>th</sup> Edn. UNSW Press. pg 394. and Chapter 10.