

Using copper nails to treat tree disease, by David Whyte

Due to an interesting debate on Facebook about using copper nails to prevent leaf curl in peach and nectarine, I wondered if there was any objective science to confirm or deny this procedure. From the comments, it appears many people in New Zealand do this and some gave testimonies about how it worked for them.

Unfortunately, like many things there is no specific research looking at this exact question. But there are some papers that we can make inferences from.

Using nails to cure mineral deficiencies has been studied early in the 20th century. Before there was understanding of how soil pH affects mineral uptake, apples planted in soils with a high limestone content (one would assume these were high pH) showed signs of iron deficiency, called chlorosis. A number of treatments were considered, including hammering nails into the tree¹. These iron nails were approximately 30 mm long and were described as “heavy finishing nails” - one could assume these were reasonably thick. They were hammered in without damaging the bark, and a nail punch was used so that the heads were sunk completely under the bark.

Between eight and ten nails were used on a branch, or if the trunk was used, 15 – 20 nails. The four trees in the experiment that used only nails, completely recovered from chlorosis. After one year, there was little improvement, but by the second year the trees had recovered. Similar effects occurred when nails were used a year after injection of iron sulfate into the trunk.

In Utah, where soil pH and chemistry means that iron chlorosis still occurs and treatment of the soil is challenging, nails are seen as a solution². However this comes with the disclaimer that results are variable and trunk damage can occur (we will return to this later).

As well as iron, zinc deficiency has been corrected with nails.³ In California, orchardists were treating zinc deficiency by driving galvanized nails or pieces of zinc, into the trunk. However, large numbers were required, 50 – 60 zinc-coated nails for each inch of trunk diameter. For example, if the trunk was two inches in diameter, then 100 – 120 nails would be used, and so forth. This treatment apparently completely cured zinc deficiency in all producing orchard trees except citrus and even stated it was better than soil treatments for walnut trees and grapevines.

There is also a patent where nails were coated with micronutrients so they could be nailed into trees to provide them with these specific trace elements. A clever concept, but one that didn't catch on.

It could be concluded that copper nails hammered into trees will most likely provide copper to these trees if they are lacking it. However, given that most people will have a soil pH within the range that allows trace elements to be taken up, and if you have a property like mine which already has high copper levels due to previous owners using copper sprays, the soil levels of copper are already on the high side and deficiencies are unlikely to occur.

A leaf micronutrient test would of course be the best tool for determining copper levels in the plant and making wise management decisions, but this type of tool was not available nearly a century ago when these studies took place.

A detrimental effect of inserting nails into trees is that the process can cause physical damage to the tree. It is claimed that if you inject your trees with fertilizer⁴ much higher yields can be obtained than by applying fertilizer to the ground below. This makes sense as you are removing a number of steps for instance, the dissolving of the fertilizer into the soil. The soil biology would provide the nutrients to the tree roots and the roots would then be able to take up the nutrients.

However results for injecting nutrients are mixed⁵ and there are many problems with injecting. One of them is the damage to, and death of the xylem. The xylem is one type of transport tissue inside the tree, and is important as it transfers water from the roots to the shoots and leaves. When injection occurs it can cause the tree to isolate the area of xylem that is pierced and seal it off from the rest of the tree, causing that part of the xylem to die. These injured sections may extend as much as five metres in either direction and even into the root system. They not only extend vertically, but may also ascend or descend in a spiraling or curving nature.

The relevance to this discussion is that the paper states:

“Examination of wounds that mimic those made by tree injection (holes made by increment borers, nails or bolts driven to install deer stands, maple tree taps, gunshot wounds, or yellow-bellied sap suckers drilling to induce sap flow and attract insects) reveal similar columns of occluded xylem and decay.”

This clearly indicates that nails inserted into trees can cause death to parts of the trunk. Frustratingly, I could not track down papers showing injury by nails and can only assume that this is common knowledge in the US. Trunk death clearly takes time, as the iron or zinc in the nails was able to impart enough of the micronutrient over a two year period to cure the signs of deficiency.

A fascinating aside is that the famous Italian polymath Leonardo da Vinci injected arsenic into peach trees in order to make the fruit poisonous, and Stephen Hales, a clergyman in the 1700s who made numerous contributions in several scientific fields (including botany) injected camphor into trees to study their circulation and found he could smell the camphor when it reached the tree buds.

So in conclusion, there is no scientific evidence that copper nails inserted into trees help them in any way. If the soil conditions are such that copper is not able to be absorbed, then adjusting the pH or otherwise changing the soil conditions would be preferable to using nails. This also applies when copper is present in low levels in the soil where it can be added as a trace element, instead of using nails. Lastly, an additional reason to avoid using nails to treat deficiencies is that these can injure the tree, and will therefore not be good for the long term health of the tree.

References

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- 4 Shaaban, M., Trunk Nutrition. *Advances in Citrus Nutrition*, pp 101-112 2012
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