Sterilized Pruning Tools: Nuisance or Necessity?

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Anyone who has made an investment in top-quality pruning tools probably cleans and maintains them on a regular basis. But would you clean them every day - maybe several times? While most of us would agree that such a cleaning regime would not be cost effective, there is evidence that such measures can help reduce the transmission of certain plant diseases to healthy plants.

In spite of the ongoing debate regarding tool sterilization, there is surprisingly little information in the scientific literature that addresses this issue. Most of the research has focused on agriculturally important crops: citrus, stone fruits, and vegetable crops. We can extrapolate these results to woody ornamentals, however, and draw some rational conclusions. The focus of this article will be on when, why, and how to sterilize pruning tools.

First, the good news. It is probably not necessary to sterilize pruning tools to prevent transmission of soil- or air-borne pathogens. These diseases, generally bacterial or fungal in nature, are more likely to be transferred by your hands and clothing than by your pruning tools. Obviously you should avoid being a direct vector in disease transmission, but you will probably have better success in controlling these diseases through preventative landscape management practices (e.g. pruning diseased parts, disposal of contaminated leaf litter, and use of disease-free compost and mulch).

In contrast, diseases that invade the vascular system or form oozing cankers are much more likely to be transmitted by contaminated pruning tools. As early as 1906, Waite & Smith linked fire blight (*Erwinia amylovora* Burrill) infections in nurseries to contaminated pruning tools. Others have confirmed this more recently (Beer 1979; Goodman & Hattingh 1988; Kleinhempel et al. 1987; Lecomte 1990; van der Zwet & Keil 1979), and Lecomte (1990) noted that transmission did not occur during plant dormancy - only during the growing season. Fire blight bacteria do not overwinter in the vascular system, which may explain why transmission does not occur during this time. In contrast, Goodman and Hattingh (1988) found a 66% infection rate during cool, wet conditions in trees pruned with shears treated with bacterial spot (*Xanthomonas campestris* pv. *pruni* Smith). The infection rate dropped to only 7% when trees were pruned with infected shears under hot, dry conditions. The authors speculate that the cankers are less infectious when dry; under wet conditions they become gummy and the inoculum adheres more tightly to pruner surfaces.

Seasonal differences in infection rates were also seen with the fungal pathogen *Leucostoma cincta* (Barakat & Johnson 1997). Also called perennial canker, Cytospora canker, and Valsa canker, this disease can be transmitted either directly onto pruning cuts or from contaminated pruning shears. The authors found that pruning in the late spring was worse than dormant pruning. Although the wound-healing rate was slower in winter-pruned trees, the availability of inoculum, the percentage of infection, and the expansion of cankers was less than in trees pruned in the late spring.

Viruses and viroids are the final group of plant pathogens that can be transmitted by contaminated pruning tools. Although Berg (1964) reported that infected pruning tools did not transmit poplar mosaic virus, the preponderance of the published literature indicates otherwise. Citrus exocortis and other citrus viroids can be transmitted with contaminated tools (Kyriakou 1992; Roistacher et al. 1969). Hadidi et al. (1997) were successful (50-70% infection rate) in transferring peach latent mosaic viroid to both lignified and green shoots of peach plants using contaminated shears. Likewise, tomato mosaic virus was transferred to healthy plants 70% of the time when contaminated pruners were used (Pategas et al. 1989).

It seems clear that if pruning tools are contaminated with vascular pathogens or active, oozing cankers, then there is an excellent chance that the disease will be spread to other plants if the tools are not disinfected. Several researchers have studied different disinfecting solutions with sometimes ambiguous results. In general it seems that any disinfectant will remove virus or viroids from tools (Broadbent 1963, Broadbent, 1965, Brock, 1952; Demski, 1981, Gooding, 1975). This makes sense as both viruses and viroids are relatively unprotected and can be killed by direct contact with disinfectants.

Successful removal of other pathogens, especially canker bacteria, is less certain. Plant pathogenic bacteria do not form spores and therefore they are not as resistant as fungi to harsh environmental conditions. However, bacteria associated with active cankers are embedded in a sticky mass, which is often difficult to remove from pruner surfaces. In fact, one study (Kleinhempel et al. 1987) argues that disinfectant solutions would not remove bacterial slime from the surface of cutting tools. Their research indicated that the pruning blades were covered with microscopic pits from which bacterial slime could not be removed. Only when they pre-coated their tools with plastic could pruners be successfully sterilized.

Obviously the solution to spreading pathogens from active cankers is to avoid cutting the cankers altogether. For other plant pathogens, several disinfectant treatments have been compared:

Tested Disinfection Treatments of Pruning Tools

Alcohol dips (ethanol or isopropyl alcohol)
Recommended: Barakat & Johnson 1997; Horticultural Abstracts 1986; Teviotdale et al. 1991.
Not recommended: Pategas et al. 1989.

Alcohol dips + flaming - standard procedure for tissue culture
Recommended: Goodman & Hattingh 1988; Singha et al. 1987.

Chlorine treatment (Clorox, monochloramine)
Recommended: Horticultural Abstracts, 1986; Lecomte 1990; Teviotdale et al. 1991.

Household cleaners (Listerine, Lysol, Pine-Sol)
Recommended: HortIdeas 1987; Teviotdale et al. 1991.

Trisodium phosphate (Na_3PO_4; 10% solution)
Recommended: Pategas et al. 1989.

A final consideration to choosing a disinfectant treatment is how damaging it may be to your tools. Teviotdale et al. (1991), who performed the most comprehensive study, found Lysol to be least corrosive and Clorox to be the most harmful to pruning tools.

To disinfect your tools or not - what's the bottom line? To make an informed decision, you need to know your pathogen and its life history, and use common sense:

- if it's a virus or viroid, disinfect your tools.
- if it's a vascular fungus or bacteria, and/or forms oozing cankers, disinfect your tools.
- avoid cutting active, oozing cankers; wait until they dry.
- if you are pruning irreplaceable plants, disinfect your tools.
- choose a disinfectant treatment that has been shown to be effective through published research; I would probably not use alcohol but one of the common household cleaners at full strength.

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