

Avoiding Diseases in Propagation

Ann R. Chase

Chase Agricultural Consulting, LLC, Cottonwood, AZ 86326

archase@chaseresearch.net

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INTRODUCTION

The characteristics of propagation that promote disease are excess water, high humidity, poor air movement, and handling. In addition, there are generally open wounds on unrooted cuttings for obvious reasons. Water trumps fungicides! That means poor water management cannot be repaired by application of fungicides and bactericides. I've heard really good growers say that some diseases never occur unless the water is not managed correctly. Getting plants out of misting as soon as possible is always the best idea.

Combating shipping damage with rehydration under cool/cold conditions before sticking can really help. In addition, ethylene monitoring during shipping can alert you to possible problems. Dipping is not the best idea for many herbaceous unrooted cuttings as it can lead to water-soaking and cutting loss.

Unfortunately, pathogens on cuttings and seeds are more common than I would like. The fact that our propagators are often overseas makes the possibility of introducing a "new" disease more likely than previously. There do appear to be fewer seed-borne diseases than 20-30 years ago, but I would watch out for "heirloom" varieties. These special crops are not usually handled the same way as the more common, newer varieties.

It is critical that you learn to recognize common diseases or at least when something is wrong with your cuttings. This will allow you to do something therapeutic to stop losses and damage. Some fungi and bacteria are on cuttings, including downy mildew, bacteria, *Sclerotinia*, and even *Pythium* (Table 1). Keep track of all treatments you do, including dates and rates. It never helps to guess what worked or did not work after the crop is done.

Table 1. Pathogens common to widely cultivated ornamental species and their primary source of infection on propagative material.

Plant species	Source(s)	Pathogen
Basil	Seed	<i>Fusarium</i> , downy mildew
Begonia	Leaf cuttings	<i>Xanthomonas</i>
Calla lily	Bulbs	<i>Pythium</i> , <i>Erwinia</i> , <i>Rhizoctonia</i>
Coleus	Seeds, cuttings	Downy mildew
Geranium	Cuttings	<i>Botrytis</i> , <i>Pythium</i> , <i>Sclerotinia</i> ,
Hydrangea	Cuttings	<i>Rhizoctonia</i> , powdery mildew
Impatiens	Seed	<i>Acidovorax</i>
Lavender	Cuttings	<i>Pseudomonas</i> , <i>Xanthomonas</i>
Molucella	Seed	<i>Cercospora</i>
New Guinea impatiens	Cuttings (appears in shipping)	<i>Myrothecium</i>
Petunia	Cuttings	Tobacco mosaic virus
Poinsettia	Cuttings, flats, benches	<i>Rhizoctonia</i> , <i>Erwinia</i>
Purslane	Cuttings	Alternanthera mosaic virus
Ranunculus	“Bulbs”	<i>Pythium</i> , <i>Xanthomonas</i>
Rosemary	Cuttings	<i>Pseudomonas</i> , <i>Xanthomonas</i>
Salvia	Cuttings	<i>Pseudomonas</i> , <i>Xanthomonas</i>
Spathiphyllum	Liners (appears in shipping)	<i>Erwinia</i> , <i>Myrothecium</i>
Zinnia	Seed	<i>Alternaria</i> , <i>Xanthomonas</i>

It is also important to track the exact source and how they root for each set of unrooted cuttings. If you do not, you cannot determine which source is most reliable. If you “clean” up bad leaves or cuttings, do not just pile them in the middle of a bench where they can act as a source of more infections. *Botrytis* moves really well from debris piles.

You also must choose the right products and apply them when the cuttings are stuck instead of 3-5 days later when the bench or entire greenhouse is full. Delaying treatment for *Botrytis* effectively means no control. Use a product that stays on the unrooted cutting. For *Botrytis* we found that

Daconil WeatherStik was most effective under average propagation conditions.

Do not use plugs within the immediate area of where others have died or rotted out. They are probably infected, too. Scout frequently and quickly discard infected propagation flats. A little problem can quickly turn into a big one. If you use infected cuttings or plugs, you will simply put more dollars into something that will end up in the trash.

What kind of water treatments are safe and effective? ZeroTol is very good on algae prevention, but not very safe on small plants. X3 is not as effective on algae but is safer on small plants and can control some

diseases. KleenGrow can be very effective on algae for prevention, but should be checked for safety on sensitive crops, such as basil. Be sure to regularly clean trimmers. KleenGrow is effective and safe on plant material and machinery.

Do not use fungicides on everything. They are costly, and some of them can delay or even stop rooting. This has been shown with a few active ingredients (e.g., fludioxonil and triflumizole) on a few plants. It is also common to see copper used under conditions where it will not dry quickly, such as in propagation facilities. The result is often phytotoxicity, which may not be apparent to the naked eye. If you wound a plug or unrooted cutting, that gives *Botrytis* an entry point, and can lead you to assume that the fungus is resistant to copper. It is not clear that this is the case since copper is not the best control for *Botrytis* and can cause phytotoxicity as mentioned above.

Get plants out of the propagation environment as quickly as possible. This can mean using under-bench heating in the winter to speed up rooting, using fans to move stagnant air around, and careful monitoring for signs of rooting and/or signs of disease.

Some products even help seeds germinate and unrooted cuttings root. Strobilurins are a good example of this. A single spray with Pageant Intrinsic (4 oz/100 gal) or RootShield Plus (4 oz/100 gal) has improved germination and growth of *Ranunculus* seed, rooting of *Solidago* cuttings, and rooting of myrtle cuttings. We have also seen Pageant Intrinsic help with drought stress. Similar benefits in rooting on

poinsettias (and other crops) using either Heritage or Mural has been demonstrated.

Most recently we have seen benefits in doing a bulb dip employing KleenGrow. The product has been shown to reduce losses due to *Fusarium* on infected bulbs. Our trials started by checking out the possibility that the dip solution might be contaminated with plant pathogens, leading to the spread of disease. We found that treatment with either 1- or 2-mL L⁻¹ actually killed bacteria and fungi in the dip water, making disease spread unlikely. We also saw improved growth after a 5-minute soak in 1 mL L⁻¹ for several bulb crops, which was probably due to improved wetting of the bulbs given that KleenGrow is a wetting agent. These trials included calla lilies (three cultivars), caladiums, tulips, Asiatic lily, hyacinth, and gladiolus.

CONCLUSIONS

Do not use contaminated seeds or cuttings. Do not try to cure trash. Be careful about using fungicides or certain water treatments on unrooted cuttings. Do not use recycled water in propagation at all! Manage your water, both the timing and amount. Get plants out of propagation as soon as possible. Use RootShield Plus or a strobilurin, such as Heritage, Mural, or Pageant.

Characteristics of propagation that lead to disease include high humidity and poor air movement. Handling spreads pathogens. Combat shipping damage with rehydration and ethylene monitoring. Dipping is not the best idea for many herbaceous unrooted cuttings given that it can cause water-soaking and cutting loss.