Propagation Media: Don't Forget What Is Not Easily Seen©

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INTRODUCTION

There are two parts to this talk. The first is about cutting media and the second is about media for seedling production. Within each, I concentrate on physical properties and a few aspects of nutrition. I take it for granted that your media are free from plant pathogens and that your hygiene practices are excellent.

CUTTING MEDIA

Physical Properties. Root production by cuttings requires that the cuttings remain turgid. Any wilting decreases rooting percentage. Turgidity is maintained in part with water from the medium itself and in part from humidity in the air.

It really does not matter what you use to make cutting media, so long as the physical properties are what your cuttings need in your environment. The main components used are composted bark, peat, perlite, sand, coir fibre dust, and vermiculite. By physical properties I mean air-filled porosity (AFP) and water-holding capacity (WHC). The AFP and WHC are mutually opposed to one another: increase one and the other automatically decreases. So it is necessary to strike a balance between them, based on the environment in which the medium is to be used.

For this discussion, the important part of that environment is how water is to be supplied. Specifically, the media requirements for propagation under fog are different from those for propagation under mist.

With mist, the cuttings themselves are intermittently sprayed with water. Some of this water runs into the cutting medium, which is likely to remain quite moist. If the AFP of the medium is too low, the cuttings may not get enough oxygen and so root formation is compromised. The medium must therefore have a high AFP, probably in the range 20% to 30%. However, it is also important that the basal part of the cutting remains in contact with liquid water, so the AFP should not be higher than is needed to ensure good oxygen entry.

With fog, while the air is kept humid, very little water actually enters the medium. The WHC of the medium should be higher — and AFP lower — for propagation under fog than under mist, so that cutting bases remain in contact with water. It will generally be necessary to irrigate occasionally to maintain WHC. An AFP in the 10% to 20% range can be appropriate. Including peat or coir fibre dust in the medium helps ensure good contact with the cuttings.

Chemical Properties. It has been repeatedly shown that the pH of cutting media should be fairly low in the range 5–5.5 generally. Low pH increases the "leakiness" of the cutting and so enhances auxin uptake and root formation.

While the cutting itself will not take up nutrients from the medium, as soon as roots form they should have nutrients available to them. It is therefore generally desirable to include a small-prilled, intermediate-term, controlled-release fertiliser (CRF) in the medium at about 1 $kg \cdot m^{-3}$.

If the cuttings came from stock plants that were over-fed with nitrogen, they may have a carbohydrate concentration that is too low for good rooting. A drench or two of sugar solution (50 $g \cdot L^{-1}$) should help.

It is also highly desirable that the medium contain humified organic materials. Humic and fulvic acids in the humates of such materials have hormonal activity that can promote root initiation and early growth. That means that the medium should contain some composted material that has been thoroughly cured at temperatures below 40 °C. If that type of material is not available, a drench or two of a humate extract may be useful.

The medium should have a low level of biological activity, as an aid to pathogen suppression. However, such activity must be minimal, such that the nitrogen drawdown index should be 0.7 to 0.8. Heavier drawdown will interfere with early root growth.

SEEDLING MIXES

Physical Properties. Seedlings are typically germinated in/on media contained in plugs, cells, or trays that are much shallower than pots. Shallowness means that the saturated zone at the bottom of the container can extend to the surface if the particle size of the medium is not carefully controlled. Increasing average particle size is the usual way of reducing the height of the saturated zone (by increasing AFP). Such an increase is opposed by the need to maintain good contact between water and small seeds at the medium surface.

Success in this balancing act calls for very close control over the spread of particle sizes in the medium. It is not good enough to specify, for example, composted bark of "minus 6 mm grading." Such a specification says nothing about the proportions of particles of different sizes below 6 mm. Thus a high proportion of 5–6 mm particles will give a medium with large enough holes that seeds fall down them and/or soon lose contact with water. Conversely, a high proportion of particles in the 0–3 mm range could produce a medium that remains saturated and oxygen-less most of the time. It is critically important that your supplier can guarantee consistency in particle size distribution from batch to batch, and can easily change this distribution to suit seasonal conditions.

Other important physical properties include an absence of slivers (as of wood) and long fibres (as from coir fibre dust) and a moisture content that allows good flowability into cells.

Chemical Properties. Seedlings being produced in plugs will receive their nutrients via fertigation. The contribution of the medium is via appropriate pH, usually around 5.8. Media for seedlings being produced in cells and trays can have a low rate of CRF, or a basal inclusion of a slow-release fertiliser.

Two precautions must be noted.

1) First, it is essential that the medium have a low ammonium concentration. Some seedlings are damaged when the ammonium-N concentration in a 1 : 1.5, v/v extract of the medium has as little as 10 $mg \cdot L^{-1}$. Such low levels are achieved through use of thoroughly cured composted organics, use of peat and perlite, minimal fertiliser addition, and/or the inclusion of zeolite in the mixture.

2) The second precaution relates to phosphorus. A normal result of the supply of ample phosphorus in the presence of adequate nitrogen is stretching that might or might not be limited through the use of growth retardants. The simplest way of controlling stretching in seedlings is to supply sufficient nitrogen, but have phosphorus supply such that the plants are slightly deficient in phosphorus. The P/N concentration ratio in the fertiliser used needs to be no higher than 0.07, as for example from a 13N-0.9P-11K fertiliser.

FURTHER READING

Handreck, K.A., and **N.D. Black.** 2010. Growing media for ornamental plants and turf. 4th Ed. Univ. New South Wales Press, Sydney.