PROPAGATION MEDIA: WHAT A GROWER NEEDS TO KNOW

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There is no one best material or combination of materials for every grower and every propagation need. Thus, it is important to understand some of the overall basics, not just characteristics of specific media.

DESIRABLE MEDIUM CHARACTERISTICS

A list of desirable characteristics of a propagation medium published by Matkin, *et al.* (2) in 1957 differs little from the list of Hartmann and Kester (1) in 1983. Our list which follows has new wording but has nothing new in theory. A grower needs to know if his *medium*:

1. Will hold cuttings upright.
2. Will assure adequate aeration.
3. Will retain adequate moisture so that watering does not have to be too frequent.
4. Is readily available in a consistently uniform grade.
5. Is free of weed seeds, nematodes, and plant pathogens.
6. Is durable; volume change is negligible, structure retains porosity, and chemical makeup is stable to steam or fumigation.
7. Is free of excess salts or toxic chemicals and preferably has low fertility.
8. Is somewhat resistant to loss of nutrients by leaching, especially where used for direct-stick propagation.
9. Is relatively inexpensive.
10. Is relatively light in weight.

MEDIA MATERIALS

Many materials have been tried and tested, accepted and rejected and often tried again in an attempt to find the ideal medium. Listed in the literature (1, 2, 3, 4) and personally observed are: soil; sand that is further identified by terms including fine, coarse, brick, concrete, plaster, bank, pit, silica, and torpedo; peat, peat moss, peat humus; gravel; sphagnum moss; flu ash; fly ash; pumice; perlite; vermiculite; cinders; sawdust (many kinds); wood shavings; rice hulls; compost; manure; leaf mold; pecan hulls; calcined clay; styrofoam; sheet plastic over humid air chamber; water; and rockwool. Many of these materials are used both alone or in combina-

tion. Some materials that are not desirable alone may add desirable characteristics when mixed with other materials.

HOLDING CUTTINGS UPRIGHT

Very light-weight materials such as perlite may not hold large cuttings upright unless mixed with other materials to add weight and allow slight compaction.

ADEQUATE AERATION

The most common problem we have observed in propagation is inadequate aeration, usually resulting from excessive watering by misting or fogging. Soil, fine sand, peat, peat humus, ash products, compost, and leaf mold usually should not be used alone due to poor aeration. However, these same materials may be desirable additives to increase resistance to loss of nutrients by leaching when mixed with coarser, more porous materials; 25% non-capillary pore space should provide adequate aeration.

MOISTURE AND NUTRIENT RETENTION

Both moisture and nutrient retention are more important for direct-stick propagation (sticking cuttings directly into container/beds/fields for growing-on), than for cuttings that are transplanted as soon as they are rooted. The materials mentioned above generally aid nutrient retention as well as moisture retention. Coarse sand and gravel used alone usually would not hold adequate moisture and nutrients.

READILY AVAILABLE, CONSISTENTLY UNIFORM

Few naturally occurring inorganic materials are available in a uniform grade. Soils vary greatly in particle size distribution as do sands. Commercially marketed organic materials such as peat moss, rice hulls, and ground bark usually are readily available in uniform and reliable quality.

Perlite, vericulite, pumice and calcined clay are examples inorganic materials that are readily available and consistently uniform.

FREE OF WEEDS AND PATHOGENS

Many good materials are relatively weed- and pathogen-free for first-time use. Peat moss, perlite, vermiculite, pumice, cinders, and even bark usually are safe to use without steaming or fumigating. However, when re-using any medium, fumigation or some sort of sterilization is a recommended practice.

LOW SALINITY AND FERTILITY

Few would question the need for a materials with low salinity, but some may question the intentional use of materials of known low fertility. We think it is much easier and safer to add desirable nutrients from a known low level than to run soil tests and make adjustments. It is difficult to remove undesirably high levels of salts, plant nutrients included.

RELATIVELY INEXPENSIVE

Few propagation media are prohibitively expensive as a propagation medium, considering the value of the crop to be grown. However, costs should not be ignored when less expensive materials may do just as well. We think the medium should be as deep as possible to provide space for excess water to settle. When a relatively expensive medium is used, the inclination to reduce medium depth is greater. Also, propagation in the same medium as used for growing is recommended, thus making a relatively inexpensive medium highly desirable.

LIGHTWEIGHT

A light-weight, or low density, medium generally is desirable for ease of mixing, handling, shipping, and transplanting, but there may be some undesirable aspects in certain situations. For example, when transplanting potted liners to field soils, plants grown in lightweight media usually establish more slowly. This probably is due to unequal moisture levels across the light-weight, heavy soil interface.

SUMMARY

Our topic was "Propagation Media—What a Grower Needs to Know." We haven't given you many answers, but hopefully we have told you a few things you "need" to know. The medium that works for one grower may not work for another unless both use the same containers and trays, use the same structure, have similar quality water, have similar weather, and follow similar watering, transplanting, and fertilization programs. Media alone will not assure successful propagation. But, if you know the 10 characteristics we have listed, problems should be fewer.

LITERATURE CITED

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UTILIZING AIR ROOT PRUNING IN NURSERY SEEDLING PROPAGATION

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Judkins Nursery decided to diversify its product line by starting two new operations: tree growing in 5-gallon containers, and field production of large-caliper trees. A new propagation facility was needed to supply a broader range of plant species and better quality liners to the new operations.

Why use the air root-pruning system? *First*, it produces a superior root system without the winding common in other types of container-grown seedlings. *Second*, it offers accelerated growth through controlled growing conditions. *Third*, the liners can be moved to the next step in the production cycle without shock or loss of the momentum gained from the accelerated growth. *Fourth*, the transplanting can be done in the late summer or early fall when the nursery work load is at its lowest point. This system was brought to management's attention by the writer, who had observed the work of Dr. Carl Whitcomb and his students in experimenting with growing seedlings in milk cartons. These experiments were reported at Oklahoma State University Nursery Research Field Days over a period of several years.

There were two main objectives of the new system. *First*, to produce a salable 6- to 8-foot tree in a 5-gallon container in two growing seasons from a seed. *Second*, to produce a better quality liner for the field that could be transplanted in late summer or early fall.

FACILITY AND MATERIALS

The site was graded to assure good drainage and covered with approximately 2 in. of ¾-in. aggregate crushed limestone. Three water lines were installed 30 feet apart with risers 32 feet apart in each line. This spacing allowed the placement of five raised