

Equipment, Products and Services

All trade names mentioned in this section are used for the information and convenience of the reader, and do not imply endorsement or preferential treatment by the author or the USDA Forest Service.

Soluble Fertilizers with Calcium and Magnesium

As any of you know who have ever tried to custom-mix soluble fertilizer solutions for liquid injection, materials containing calcium and magnesium can cause solubility problems in the mix tank (Figure 13). This problem is especially common in nurseries with very pure water which do not contain a base level of these important nutrients (see pages 9-11 for more on calcium nutrition). Recently, however, Scotts Horticultural Products has introduced a line of water soluble fertilizers that contain both calcium and magnesium, as well as micronutrients (Table 7). Their new patented process has made it possible to mix a complete fertilizer solution in one tank, which eliminates the need for two-head injectors, and makes the mixing instructions much simpler.

In addition, the new Osmocote Plus? controlled-release-fertilizers also contain 6 micronutrients and magnesium, but not calcium, for those incorporating slow-release fertilizers into their growing media. Several N-P-K formulations are available that will last from 3 months to as long as 1.5 years at 21 °C (70 °F), which is much longer than earlier slow-release fertilizers. For this reason, they are being applied at the time of outplanting to provide supplemental mineral nutrition during that critical period of establishment.

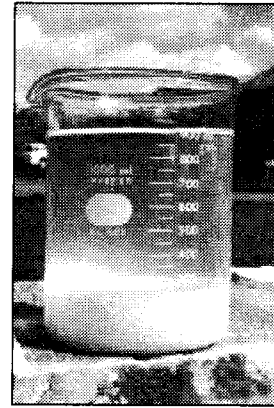


Figure 13. It is difficult to add calcium to most concentrated soluble fertilizer mixes because chemical incompatibilities result in heavy precipitates.

Growing Media Containing Sawdust

Although sawdust has been used as a growing media component in horticulture for many years, this has not been the case in forest and conservation nurseries where peat-vermiculite media have been the norm. About five years ago, Steve Pelton of Pelton Reforestation in British Columbia began experimenting with a medium containing sawdust, and after good initial results, other Pacific Northwest growers followed suit. Now, Black Gold is offering a new "Forestry Mix #3" which contains 30% fresh Douglas-fir sawdust and 70% *Spagnum* peat moss. Since fresh sawdust requires supplemental nitrogen during decomposition, this mix contains 0.75 lb of urea form fertilizer (38-0-0) per cubic yard to allow for this demand.

Table 7. The Peters line of Excel? fertilizers contain calcium and magnesium

Product Name	Formulation (N-P ₂ O ₅ -K ₂ O)	Available Nutrients in 100 ppm N Solution					
		N	P	K	Ca	Mg	S+Micros
EXCEL Cal-Lite	15 - 0 - 0	100	0	0	120	0	Yes
EXCEL Cal-Mag	15 - 5 - 15	100	15	83	33	13	Yes
EXCEL Magnitrate	10 - 0 - 0	100	0	0	0	90	Yes

Growing media containing uncomposted sawdust offers one valuable attribute that other commercial media lack—the gradual creation of more macropores during the growing season. This shrinkage due to decomposition was originally thought to be detrimental because it caused the media to pull away from the side of the container, allowing irrigation to run through without wetting the media. If this decrease in volume could be controlled, however, then the growing media would gradually create more aeration porosity, and places for roots to expand throughout the growing season. Good growers have been concerned about the tendency of roots to fill all the available cavities in the medium, which decreases the air porosity and creates saturated conditions in the root zone (Figure 14). This condition is particularly prevalent later in the growing season when root growth reaches its peak. As the peat moss-sawdust mix gradually decomposes, however, the additional porosity provides better aeration in the rhizosphere and places for the roots to grow.

The rate of decomposition must be carefully controlled. The type and condition of the sawdust, and the amount and form of supplemental nitrogen fertilizer are critical. The quality of sawdust varies considerably depending on tree species, age, and how it is handled and stored. Black Gold has developed a steady source of Douglas-fir sawdust of uniform quality and has the expertise and mixing equipment that is necessary to properly incorporate the fertilizer. They also have the ability to sample the media and maintain a uniform quality which is most important. As with any change in growing media, irrigation and fertilization will have to be adjusted, so the Forest Research Nursery at the University of Idaho will be conducting a series of tests with this peat moss-sawdust media during the upcoming season. Several other growers will also initiate small-scale trials, so we should know more about this exciting new growing media by later this fall. If you would like more information in the meantime, then call or FAX Michelle at Black Gold:

Michelle Miller
Black Gold, Inc.
19308 Highway 99E
Hubbard, OR 97032
USA
Tel: 503-981-4406
Fax: 503-981-2304



Figure 14. *Waterlogged roots often develop “cauliflower-like” growths around the lenticels.*

Source:

Handreck, K.A.; Black, N.D. 1994. Growing media for ornamental plants and turf. Randwick, NSW, Australia: University of New South Wales. 448 p.
Landis, T.D.; Tinus, R.W.; McDonald, S.E.; Barnett, J.P. 1990. Containers and Growing Media, Volume Two, The Container Tree Nursery Manual. Agric. Handbk. 674. Washington, DC: USDA Forest Service. 88 p.

Seed Upgrading Equipment

Nursery managers that purchase seed should expect clean, pure seed of high quality, but those that collect and process their own seed may need to upgrade certain seedlots. While it cannot directly improve the quality of individual seeds, upgrading improves the potential performance of a seedlot by removing empty, damaged, weak, and immature seed. Nurseries often upgrade seed lots that will be single sown, especially if precision seeders will be used.

A promising new technique for upgrading Pinus and Picea seed lots is the IDS (Incubation-Drying-Separation) method which separates filled, nonviable seeds from filled, viable ones. First, the seeds are soaked in water at 15 °C (59 °F) to obtain full

imbibition, then dried at 25 °C (77 °F) to create differences in seed moisture content. During drying, viable seeds will retain more moisture than nonviable ones, and this difference in weight can be used to separate the two fractions by flotation in water. The principle is that heavier filled seeds will sink and the lighter empty or damaged seeds will float. This procedure needs to be carefully checked with a cut test, however, as some filled seeds will float if water bubbles are trapped on the seed coat, or empty seeds may sink if they are dirty.

Several types of upgrading equipment can also be used to upgrade seed, but air column separators are perhaps the best option because they can be precisely adjusted to separate seeds by three physical properties: size, shape, and density. Richard Felden of Seed Tech Systems has developed a couple of new precision air seed separators. The STS-WM3 is a wall-mounted model that was specifically designed for upgrading seedlots based on the weight of the individual seed in relation to its air resistance (Figure 15). The rate at which seed is fed into the air columns can be precisely adjusted so that each seed reacts individually, and an air valve slide adjustment controls the volume or velocity of air moving up through the separating columns. The STS-WM3 has been shown to successfully reclaim seed that would have been discarded from screen separators or gravity tables. The STS-MACS is a multiple air chamber system which feeds seed into multiple enclosed chambers which have precisely calibrated air streams. The air flow is calibrated by a digitized LED variable frequency computer to allow very precise air adjustments in each column, and thus achieves in a single-step process, the same separation that would require several other machines in sequence. For more specific details, you can call Rich at:

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Seed Tech Systems
PO Box 980243
West Sacramento, CA
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Tel: 916-684-1196
Fax: 916-684-7675

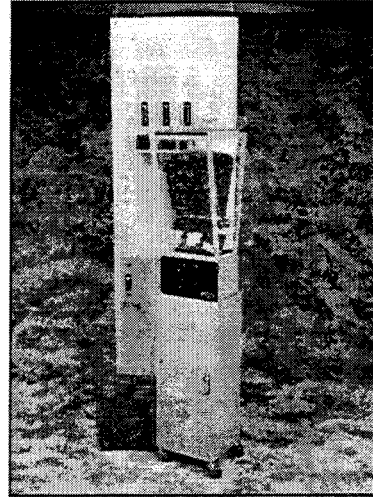


Figure 15. Air column separators are one of the best and easiest ways of upgrading seedlots by removing empty or partially filled seeds. (Courtesy of Seed Tech Systems.)

Source:

Bonner, F.T.; Vozzo, J.A.; Elam, W.W.; Land, S.B. Jr. 1994. Tree Seed Technology Training Course - Instructor's Manual. General Technical Report SO-106. New Orleans, LA: USDA Forest Service, Southern Forest Experiment Station. 160 p.

MycorTree Root Dip Inoculant

Mycorrhizal fungal inoculants have been around for decades (see article in *FNN* January, 1993), but this new product incorporates two important concepts:

- 1) use of a mixture of fungi, and
- 2) proper timing of inoculation.

MycorTree is a root dip that is used to inoculate either bareroot or container seedlings prior to outplanting. One of the limitations of previous mycorrhizal inoculants is that they were composed of only one fungus that was specifically suited to a limited number of plant species. MycorTree? , on the other hand, contains five specially selected

species of both vesicular-arbuscular (VA) and ectomycorrhizal fungi that can colonize the roots of most plant species under a broad range of growing conditions. The VA "cocktail" includes spores of several species of *Glomus* spp. as well as *Entrophospora columbiana*, along with spores of the well-known ectomycorrhizal fungus, *Pisolithus tinctorius*. Actually, I would prefer a few more ectomycorrhizal fungi in the mix, but I still like the concept. For ease of application, the spores have been mixed with Terra-Sorb[®] super absorbent gel to reduce root drying and enhance drought resistance, and natural organic extracts to promote fast root regeneration.

The other thing that I like about this product is the fact that the seedlings are being inoculated at the right time. One of the problems that I've had with other mycorrhizal inoculants is that they are added either as a seed treatment, mixed into the growing medium prior to sowing, or sprayed on young seedlings in the nursery. These types of applications mean that the grower often must modify irrigation and fertilization practices to encourage the development of the mycorrhizae, usually at the expense of seedling growth. I've always contended that the time to inoculate is during the Hardening Phase when fertilization and irrigation are being reduced anyway. Dipping the seedling roots right before outplanting is a good idea that allows nursery managers to treat their crops without sacrificing growth. MycorTree[®] Root Dip is added to water in a bucket and mixed for 3 to 5 minutes until it becomes a slurry with the consistency of a heavy gravy. Seedlings are treated by dipping the roots into the slurry until it completely coats the root system. Although it is best to plant them immediately, treated seedlings can be stored for a reasonable amount of time without loss of effectiveness. For more information, contact:

Don Mans or Ed Cordell
Plant Health Care, Inc.
440 William Pitt Way
Pittsburgh, PA 15238 USA
Tel: 412-826-5488 or 800-421-9051
Fax: 412-826-5445

This new root growth stimulant is called Rootall[®] or "P-ITB" because of its chemical composition (phenyl indole-3-thiolobutyrate) and is used just like indole-3-butyric acid (IBA). Comparative trials with IBA conducted on a wide range of ornamental woody plants showed similar effectiveness, but the toxicity profile for P-ITB is much lower. Rootall has just been registered with the US Environmental Protection Agency but it was a long and expensive process. Therefore, the company is conducting a marketing analysis and would like to hear from potential users. If you would like more information including a Material Safety Data sheet on this product, contact one of the following people:

Thomas Zeller or Greg
Brekken Gro/Tech, Inc. PO
Box 725 Rapid City, SD
57709 USA Tel:
605-394-6440

Rotronic Instrument Corporation is marketing a line of instruments that should have several applications in forest and conservation nurseries. The AZ model is a battery operated portable instrument with a long probe (Figure 16) that measures both ambient temperature and relative humidity (RH) and displays

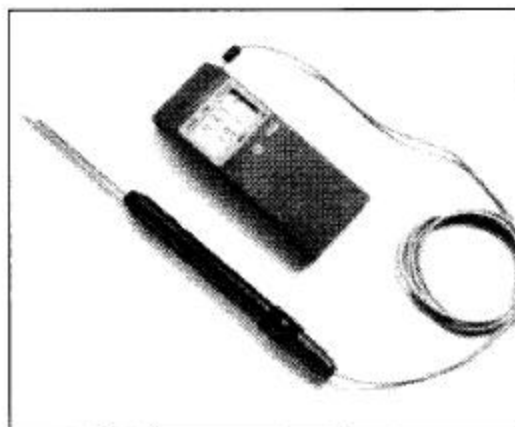


Figure 16. The A₂ is a portable instrument with a long probe that can measure relative humidity and temperature, and also can compute the dew-point. (Photo courtesy of Trotronic Instrument Corp.)

them on an LCD screen. Temperature measurements have never been much of a problem but measuring RH, especially in high humidity environments like greenhouses or seedling storage buildings, has been more of a challenge. Accuracy of RH measurements is advertised at +/- 2% in the range of 5 to 100% RH. The company also sells humidity/temperature transmitters that are ideal for remote control applications. For more information, contact:

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