Protective Root Dips - Are They Effective?
By Thomas D. Landis

The concept of dipping plant roots has been around for many years because it is intuitively attractive. Roots of nursery plants dry as they are exposed to the atmosphere during harvesting and handling and so it would make sense to rehydrate them or apply a coating to protect them (Chavasse 1981). Southern nurseries have been dipping the roots of their bareroot stock in a clay slurry for decades (May 1985). In the western states, the use of root dips is less common but some forestry organizations sell protective root dips as part of their tree distribution programs (for example, Kansas State Forest Service 2005). Root dipping bareroot stock in a peat moss slurry is recommended in some reforestation handbooks (Mitchell and others 1990).

Water - Many bareroot nurseries wet their stock immediately after lifting and therefore the first root dips were undoubtedly water. In the late 1960's and early 1970's, a series of experiments with various durations of root exposure after harvesting and water dipping of roots was conducted on conifer seedlings at Midhurst Nursery in Ontario, Canada. The results varied considerably by species (Mullin in Table 1). For white spruce (*Picea glauca*), dipping roots in water improved survival and had a positive effect on shoot growth after five years. With red pine (*Pinus resinosa*) and white pine (*P. strobus*), however, the dipping treatment showed no benefit except when the seedlings were exposed for considerable periods (Mullin 1978).

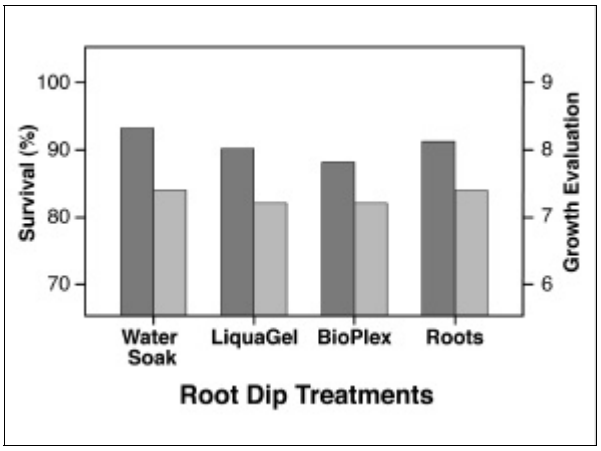

Figure 1 - Compared to a water dip, none of three commercial root dips improved survival or growth of four conifer seedlings two years after outplanting (Bates and others 2004).

Commercial root dips - In the intervening years, many different commercial root dips have become available and most are superabsorbent hydrogels. These crosslinked polymers can absorb and retain many times their own weight in water, and root dips for bareroot stock is just one of the agricultural applications. Erazo (1987) did a good review of the products available at that time and I haven't seen anything newer. I did a check of the FNN database and found quite a few articles that tested various root dip products (Table 1).

While reviewing the published literature for this issue, one recent experiment caught my eye that tested 3

Table 1-Comparison of recent research trials on protective root dips prior to outplanting of bareroot seedlings

Source	Root Dips Tested	Control	Results
Bates and others (2004)	BioPlex®, Roots®, Liquagel®	Water	Negative
Alm and Stanton (1993)	Terra-Sorb®, Terra-Verde®	Untreated	Variable
Hicks (1992)	Supersorb-F®	Untreated	Variable
Echols and others (1990)	Terra-Sorb®	Untreated	Variable
Sparkman (1998)	Ag-Sorbent®	Untreated	Positive
Tung and others (1986)	Terra-Sorb®	Untreated	Negative
Magnussen (1986)	Waterlock®	Untreated	Variable
Dunsworth (1985)	Symbex®	Water	Negative
Mullin (1978)	Water	Untreated	Variable

products (see #150 in the New Nursery Literature section: Bates and others 2004). The thing that I liked about this trial is that they tested the products against a water control. In most previous experiments, commercial root dips were compared to no treatment at all. All of these products are applied in a water slurry and so it just makes sense to me to use a water dip as a control. The authors applied the commercial root dips and the water dip controls to four conifer species in a Christmas tree plantation: Fraser fir (*Abies fraseri*), Colorado spruce (*Picea pungens*), Douglas-fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*). When evaluated for survival, none of the products showed a significant improvement over the water dip control (Figure 1). The commercial root dips gave no appreciable benefit for growth after 2 years, when compared on a 10-point scale: 1 = poorest and 10 = best.

The recently published literature showed a similar trend (Table 1). The one article reporting positive results was anecdotal and presented no real data (Sparkman 1988). The majority of the articles reported variable results, with the dips helping some species but showing no effect with others. Several suggested that the dips would be most beneficial when harvesting during dry, windy weather or when roots were exposed for extended periods. Interestingly enough, there apparently have been no studies with root dips on container stock.

Figure 2 - Al Dahlgreen, reforestation specialist for the USDA-FS, taught that dipping seedling roots in a slurry of wet vermiculite, or products such as Terra-Sorb®, was a critical part of seedling care and handling before outplanting.

That being said, dipping seedling roots after harvesting or before outplanting is still being practiced and many foresters and other seedling users believe that this practice has merit. Al Dahlgreen was the reforestation specialist for the USDA Forest Service in the Intermountain Region for many years as was the person responsible for making significant improvements in their tree planting program. Al taught reforestation workshops every year and convinced many foresters that acclimatization was important for seedling survival and growth on their harsh outplanting sites. Root dipping in a slurry of vermiculite or commercial root dips such as Terra-Sorb® was a critical part of his acclimatization process (Figure 2).

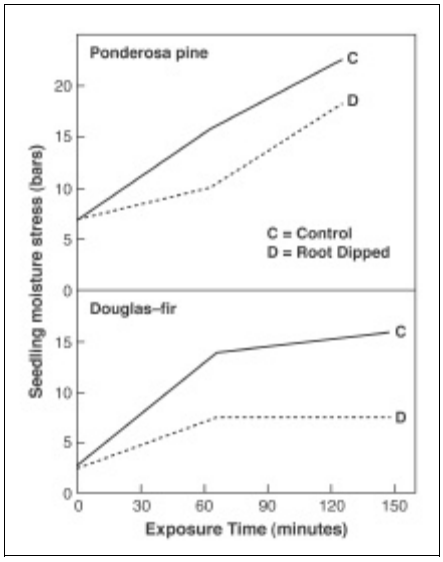

Figure 3 - Bareroot seedlings with their root dipped in a slurry of water and peat moss were more resistant to desiccation when exposed in the planting bag (modified from Lopushinsky 1986)

In the early 1980s, Bill Lopushinky of the USDA Forest Service Pacific Northwest Research Station attempted to verify root dipping and other aspects of acclimatization in a series of controlled experiments on outplanting sites in Washington and Oregon. The root dip treatments consisted of a control and dipping in a peat moss and water slurry for a few seconds on the outplanting site. Subsequent measurements of outplanting performance showed a slightly significant increase in survival for the root dipped versus the control seedlings but no apparent differences in height growth. In a related test of plant moisture stress on untreated and root dipped seedlings in planting bags on a warm, sunny day showed a very favorable effect of the root dipping (Figure 3).

So, in summary, root dipping seedlings in water or in water slurries of peat moss, vermiculite or any of the commercial root dip products is not detrimental and, in several cases, has been shown to benefit seedling survival and growth. I'm sure that many field trials of root dipping have been done over the years but that the results were not collected so as to allow statistical analysis. I'm a great fan of such anecdotal observations, however, so I'd appreciate hearing about any of your thoughts or experiences.

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