Kaolin Clay Dipping at Union Camp's Bellville Forest Tree Nursery

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ABSTRACT

A kaolin clay slurry has been used as a root dip in Union Camp nursery operations since the late 1960's. Rationale for the use of clay slurry, the application system used at the company's Bellville, Georgia nursery, and advantages/disadvantages of use and handling are discussed.

BACKGROUND

Research in the late 1950's (Slocum and Maki 1956) and early 1960's (Bland 1964, Davey 1964) indicated that a clay slurry root dip could result in equal or better seedling survival than was obtainable with the use of moss as a packing medium. Union Camp research (Broerman and Hamner 1966) indicated that clay packing was as good as moss packing when seedlings were stored up to 4 weeks without refrigeration. It was felt that clay offered certain advantages over the **use** of moss including:

Clay-packed bales require no watering after packing for at least four weeks.

It is unnecessary to have water in the planting machine hoppers or buckets when planting clay-dipped seedlings.

Clay lends itself more to a mechanized nursery operation than does moss.

Clay protects seedling roots both before and after planting.

At this same time moss was becoming more difficult to obtain and more expensive when it was found. As a result of the advantages of clay, and the disadvantages of moss, clay became the packing medium of use at the company's Bellville, Georgia tree nursery.

CURRENT PACKING SYSTEM

The packing system that is used today differs little from what was developed about twenty years ago when clay use began.

Seedlings are harvested in the field using a single row lifting machine and placed in tubs. The tubs are transported to the packing shed and placed on conveyers. The packing shed operation consists of four to **six** graders, two dippers, two balers, and a quality control person. The graders remove the seedlings from the tubs, examine them for defects, and discard the unacceptable. Acceptable seedlings are gathered into a handful of approximately 100 or 150 seedlings depending on desired bale count. (Bales are usually packaged in counts of 1000 or 1500.) The graders place the handfuls of seedlings onto a slotted table where the dippers will pick them up. Handfuls are separated on the table by partitions so that the dippers can easily pick up one handful without interfering with another. Each dipper picks up a handful of seedlings and dips the roots in the kaolin clay slurry. He then shakes the excess slurry off the roots back into the dipping vat and places the handful of seedlings into the open bale. The handfuls are placed in the bale with the roots to the middle of the bale slightly overlapping, and the tops of the seedlings to the outside of the bale. Each dipper places five handfuls on his side of the bale for a total of ten handfuls to the bale. The table on which the bales are formed is designed to rotate. When the bale has the proper number of handfuls placed in it the table is rotated so that the balers may close and strap the bale for shipment or storage. While the balers work on closing one bale the dippers will be working on filling another.

The clay slurry used for dipping the seedlings is made by mixing 2.5 pounds of kaolin clay per gallon of water. The clay used is Afton brand kaolin clay from Cyprus Industrial Minerals Company of Englewood, California. It is mined in South Carolina and picked up at the company plant in Aiken.

The mixing and delivery system consists of a 560 gallon mixing tank, a 2 inch feed line, and a dipping vat which will hold 20 gallons of slurry. The mixing tank is located on the outside of the packing shed adjacent to where the seedling tub conveyers enter the building. It is sheltered from the weather by a roof which covers the top and one side of the tank and by the side of the packing shed. Two sides of the tank are exposed allowing material and personnel access. The tank is a 42 inch diameter by 95 inch long cylindrical tank placed upright

on its long axis. It is on a raised platform 36 inches off the ground to allow access underneath the tank for piping and drainage. The top of the tank has been removed to allow space for the water line, adding the clay, and installing continuous agitation equipment. The agitator consists of a shaft running from the top to the bottom of the tank with paddles attached at the bottom and the middle of the tank. The shaft is turned with an electric motor mounted at the top of the tank. Water is supplied through a 1.5 inch water line with a valve at the top of the tank. The clay slurry is moved from the mixing tank to the dipping vat through a 2 inch galvanized pipe. The supply pipe is run from the mixing tank to the dipping vat on the floor of the packing shed. The pipe is placed on the floor under the seedling tub conveyers in order to minimize any tripping hazard. When the supply pipe reaches the dipping vat it is turned up with elbows and positioned so as to pour into the vat. It is equipped with a valve that can easily be turned on or off by the dippers. The elevation of the mixing tank above the supply pipe permits the slurry to flow through the pipe with sufficient pressure to reach the dipping vat. The dipping vat is 36 inches long, 20 inches wide, and 14 inches deep. It is positioned between the dippers with the long axis between them. The mixing tank is marked on the outside and equipped with a simple float device that indicates how many bags of clay need to be added to fill the tank for various depths of slurry in the tank. The slurry is made by partially filling the mixing tank with water, turning on the agitator, and then adding sufficient clay and additonal water to prepare the amount of slurry desired. The slurry can be thickened or thinned by adding clay or water as needed. Although the amount of clay used on a particular day will vary depending on such things as the size of the seedlings being processed, the condition of the root systems of the trees involved, and the individuals doing the dipping, we have found that on average it takes about a ton of clay for each million trees packed.

ADVANTAGES/DISADVANTAGES

Some of the reasons that clay was considered for use to begin with have already been mentioned. Since the time Union Camp chose to begin using clay, researchers have continued to look at the use of clay as well as other alternatives. In most of the work clay appears to do as well or better than the alternatives (Brenneman 1966, Dierauf and Marler 1969, Goodwin and Williams 1980, Goodwin 1982, Venator and Brissette 1982, Strangle and Venator 1984). Some of the additional advantages pointed out by investigators included:

Bales were less likely to heat up as quickly when stored without refrigeration.

Mold did not seem to develop as easily in clay dipped seedlings.

Clay could be used as a carrier for additional root treatments.

It is easy to see that the treatment has been applied.

The reasons that we continue to use clay dipping is that it works. Although we recently added a refrigerated storage facility at the nursery, we do not have refrigerated storage at field locations. Seedlings must be able to survive at field locations until planting occurs which at times may be several weeks. We do not want to have labor tied up watering bales. For those two reasons alone the clay is favorable for us. In addition 100% of our planting is contract, mostly with machine, and much of it on rough ground. The idea that water is not needed in planting machine hoppers or planting bags is also important. To put it simply, clay improves the seedling's chance for survival in our operation, and we like that.

We continue to dip seedlings because of fear that spraying would not result in adequate root coverage. Switching to a spray operation would be costly and at this time it is not felt that it would be beneficial.

The use of clay as a root dip is not without drawbacks. The biggest complaint associated with the use of clay is probably that it is messy. It IS messy. The process of dipping the seedlings in the slurry and shaking the excess material back into the dipping vat results in slurry on the dippers, on the floor, and on just about anyone nearby. It is difficult to shake all the excess slurry off the roots. As a result some clay ends up in the bales and eventually runs out while the bale is waiting to be planted. The slurry runs from the bale onto the packing shed floor, onto the bed of the delivery trucks, and onto whoever handles the seedling bales. Fortunately it is fairly easy to clean up, but unfortunately it does make surfaces slick and increases the risk of slipping or falling. It requires extra caution when working on the slick surfaces. When dipping is used in conjunction with bags, rather than bales, less clay escapes. The problem then becomes one of the seedlings in the bottom of the bag becoming drenched in the slurry, tops as well as roots. If seedlings are not planted for several weeks after packing, the clay will eventually start to dry out. When this happens the seedlings tend to stick together making them more

difficult to plant. The thicker the slurry at the time of packing the greater this problem is likely to be.

The use of a ton of clay per million seedlings in a mechanized operation usually means that a fairly large quantity of material must be kept on hand to insure that you do not run out. We receive clay in twenty ton shipments and get nervous when the supply drops below 10 ton. The maintenance of a sufficient reserve of clay requires a storage area where it can be kept dry. Fortunately it does not matter whether the area is hot or cold which makes finding storage a little easier. The clay is generally packaged in 50 pound bags. Whoever handles the material must be physically able to do so. In addition it is in a powder form which requires some care in handling to avoid inhalation. Dipping has one possble disadvantage over spraying from a personnel safety standpoint and that is that it requires repetitive motion. Care must be taken in choosing and monitoring the dippers to avoid occupational injuries associated with repetitive motion type work.

The use of superabsorbants as a replacement for clay has been investigated just to be sure we are not letting new technology slip by unnoticed. To date we have seen no survival or growth differences in planted seedlings that would justify additional expense nor does the use of the superabsorbants appear to be less expensive.

CONCLUSION

At the present time the use of kaolin clay as a root dip for packing seedlings is preferred. Clay dipping results in equal or better seedling survival than other packing mediums. It lends itself well to a mechanized nursery operation. The advantages of its use are felt to outweigh the disadvantages associated with it.

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