Tree Root Culturing in Polypropylene Pads with Protruding Roots

John Maurice
Kibbutz Hazorea, Israel 30060

INTRODUCTION

A small experimental nursery at Hazorea has for a number of years been developing techniques intended to produce lightweight nursery trees adapted for transportation to remote and possibly primitive destinations. Subtropical and tropical fruit and nut trees, such as are usually grown commercially in bags, are produced with highly compacted roots in pads whose dimensions are similar to thin pocketbooks. This flat configuration allows for efficient packing, insulation, air-freighting, and cartage under rough conditions. The rootpads can be used with wide-ranging tree-nursery-propagating systems.

Tests included both open ground and intensive greenhouse practices; all of the techniques involved air root pruning, copper root control, or spun-bonded polypropylene fabric as used in growbags. Most trees were vegetatively propagated.

Modifications were made recently to accommodate more efficient irrigation practices. These resulted in incorporating the rootpads into a kind of hydroponic/aeroponic system. It is becoming increasingly obvious that the rootpads function at their optimum potential under this system — consequentially it is this system which is described below. The trials were done with irregular numbers of assorted trees and changes in technique were made during the growing period. For this reason no statistics are supplied and results are of a generalized nature.

A trough containing a nutrient solution served as the basic structure. The rootpads were given rigid support by Styrofoam sections. Excellent growth conditions were induced by the constantly wet polypropylene enveloping an aerial rootmass. The tag ends of the polypropylene acted as wicks to suck up the solution.

MATERIALS AND METHODS

Individual Styrofoam sections 20 cm × 12 cm × 2 cm were used as rigid support for a flat root mass, wrapped, and grown in nonwoven thermo-bonded polypropylene fabric of similar dimensions after wrapping (Fig. 1). This fabric also acted as a wick when inserted about 5 cm into a nutrient solution. Roots grew well without any substrate in the polypropylene, or with about 100 cm^3 of an inert substance such as vermiculite or a vermiculite/peat/coconut fiber mixture. The nutrient solution was drawn up so that a film of water envelops the flat root mass. The wet polypropylene adhered to the Styrofoam sections provided the contents were not too bulky or heavy. The trees were held in place by pressure between the insulating Styrofoam sections.

The nutrient solution was contained in a trough 25 cm to 40 cm wide, of any convenient length and height. The floor of the trough was treated with Kocide/latex paint or spun-bonded polypropylene fabric for root control. Various refinements, such as polyethylene coverings, could be fixed to the trough. The density of the trees was adjusted according to their size. When the foliage became overcrowded some of the rows could be removed to another trough. Inserting and extracting the pads was

Figure 1. Rootpads clamped in groups in a trough. By another method, field scale troughs can be molded into the soil just above ground level, and covered by black plastic.

Figure 2. A cherimoya rootpad containing 400 cc of substrate. Flat rootpads are rapidly planted against a soil wall, or inserted into moist soil between a metal blade and a plastic strip.

not done individually, as the remaining pads would topple over due to the buoyancy of Styrofoam. They were handled in groups that were tightly clamped between the two sides of the trough.

It appeared advisable to use a dense quality Styrofoam, as this discouraged root penetration. Copper treatment of the Styrofoam was also possible but not essential.

The plants originated from various sources: seeds and cuttings planted directly in the pads or from plants started under other conditions, such as field-grown bare-rooted seedlings or graftlings, plugs, airlayers or from air root-pruned baskets, mist, fog, or tissue culture. These were inserted into a 35-cm length of polypropylene fabric folded into the desired dimensions to form pads, with or without substrate.

Even when rooted plants were intended for wrapping without substrate, it was advisable to retain just enough material around the roots to protect the white tips.

Some difficult-to-root cuttings had to be treated under more sophisticated conditions, but a technique that might help certain moderately difficult ones was by extending the polypropylene beyond the upper leaves.

Trees could be removed and grafted in the trough under a mobile shade structure on bicycle wheels. This shade device had a grafting table that held various grafting materials.

DISPATCH AND PLANTING OUT

The root pads were detached from the Styrofoam section when removed from the trough for despatch (Fig. 2). Foliage could be thinned out, pruned, and dipped in phytosanitary materials. The root pads were dipped in a gel to protect protruding rootlets during the critical moments when they were exposed to the elements at planting time. This was economically practical due to their compactness. The pads were compressed to reduce moisture content. The trees were inserted full length into polyethylene sleeves and packed in cartons with any necessary insulation. Instructions were sent with the trees regarding two possible planting alternatives as follows: (1) The rootpads were placed up against 15-cm soil walls. (2) A slit of loosened soil was prepared in advance with a pick axe. Planting took place after rainfall with the possible addition of a little water to completely saturate the soil. The tree was removed from the polyethylene sleeve. The tag end of the pad was placed flush over the end of the sleeve and directly over the slit. A 12-cm- wide blunted metal blade pressed on the tag end forced the rootpad downwards, clamped between the polyethylene and the blade. The blade and sleeve were then extracted. This operation was very fast and especially useful under rough, sloping, and rocky conditions.

Flat root mass tree roots have been examined a year after planting by extraction under water pressure. The root systems were found to have reverted to their natural configuration, sending down anchor roots in a symmetrical manner.

Propagation of Promising High-Elevation Species Native to the Colorado Plateau

Janice K. Busco and Joyce Maschinski
The Arboretum at Flagstaff, 4001 S. Woody Mountain Rd., Flagstaff, Arizona 86001

INTRODUCTION

The Arboretum at Flagstaff is located at an elevation of 7150 ft on 200 acres of the world's largest ponderosa pine forest. It is the mission of the Arboretum to study and display native plants and plant communities of the Colorado Plateau. It is also our mission to identify, evaluate, and introduce into cultivation plants adaptable to the climatic conditions of the Plateau.

With an area of 170,000 square miles, the Colorado Plateau includes elevations from 2000 to 14,000 ft. Parts of Arizona, New Mexico, Utah, and Colorado are located on the Plateau. Known throughout the world as the site of the Grand Canyon, the Plateau is one of the most environmentally varied and sought-after environments in North America. It was here that C. Hart Merriam pioneered his system of life zones, with all of the six zones represented on the Plateau.

PLANT COMMUNITIES AND CLIMATIC FACTORS

The Arboretum's living collections include plants from desert grassland, chaparral, pinyon-juniper, ponderosa pine and mixed conifer forests, and alpine plant communities, as well as from riparian zones, seasonal wetlands, and native grasslands.

Included in our collections are plants from USDA Temperature Zones 2 through 6, (Sunset Western Garden Zone 1) reflecting a range of recorded minimum temperatures between -20 and -50°F. Much of the average annual precipitation of less than 25 inches is lost to runoff and evaporation caused by strong winds, bright sun, and low relative humidity.

The Plateau has been described as a "a land of extremes and surprises." Native to the western great plains and mountains of New Mexico, Maximilian's