ROOTING HARD-TO-ROOT CONIFERS

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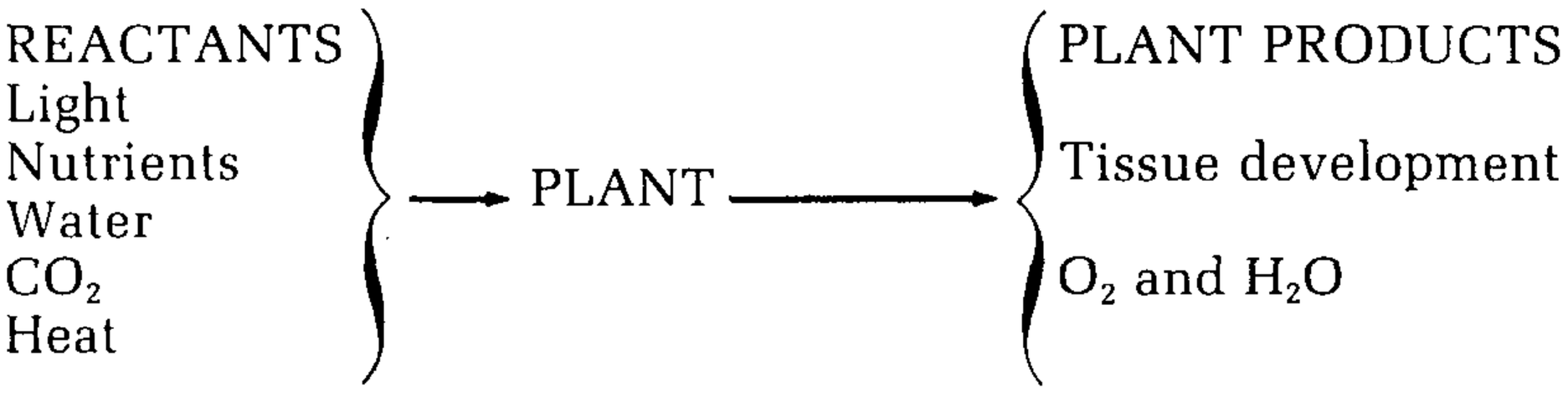
In October, 1971, the Western Region, IPPS, held its 12th annual meeting in Santa Barbara, California. One of the presentations (1) that year made a lasting impression on me. Robert W. King of the California Propagation Co., Sepulveda, California, spoke on "The Balance of Light, Humidity, and Temperature As Related To Cutting Leaf Drop". The "bottom line" of his experiments was that rooting percentages of *Pittosporum tobira* and other cuttings could be increased by about 30% if bottom heat was reduced an average of 10°F. on cloudy days. He noted that rooting time was, however, increased by more than 10%. My question of Mr. King after his presentation was — "had he considered turning the bottom heat even lower to see if he could get increased benefits." He answered in no uncertain terms that he was in the business to make money and that time was money — since bench space was very costly. Both my question and his answer have continued to haunt me over the years.

My presentation today takes up where Mr. King's left off nearly 14 years ago. In his very clear introduction, Mr. King summed up plant development and growth as follows:



Simply stated: a warm, well-fed, well-watered and well-lighted plant will grow vigorously. Conversely, a poorly fed and poorly watered plant in a cool, poorly-lighted area will produce tissue growth much more slowly. Plant propagators know that it is the proper balance of these reactants that is the key to successful propagation and production. We know that the plants more difficult to propagate from cutting are those in which the proper balance of these reactants is very critical. Most of us have lost crops both from too much light and heat and from too little water, as well as from too little light and too much water. The conifer propagator must not only be able to maintain this optimum balance of heat, light, and water, and nutrients but he must be able to maintain it over a very

long period of time during which there are often considerable weather changes in the seasons. He must, of course, be able to do all this in a cost effective manner.

Over the years we have worked out a less traditional method for achieving this balance of heat, light, and water which has enabled us to root conifers using much less energy, fewer chemicals, less water, and less labor — but requiring more time.

In the early 1970's, and at the time I heard Mr. King's talk, we were getting the approximate rooting results that we are today. We were doing this using fiberglass covered "A"-Frame greenhouses dug into the hillside, electric bench heat; and PYE mist control units controlling Monarch mist heads, together with Acme convection-tube fan systems and polypropylite shade cloth. In short, we had state-of-the-art structures for the time. I do not need to dwell on the construction and operation costs of such units today. By 1983 we were confidently rooting our same line of conifers, mostly dwarf and ornamental spruces, with some firs and hemlocks outside under a canopy of deciduous and evergreen trees without a structure, without an automatic watering system, without bottom heat, and without the use of fungicides. The trade off: it now takes up to 1½ years to produce a well-established rooted conifer cutting outside as opposed to 6 to 8 months in the greenhouse. For us the savings in dollars, labor, and materials have much more than offset the cost of holding the cuttings the extra time.

The theory behind our strategy is really just an extension of Mr. King's findings: Reduced bottom heat temperatures, although slowing tissue growth, greatly reduces the growth of pathogens. In addition, if light is kept to the low levels of only a few hundred foot candles, the water requirements are greatly reduced both from transpiration and evaporation. In fact, the water needs are reduced to the point that our cuttings need no water other than rain from January through June and no more than 2 or 3 waterings per week during the hot summer months. Cuttings receiving such low amounts of water and no bottom heat have a greatly reduced chance of decay, so much less so that our outside cuttings have fungicide treatments only when they are initially stuck (one in 1½ years) as opposed to weekly applications for those cuttings in the greenhouses.

I would like to encourage more of you to experiment with propagating conifers outside in high shade without bottom heat. Our nursery is located 30 miles east of Portland, Oregon, at the western end of the Columbia River Gorge, at an elevation of 1000 ft. Our yearly temperature is several degrees

cooler than that of Portland, Oregon, and ranges from about 0° to 90°F. Our annual rainfall is about 60 in. per year.

LITERATURE CITED

1. King, R.W., 1971. The balance of light, humidity, and temperature as related to cutting leaf drop. *Proc. Inter. Plant Prop. Soc.* 21:83-86.

CONTROLLING THE ENVIRONMENT FROM CUTTINGS TO FIELD

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At Bailey Nurseries, a significant quantity of softwood cuttings are rooted and successfully planted bareroot to the field within the same growing season. These plants normally remain in the field throughout the summer and through another full growing season producing what is referred to as a "year and a half" plant. The objective of this practice is to provide the nursery trade with a medium sized, highly vigorous bareroot plant in as short a time as possible. This plant is unattainable by other nursery practices. Certain environmental conditions must be created and maintained in order to produce healthy, vigorous rooted cuttings with good survivability.

Controlling the environment for propagation begins with healthy vigorous stock plants from which to take cuttings. The stock plants should have optimal water and nutrition, and be free of all diseases and pests. Without these essential factors, the propagator is at a distinct disadvantage. Actively growing field stock will normally provide excellent cuttings; however, in some cases stock plants must be maintained.

Once it has been determined that the cuttings are at the proper stage for propagation, they must be given a healthy environment in which to exist after being separated from the parent plant. A sharp knife or pruning shears are used to make a good clean cut. Small bundles of cuttings (25 to 50) are laid in the cool shade of the stock rows until they are picked up and placed in a basket. Cuttings are picked up within a few minutes after they have been taken from the stock plant. Baskets of cuttings are immediately drenched with cool, clean water.