

they are quite difficult to germinate. Some get good results and some don't. I think use of bottom heat seems to be one of the best ways of breaking their dormancy.

## MONDAY MORNING SESSION

August 13, 1973

VICE-PRESIDENT OKI: We will start this morning's session with Dr. Fred D. Rauch, University of Hawaii, in charge. Fred:

MODERATOR RAUCH: We will hear first from Dr. Horace F. Clay, Dean of Special Programs, Leeward Community College, Pearl City, Hawaii<sup>1</sup>.

MODERATOR RAUCH: Our next speaker is a young man who graduated from Penn State, did his graduate work at UCLA, and arrived here in Hawaii about 5 years ago. I think he is also one who took the idea of his topic "Population Explosion," quite seriously — he is still a bachelor. He is a horticulturist working in growth regulators, media, and ground covers. So now I would like to call on Dr. Richard Criley.

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<sup>1</sup>Dr. Clay showed slides and described the propagation methods of many of the unusual shrubs and trees grown in Hawaii.

## POPULATION EXPLOSION<sup>1</sup>

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Are you worried about the population explosion? Our national population is growing by about 2,000,000 persons a year. Our 1970 census tabulated 204.7 million people. About 74% of our people now live in urban territory — towns of 2,500 or more to densely settled suburbs of large cities. To some, it seems that the United States will need perhaps 400 or more new towns and cities accommodating 25,000 to 250,000 with space to grow.

The next 30 years will bring an explosion of urban growth in areas now largely rural. Cities will continue to grow upward. How congested we feel will depend on how we design and use our space.

The 1972 Yearbook of Agriculture, "Landscape for Living," tells us that an estimated 80 million people garden as a hobby in

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the United States, and that 59 out of every 100 people believe that "green grass and trees around me" are most important to their happiness. Everyone seems to enjoy plants and the effects that they create.

We are all familiar with the diverse uses to which plants have been put — in shopping malls, along city streets, as screens and barriers, in offices and homes, and on small lanais.

With all of these needs for plant materials, we must ask, where are these plants to come from? What we need — is a population explosion of plants! The rapid increase of plant materials represents a challenge to us all.

## SYSTEMS

One of the newest tools of the plant propagator is tissue culture. Success has been achieved with a few plants such as orchids, carnations, and some foliage plants but research is still needed for many more. Tissue culturing facilities are expensive to set up, and the sanitation requirements are not practical for many growers.

A variety of conventional systems is still available to us. These include the use of single-node cuttings to make maximum use of limited amounts of plant material. Leaf cuttings, of course, have been used successfully to increase certain fleshy-leaved plants such as begonias, crassula, sedums, sansevieria, and African violets and gloxinias. Leaf-bud cuttings are more specialized forms of single node cuttings which have the leaf, an axillary bud, and a portion of the stem.

It is sometimes hard to break the traditions built up over the years. Here in Hawaii it is common practice to take a 2-3 foot long branch of plumeria and bury its base in soil and await root formation, which takes anywhere from 6 weeks to 6 months, depending on the reliability of the propagator's memory. On the other hand, I have found that 6 to 8-inch terminals will root under mist in 8 weeks if 2,000-3,000 ppm IBA is used. Dr. Rauch has gone even one step further using — for plumeria, anyway — what amounts to a "mini-cutting." A very soft, 3-inch long terminal kept under strict sanitation under mist in a foam block will also root in 6 to 8 weeks. One of the important implications to us, then, is a more efficient means of increasing new cultivars which we select.

There is no need to describe the systems of grafting and budding to a meeting of plant propagators. It is enough to be aware that small amounts of plant material can be increased quickly and efficiently using these methods.

However, we can point to these potential "explosions" for our Hawaii plant materials which use these increase methods.

The pummelo, a grapefruit relative, is a desirable citrus. Selections obtained through a competition for pummelos have been grafted by Warren Yee of our U. H. Horticulture Department to provide a source of propagating material for our growers.

The rainbow shower, [*Cassia javanica* x *C. fistula*] the city tree of Honolulu, is a sterile hybrid which has not been successfully propagated by cuttings to my knowledge. All of the trees in our parks show the crooked trunks of an air layer. Sometimes the root systems are inadequate because of insufficient post-planting attention. The parent tree stands mutilated after layers have been taken. I have found that the rainbow shower can be budded onto *Cassia fistula* seedlings in the fall using a T-bud. This is hardly new, but only a few "old-timers" have made use of the vigorous root system of one of the parent species of this hybrid to achieve the same kind of growth in 8 months that an air layer may take 10 to 12 months to acquire after a 6 to 8-month rooting period.

We find also that our plumerias are fairly easy to bud. Thus, if we can use every bud on a branch of a new selection, we can increase it all the more quickly. This leads me to the last part of my story — the aids to propagation in our pharmacy of plant chemicals.

#### CHEMICAL AIDS TO PROPAGATION

The use of auxins to stimulate rooting and of gibberellins to stimulate sprouting of a dormant bud have been described to IPPS members many times before. I would like to mention, then, some chemicals which may give us more plant material with which to work.

These are compounds which stimulate branching and the development of shoots from axillary buds.

A synthetic cytokinin, 6-(benzylamino)-9-(2-tetrahydropyran-yl)-9-H-purine (PBA, code name SD8339), has been shown to stimulate greater bud initiation in red ti as shown in Table 1. A greater percent of the initiated buds went on to develop into sprouts. This affords us more plant material, especially of the attractive dwarf ti so popular in the foliage industry.

PBA also hastened plantlet development on begonia leaf cuttings. It also gives us more buds when applied to the cut stump of a plumeria branch. Thus, more buds are available for our increase system.

The compound, ethylene, has been known for a long time to stimulate root initiation on certain herbaceous plant material and to overcome apical dominance. A new ethylene generating compound, ethephon, now permits us to apply a spray to plants to stimulate more lateral branches.

**Table 1.** Effect of PBA on bud initiation and development in *Cordyline terminalis* 'Onomea'

Treatment		Buds initiated	Buds developed	% buds developed
PBA	500 ppm	4.1	2.8	68.3
PBA	100 ppm	4.7	2.8	58.6
PBA	50 ppm	6.0	2.2	36.7
Control		4.0	1.5	37.5

The morphactins are a strange class of compounds with many effects on plant growth. It is interesting, however, that low concentrations stimulate lateral bud break in a variety of plants. If some of the extra side shoots can be removed and propagated, as in the case of the pineapple, we have again found ways to augment a low population of a desirable plant.

For plants, unlike people, an increased population is to be sought after. Whether we take the laboratory route of turning out thousands of "test tube babies", or more conventional approaches, with or without chemical aids, we can meet the challenge of more plants for a more livable environment.

MODERATOR RAUCH: Thanks very much, Richard, for a good presentation. Our next speaker, Bettie Lauchis, has been a professional horticulturist for about 20 years, even though her training is in the area of botany. She has recently established a botanical garden on the island of Kauai. Many of you who will take the side trip to that island will have an opportunity to visit with Bettie at her garden. Bettie Lauchis: