

Dr. Gilbert's work has influenced tomato production all through the tropics. He has developed new tomato varieties for the tropics. We have to be careful about our day lengths and we have to breed for resistance to nematodes and to disease.

For a number of years Dr. Robert Warner has been developing an arboretum of economic plants at Waimanalo Research Station. The cashew [*Anacardium occidentale*] isn't common in Hawaii but he has cashew trees out there. Here is a picture of the fruit with the nut on the end of it. Also cloves [*Syzygium aromaticum*] can be grown quite easily; they make an excellent clove if they are picked and used fresh. You see, it is nothing but the bud before the flower has opened. It is picked and dried or used fresh.

Now, in conclusion, I want to make it clear that in spite of the fact that our city has turned, like most cities, into high buildings with a lot of concrete, there is still quite a bit of appreciation of plants. The fact that the Hawaiian plants are related to the Hawaiian people is due to a great extent to the Polynesian upbringing and the Polynesian beliefs.

MODERATOR WARNER: Thank you, Don. Now we will have one more presented paper that was not on the program. Bill Barr of Monrovia Nursery will tell us about his experiences in rooting *Pinus radiata* cuttings. Bill:

ROOTING PINUS RADIATA CUTTINGS

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The Monterey pine, *Pinus radiata*, is normally grown from seed. As a result the progeny are quite variable. Monrovia Nursery, in cooperation with Dick Maire of the Los Angeles County Extension Service, Dick Puffer, of the San Bernardino County Extension Service, and Fred Dorman, of Highland, California, have been experimenting with vegetative propagation of this pine. We are also observing these cutting-propagated plants in one and five gallon containers.

Our objective is to find a *Pinus radiata* clone, with good characteristics, that will root in a high percentage. Of major interest is smog resistance, color, shape, and compactness. These vegetatively propagated trees could be very desirable as Christmas trees and as general landscape plants in southern California.

The Monterey pines were rooted using these procedures: The cuttings were made five to six inches long with the needles on the bottom half of the cutting cut off. Tip and second cuttings were used. They were dipped into 3000 ppm of IBA and stuck into a mixture of eight parts perlite and one part peatmoss. The cuttings, in flats, were placed in an outdoor mist area with a bottom heat of 72° to 75° F. The cuttings were misted the same as our other conifers. We have not experimented with different techniques in propagation due to the large number of clones used and the relatively few cuttings per clone available.

The first trial began May 19, 1972 with cuttings from 17 trees. After 14 weeks, August 24, 1972, the cuttings were moved to a hardening off area. Two weeks later the cuttings were potted. The rooting percentage varied from 1.7% to 79%. Nine clones were above 43%.

The second trial began October 18, 1972; the cuttings were moved to the hardening off area on April 10, 1973. There were 18 clones in this trial. Seven of them were repeated from the first trial. The cold weather probably accounted for the fact that it took 25 weeks for this second trial to root. We also had poorer rooting this time; the range was from 2.6% to 56%. There was only one tree this time that rooted over 43%. In every case the clones repeated had a lower percentage in the second trial.

On June 6, 1973 and on July 16, 1973, we started additional trials. They are not completed at this time. We are attempting to determine the best time of the year to root *Pinus radiata*.

Ten rooted cuttings from the nine best rooting clones of the first trial were placed into one gallon containers. Later these plants were moved into five gallon containers. We have been observing these plants since the fall of 1972. There is considerable variability among clones. Four of the clones might be commercially feasible. The other five clones are too lanky, yellow, or not smog resistant. It appears that cutting-grown *Pinus radiata*, with the desirable characteristics, is commercially feasible for the nursery trade.

RON HUROV: I wonder if we could have a little discussion on various experiences in seed germination in general. I find there has been quite a bit of work done on rooting media and rooting cuttings but some of the work on seed germination, I think, is behind the times and backwards. I just wonder if you people could express your experiences in seed germination.

MODERATOR WARNER: Anybody have comments on seed germination?

DALE KESTER: This is a general comment about all seeds. One is always impressed by the significance of temperature in germination. This is probably the most important factor in con-

trolling germination of seeds of various kinds. Either too high a temperature or too low a temperature can cause failure. A lot of the dormant seeds require chilling in the winter, but they should not have too high a germination temperature after the chilling is complete. This is a very critical factor. When you really get down to the individual seed species you have to know what its requirements are.

MODERATOR WARNER: Thank you very much, Dale. I would recommend to Ron Hurov that he check with Hartmann and Kester's book on plant propagation, where seed propagation is thoroughly covered.

BETTIE LAUCHIS: We have done quite a bit of research with seeds, particularly with tropical seeds. We think here in Hawaii it helps with the germination of many tropical seeds to use heat. Also you can create a magnetic field which, with some seeds that you can't germinate any other way, may help germination.

MODERATOR WARNER: I would like to mention that citrus seeds are very carefully treated — heat-treated, then dried and covered with a fungicide to prevent phytophthora attacks. This is very important and I imagine that it would hold also for other types of seeds also.

HOWARD BROWN: We have done a little experimental work on a grant we had from Sequoia Forest Products Company. For germinating seeds in flats, bedding plants, annuals, seeds of woody plants, we have come up with a mixture of 50% redwood compost, 30% perlite, 20% peat. To that is added dolomite lime plus fertilizers. It is a very economical mixture and one that produces a good root system and the seeds show very good germination.

RON HUROV: I am a dealer in tropical seeds. That is the reason I brought this up. We're getting seeds of about 450 species that I carry in my catalog. I find that a lot of species have never been listed before and each family — each particular species — seems to have its own requirements. Besides problems with germination, we also have some problems with storage. I would like to comment briefly on Araucaria seeds, which is one of my specialties. We are getting some seeds from the U.S. Forest Service in Georgia. Normally Araucaria has to be planted within a few days because it loses its viability very quickly. This is true of a number of tropical seeds. They managed to store Araucaria seeds for six months or longer by using a high moisture content — high humidity — in jars with nitrogen-controlled atmospheres at 20° F. I think that people who do research with some of the tropical seeds will show that we can extend their storage life. I would like to ask if anyone has done work on germination of palm seed;

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, Hawaii¹.

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.

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

POPULATION EXPLOSION¹

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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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