

receive some damage. There were three or four products that looked good. I am curious to see if anyone has had some experience, one of these is combination with nitrogen and in the West it looks real good. We have run Chloro I.P.C. and a lot of these others, we still found IPC wouldn't do it because it worked by breakdown by the root system. We received injury and finally did without it.

JOHN ROLLER: I am sure someone here has some experience with Dacthal and Casaron. Dacthal is very safe for container plants, however, it's rather expensive material and short lived. We've had less experience with Casaron, but it looks like it might be good, either as a spray or as a granular.

BRUCE BRIGGS: We have tried both of those materials. One thing we objected to Dacthal was too short a life. This is our problem because in containers it's not a matter of weeds in the mix, you can sterilize this. It's a matter with the blow in with us, the weeds that come in the next fall. And this is the problem we have to fight. Maybe this isn't true here. With the other product, Casaron, it looks good, but with us it hasn't done any more than simazine. It is not as toxic, you can use it on a broader basis of plants. We did have some trouble with this year on some things such as *Daphne cneorum*. We feel it needs a lot more research. We are still holding on to simazine.

ROBERT DEWILDE: Just a comment on this weed control in containers; if you will attend the round table discussion on weed control, I'll give you a solution for weed control in containers that we feel is quite satisfactory. It will last you at least three years control with no problems.

MODERATOR LEACH: Our next speaker this afternoon is Dick Bosley, from Bosley Nurseries who is going to give us a slide tour of California container nurseries.

SLIDE TOUR OF CALIFORNIA CONTAINER NURSERIES

RICHARD W. BOSLEY
Bosley Nurseries, Inc.
Mentor, Ohio

In April 1965 I spent 4 days in California visiting some of the larger container growing nurseries. I would like to share some of the things I saw with you.

The first stop was at the Oki nursery in Sacramento. Mr. George Oki, who is well known to the Society through the many papers he and his Production Manager, Mr. Kubo, have presented, was a most gracious host. Their organization is divided into two companies, (1) the Sacramento Nursery, which is the growing organization and, (2) Oki Nursery, which is the sales firm.

While we were in the office we looked at the IBM punched card data processing equipment that Oki Nursery has been using for several years for the routine accounting functions of order writing, invoicing, accounts receivable, accounts payable, and

serves to gather sales data which can later be used with production records to forecast sales and project production requirements. This equipment will allow them to move smoothly into IBM data processing equipment which they have on order. The Yoder Brothers are now using an IBM 1401 tape-oriented computer to schedule production much as Oki will. These people are keenly aware of the many phases of management as evidenced by this name plate leading into the propagation area. Everyone knows their job title and what their job range is.

A great deal of attention has been given to cleanliness in propagation in recent years. Mr. Kubo, the production manager for Sacramento Nursery, outlined the procedures used for sanitation by them in the 1962 proceedings. It is based on the U.C. System. You can see in the pictures that they actually do what they preach. This room was spotless, but more important, it was arranged so that it was very easy to clean. The area was also arranged so that there was no unnecessary through traffic flow which may track in pathogens. In the background can be seen controlled climate rooms in which cuttings or seed can be held for one reason or another. The interior of their propagation greenhouses show the same care in sanitation that the cutting make-up room did. The house is painted each year and washed down with a disinfectant. The benches are treated with Cuprinol after each crop. Few people are allowed into these antiseptic areas.

Ventilation is by fans at one end exhausting air which was drawn through mats with water dripping over them at the other end of the house. When the air passes through the mats it is cooled as the humidity is very low during some of the hot summer months. It is possible to add a fungicide or algacide to the water running over the mats if you wish. The mist system is controlled by a device that measures solar energy and translates this to plant moisture need. The external view of the propagation house better illustrates the header pipe that drips the water over the brown mats and also the fan towers at the far end. These greenhouses are steam heated with pipes under the benches and polyethylene skirts. The steam is also used to sterilize flats of medium prior to sticking cuttings. In this area of California the temperature goes below freezing in the winter and the heat is needed not only for propagation but also to protect tender containered plants.

This picture illustrates poly covered houses used for growing tender material and the next picture illustrates the newest type of greenhouse they are using which is covered with clear PVC. It is a very pleasant, bright structure and I am sure could be put to very good use in the east for year around growing of container material.

Many nurseries have to build their own equipment and the people at Oki are masters of the art. You probably read the article in the 1964 proceedings by Mr. Dick Oki entitled: "*Specialized Equipment, Canning, Material Handling Systems.*"

This small spray rig has a Bolens propulsion unit and was manufactured from there back by Oki. I show this to illustrate that often we may have some unit that is still useful from one respect that may be adaptable for another use. This Bolens was formerly a high clearance cultivator and has now become a spray rig. I might mention that *most* of their spraying is done by a mist blower. I am sure that they are proud of their auto assembly facility. They manufacture this rugged looking, versatile cargo truck. They found that the battery operated units did not have enough capacity to travel the distances needed every day so they developed and manufacture this unit. It is powered with a four cylinder Chevrolet engine with an automatic transmission and is very substantial. This is one of the trucks on the production line. They have a well equipped shop that can handle major construction jobs. All of us are involved in material handling and container grown plant material is particularly well suited to handling on pallets. This shows their order loading area and illustrates how the large pallets can hold a good number of the 1-5- or 15 gallon containers that they grow in. The pneumatic tired fork lift truck can even go into muddy fields and lift loaded pallets. As you can see here they place a pile of empty pallets behind their truck at the beginning rather than tying up inside space. As the load is finished off this stack at the rear provides a place for the men to stand.

Many of the California growers use a container medium which has a very high organic content. Very often the great part of the organic content is Redwood sawdust that has been treated with Nitrogen. Oki uses a container mix of $\frac{1}{3}$ sand, $\frac{1}{3}$ Redwood sawdust, and $\frac{1}{3}$ rice hulls as reported in the 1962 proceedings. The sand etc., is dumped in the background and then loaded, with a tractor, into *this* device which conveys it up to the revolving drum which mixes it and then *another* conveyer which can swing THROUGH A 180° arc, piles the medium into a semi-circular pile from which the containers are filled. This system can blend 150 cubic yards a day. The medium is brought up to an optimum fertility level in the mixing and *then this* level is maintained through periodic laboratory checks and constant dilute feeding through a proportional injector in the water system. So-called "canning machines" are highly developed at Oki Nursery. This picture shows the detail of two dies which are driven by air cylinder into the medium of the two containers. Automation people will tell you that if you wish to increase output that it is much better to do this sort of thing rather than make one cylinder work twice as fast. This machine works in the can placement area rather than at the medium pile location. They feel it is better to move truck loads of medium to the machine rather than have many trucks moving the finished can to the field. On the left of the green machine is a truck that supplies painted, crimped one gallon cans. The truck on the right supplies medium. Some of the other support equipment consists of a rather large air compressor, a gasoline powered

generator and special palletized racks that hold flats of liners in peat pots ready for the machine. A crew of five people *and* this equipment pot and place 10 - 12 thousand plants a day.

After the woman places the peat pot plant into the impression left by the die the plants run down the conveyor to the men. This woman had not trouble making these men work very fast. They would pick up 4 cans at a time. The conveyor arm is on wheels allowing it to swing in an arc that is at right angles to the forward travel of the machine. This allows them to cover a rather wide bed without ever walking very far from the end of the belt.

In container growing, drainage is very important and this shows how the run off is handled in one location. I would imagine that they had the land graded to start with so that the water is always under control. Many of the growers in California have settled on growing in 1, 5, and 15 gallon cans. I saw no evidence of plastic containers in the few nurseries I visited. The customers completely accept the used food can. There would be *problems* in stacking plastic containers when they are trucked. This detail picture shows a novel way of staking rather large trees.

Proportional feeding through the irrigation seems to be standard practice with the better growers that I visited in the west. This shows the system that is now in use at the Oki Nursery. It is manufactured by BIF Industries in Providence, R.I. It is a proportional injector; that is, it will inject the same proportion of concentrate liquid to water over a flow range of 10-1, with an accuracy of \pm or $- 2\%$ of the set rate. The green object in the foreground is a deep well turbine pump. The flow meters and injector pumps are in the background. The small black drums are for sulfuric acid which is injected to overcome the bicarbonate content of the water. They had installed *this* equipment as it was better able to tolerate the acid and sand in the water and is more accurate at the lower flow rates of its working range. Another advantage to this equipment is that you can use full strength or perhaps I should say a constant strength concentrate liquid. When you receive a report from the laboratory to change the proportion you simply turn a dial on the flow transmitter and you are in business. With other equipment you would have to wait until the tank runs out to change the batch strength and there is always the chance of making a mistake in figuring the dilution.

Many of you will recognize the Smith injector shown here. This is at the Bordier Nursery which is located on the Irvine Ranch. This is a new location for them and they were starting with a clean sheet of paper, so to speak. They were being forced out of their former location due to a bad smog situation. The large wooden tank is for fertilizer concentrate and the silver tank is for a head of air. Their pump turns on with a drop in line pressure.

The Bordier people mix their potting medium in an inter-

esting way. They put the ingredients into individual piles and then scoop through it with a front end loader. The tractor turns the piles over several times. It seems to work and represents low capital outlay. As you can see there is a high Redwood sawdust content.

Empty cans are loaded on a trailer and then filled with a loader and scraped off. The liners are easily hand planted into this very light mix right on the trailer which is then towed with a JEEP to the placement area. The beds have been graded, covered with coarse stone, and sprayed with a weed control prior to placing the containers. Sprinklers are set to have at least 100% overlap.

When transplanting from one gallon to five gallon containers the larger cans are lined up around the medium pile in a wagon train fashion, sometimes in a double row as the next picture illustrates. The cans are filled from the pile and the plants dropped in; then the man on the shovel puts more medium around the roots with the aid of the second man holding the plant. This works very fast with a limited amount of handling of either medium or containers. After they have finished a wagon is driven around the pile while the plants are picked up.

At the Keline - Wilcox Nursery, large trees are grown in their special break-away boxes. The sides are held together with steel strapping so that the box is re-usable when the tree is planted. This firm does a fine job with these trees and their quality material is in great demand. As you can see, they water with small tubes. The system is controlled with a time clock and so a large area can be watered with a rather modest pump and injector equipment.

This last picture showing Dr. John Rodebaugh, of The Soil and Plant Laboratory, standing next to one of these tree boxes of Keline - Wilcox, gives you an idea as to their large size.

I would like to suggest that the growers I visited were very friendly and open with information which would not be true in most industries.