Roses are the conversation topic as Debra Dene Barnes, Miss America for 1968, visits Harrisburg. Chatting with Miss America is Jack R. Grey, deputy secretary for the Pennsylvania Department of Agriculture. Miss America is flanked by Doris Ann Laush, Miss Pennsylvania, and Kathy Ann Reeder, Miss Greater Harrisburg.
SPRAYING — AN IMPORTANT TOOL IN DISEASE PREVENTION

Sanitation, the manipulation of the environment, the use of resistant varieties, soil treatment, soil drenches, and spraying with fungicides are all tools available to help the grower prevent diseases of greenhouse crops. Each tool in itself is important and will aid in disease prevention but it is only through the use of all the tools together and in the correct manner that the best in disease prevention can be expected.

Spraying is probably the most familiar but the least understood of all the tools. The basic aim of spraying is to cover all parts of the plant with a very thin continuous film of fungicide. Ideally fungicides are applied as protectants before infection of the plant by the pathogen takes place. The thin fungicidal film acts as a toxic barrier which kills fungus spores before they can penetrate the plant tissue and start an infection. Sometimes the toxic fungicidal film acts to kill or inhibit the production of spores of fungi which already have gained entrance to the plant. In any case it is important that all surfaces of the plant, the lower as well as the upper sides of the leaves, be covered with the fungicide spray.

The application of a thin continuous fungicide layer depends on the spray machine, the spray nozzle, and the operator. The machine must be capable of producing a high sustained pressure to the spray nozzle. The spray nozzle must be designed so that the spray is delivered to the plant in a fine but penetrating mist that will be forced through thick foliage to wet all parts of the plant. An ideal nozzle for greenhouse spraying is the 6-nozzle "Cornell" spray gun, Fig. 1. It is important that the discs in any type nozzle be checked for wear periodically. At 200 pounds pressure after 1½ hours of constant use the orifice in a spray nozzle may enlarge by as much as 35 percent. Such worn discs will not deliver the recommended dosage of fungicide in the desired fine mist.

The operator must know how to spray correctly. The plants should not be "hosed-down" when they are sprayed. The spray gun should be moved in a rotary motion so that all parts of the plant are covered but the spray should be directed at the plant long enough so that the point of run-off is reached. This is the point where the first few drops of spray start to fall from the leaves. "Hosing" or overspraying the plants only results in most of the fungicide running off onto the soil. On plants with leaves which have a waxy surface such as tulips and cyclamen or on roses where the hard-to-wet masses of powdery mildew spores are to be sprayed, a spreader or wetting agent should be added to the spray. Do not exceed the manufacturers' recommendation since too much spreader may cause all of the spray to run off the plant or injury to the plant may result. Once a fungicide has dried on the plant surface it will remain effective for from 10 to 14 days even if exposed to rain or over heat watering. Additional sprays are needed about every 2 weeks to provide coverage for new growth of leaves and stems.

Spraying can be an important tool in disease prevention provided the correct amount of the correct fungicide is applied in the correct manner at the correct time.

PREVENT DAMPING-OFF — WATER IN THE MORNING

Help prevent damping-off in seed flats and other fungus disease of older plants by doing all the watering in the morning. Plants watered in the late afternoon will stay wet all night and conditions will be ideal for the growth and spread of the fungi which cause damping-off, Botrytis blight, leaf spots, and rust.

(Continued on page 7)
BACTERIAL SLOW WILT OR STUNT OF CARNATION

PAUL E. NELSON1, ROBERT S. DICKY2 and L. P. NICHOLS1

Bacterial slow wilt or stunt, a serious disease of carnation in Europe, was first found in the United States in 1954-55, on carnation plants grown in western New York. In April 1962 it was found on carnations in southeastern Pennsylvania and again in November 1967 in the same range.

The disease is caused by a bacterium which has been designated as a strain of Erwinia chrysanthemi. The disease and the bacterium were first described in England and Denmark.

We studied the disease by inoculating rooted carnation cuttings and growing them in the greenhouse for periods of 7 to 9 months. The symptoms described below and illustrated in the accompanying photographs are from these plants. We have also observed most of these symptoms on infected carnation plants growing in a commercial carnation range.

Two general types of symptoms develop on infected carnation plants. These are rapid wilting or a combination of wilting and stunting. Rapid wilt symptoms consist of a general wilting and gray-green coloration of the foliage followed by collapse and death of the plant (Fig. 1). In other plants the initial symptoms consist of wilting, "crook-neck" side shoots, and twisting, curling, stunting and wilting of lower leaves and side shoots (Fig. 2,3,4). In some plants this is followed by a general wilting of the plant and firing of the basal foliage. Plants may wilt and recover several times before permanent wilting occurs or plants may collapse and die at the onset of general wilting symptoms. Plants often exhibit this severe wilt-collapse symptom at the time the second flower crop is cut.

In plants that become stunted the initial symptoms are followed by stunting and an upright growth habit of existing shoots (Fig. 5). Leaves on stunted shoots are narrower than those on healthy shoots and are light-green to yellowish-green in color in comparison with the dark-green color of healthy leaves. This is followed by severe stunting, wilting, and firing of foliage (Fig. 6,7).

Initial symptom expression in Improved White Sim occurred over a period of 4-15 weeks after inoculation. In most cases the terminal symptoms of severe wilt-collapse (Fig. 8) or stunting (Fig. 9,10) usually occurred about 25-30 weeks after inoculation.

Carnation cultivars vary in their susceptibility to the pathogen. In our tests the cultivars Improved White Sim, Improved Sidney Littlefield, Virginia (Continued on page 7)
Hercules and Apollo were tested. We found that Improved White Sim was the most susceptible, Improved Sidney Littlefield and Virginia Hercules were less susceptible and Apollo was the least susceptible of the carnation cultivars tested.

Experimental work indicates that the bacterium can be spread throughout the plant before symptoms appear. This means the organism probably can be spread from plant to plant on knives used in cutting flowers. It also may be spread in infested soil and possibly on tools used in infested soil. The bacterium can also be spread in infected cuttings but culture-indexing will eliminate this possibility.

The disease can be prevented through the use of culture-indexed cuttings and by steam treatment of soil between carnation crops. In addition be sure all tools to be used in planting are treated at the time the soil is steamed. If you use a perimeter watering system be sure it is wiped off and flushed with disinfectant such as 1:200 LF 10. Soils should be removed from the hurdles and they should be soaked for 1/2 hour in 1:200 LF 10.

References

A NEW FUNGICIDE — PARNON

Parnon, a liquid concentrate fungicide, has shown promise in controlling powdery mildew on rose and zinnias. It contains 4.0% a,a-Bis (p-chlorophenyl)-3-pyridinemethanol and is applied as a spray.

ROSE MILDEW

Now is the time to start your preventive program against powdery mildew. The most important preventive measure for powdery mildew is to keep the relative humidity down by cracking the ventilators as the outside temperature drops in the late afternoon. Follow the same procedure in the early morning and heat and vent until the normal day-time operating temperature is reached. Some rose growers, the ones who never have a mildew problem, will run heat in their ranges at night all through the summer. A very effective preventive spray is Pipron Liquid Concentrate used at the rate of 4 ounces per 100 gallons of water. If powdery mildew is already present, use 8 ounces per 100 gallons initially followed by 4 ounces per 100 gallons. Spraying after the flowers are cut and when the temperature is below 85°F with Karathane or Mildew also is an effective control for powdery mildew. Use 4 ounces per 100 gallons of spray (6 ounces when mildew is severe). Add a spreader-sticker so that the mildew growth is completely wet.

GERANIUM CHECK

Continue to check your geranium plants for signs of bacterial stem rot. As the temperature increases from now to the end of May, the wilting, yellowing and dying of the leaves and the rotting of the stem will become more and more apparent. Affected plants will not recover and they will serve as a source of the disease for nearby healthy plants, so discard any suspicious plant you see — NOW. After handling the diseased plants and before working with the healthy plants, wash your hands well with soap and water and rinse in LF-10 at 1:200 (3 oz. in 5 gal. of water).
AUTOMATE TO REDUCE COSTS

JIM LEIDER
M. Leider & Sons, Inc.
Prairie View, Ill.

Presented at 1967 Pa. Florists Conference

I've been asked to discuss greenhouse automation—or in other words, how to reduce your ever increasing labor costs.

Of course, the easiest way to keep your labor to sales dollar ratio in line is to raise your prices. For the last few years we did just that, but unfortunately we can't do that all the time.

The alternative to continually raising prices is to increase the efficiency of your operation. In this area we have been extremely lucky, although we didn't know it at the time.

Three years ago we were forced to make a critical decision. To make room for a new school project, we had to leave the location from which we had operated for over 50 years. Either we rebuilt our greenhouses somewhere else or we leave the industry as many other growers in our area had done.

After considerable soul searching we decided that we would build a new range. Before starting construction, we considered what were our major problems. It didn't take much thought to conclude that all our problems spelled labor—the high cost of it and the tremendous scarcity of qualified personnel, especially in light of the highly seasonal nature of our business. We must eliminate as much labor as possible. This had been and continues to be our number one problem—as I suppose it is for most of you.

Every progressive industry has followed the road of increased automation in order to push their productivity to meet demands and yet hold costs in line, by eliminating the fastest rising cost of all—manpower.

The commercial flower and plant industry is in the dark ages when it comes to automation. If the greenhouse industry does not mechanize now, our industry is doomed—if not to bankruptcy—to very meager returns on our investment.

What I would like to show you this afternoon is how we approached the problem and why. I am sure that much of what we have done cannot be applied directly to your own operation, but the idea I will try to convey is to automate now.

Now is the time to utilize every labor saving device you can before labor's high cost and increasing scarcity writes the epitaph of our industry.

"Well of course" some will say, automation is too expensive for greenhouses. Automatic vents cost too much—air conditioning out of line—automatic black cloth shading out of this world. O.K., how do you determine whether a machine or an automated process is too expensive? When it is economically feasible.

Many material handling specialists tell us that if the labor saved in one year is 20 percent or more of the cost of the machine, buy it. We feel that this is a pretty loose figure and almost every form of mechanization we are utilizing will be paid off much faster than five years. But even the more expensive labor saving devices which seem too costly today will be cheap in relation to the high cost of labor in the next few years.

And more important, where will the labor come from? At times during this last season there was not a warm body available on the Chicago labor market.

Our greenhouse range is less than two years old and of course we had the distinct advantage of starting from the ground up, designing what we felt was the ideal layout and having no body but ourselves to blame for our mistakes. Some of the ideas we have innovated ourselves, some are stolen from others and adapted to our own particular operation.

Our service building and offices are located in the center with leantos on each side of the service building flanked by two identical sections on either side.

Each section is just under 30,000 square feet comprised of three I.B.G. 400 Glasshouses, 44' wide with fiberglass gables and side walls. Each section is divided into two separate growing compartments by a fiberglass wall with sliding doors and an 8' wide main aisle.

To the rear of this main compound is a new 20,000 square foot section just completed this February. This consists of 3 quonset truss fiberglass houses with their own clear span glass head house. This greenhouse section is heated by a unique gas fired modine heating system.

There are six heaters located in the greenhouse blowing warm air thru polyethylene convection tubes. The houses are constructed of a tubular steel truss with one continuous sheet of fiberglass which makes an extremely tight house. We expect a very reasonable heating cost.

In the main section all of the benches are constructed of expanded metal with simple concrete block and pipe supports. We spent a lot of time looking for the right material to build this bench.

I think the advantages over the other contemporary benches in use are obvious—complete flexibility—freedom of air movement all around the plant—and extremely durable. The cost is higher than some conventional benches, but when amortized the additional cost per year is very negligible.

Most of these benches are equipped with automatic watering. We are using the Chapin system with our own variation. Instead of the standard leader