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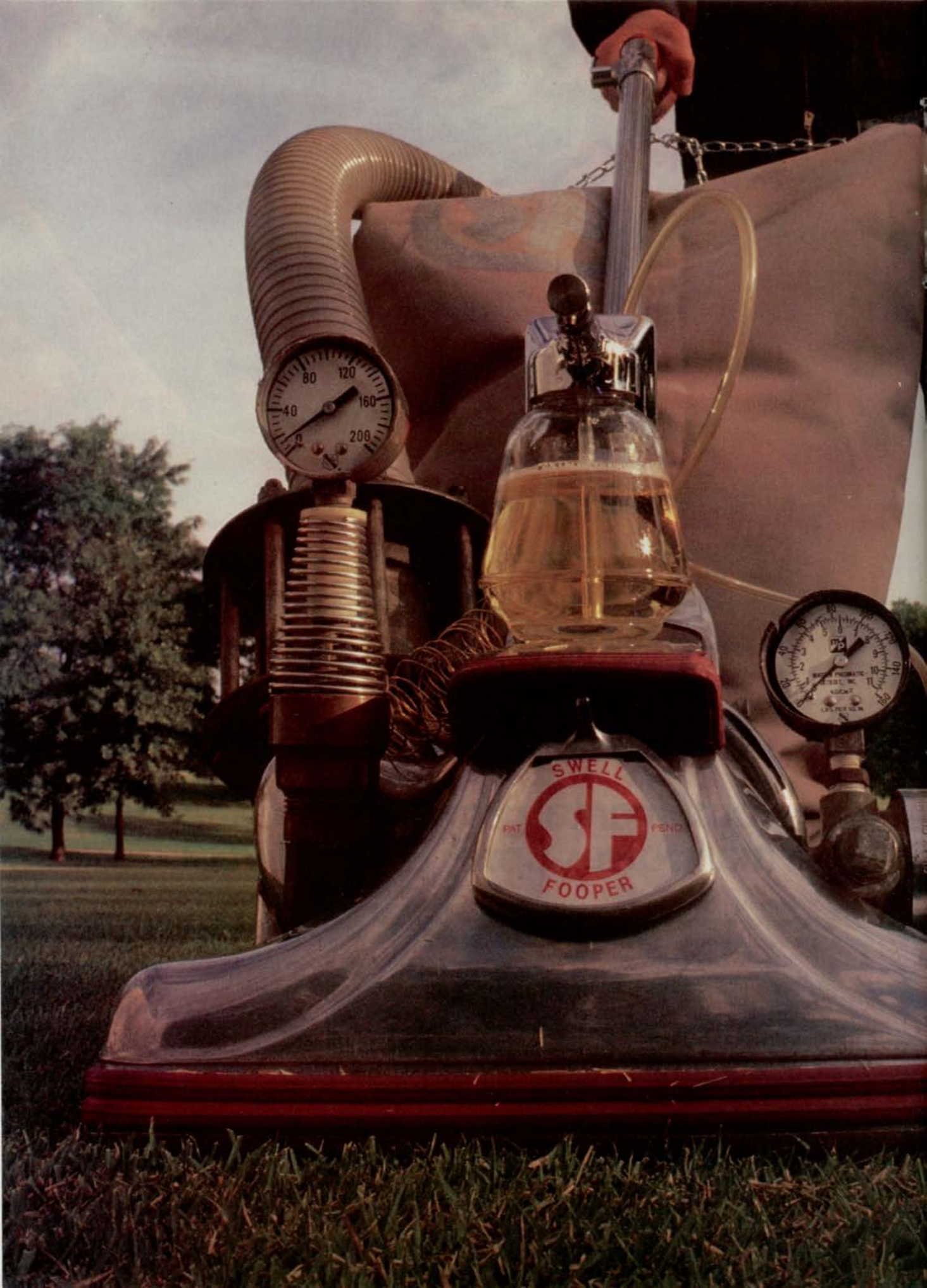
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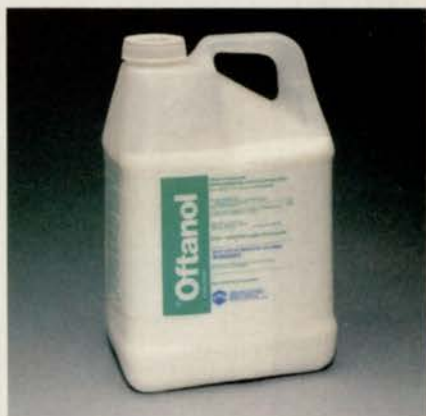
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Circle No. 136 on Reader Inquiry Card

Landscape Manager's Guide to Diseases of Cool and Warm-Season Trees and Ornamentals.

COOL SEASON

by C. C. Powell, Professor of Plant Pathology, Ohio State University.

Problems with ornamental plants in the landscape result from varied and overlapping causes. Some causes are more obvious than others; such as a poor planting or pruning, severe weather, or a harsh environment. Often, the cause is more complex and hidden, as is the case with fungi or bacteria attacking a plant.

Each plant has a certain amount of built-in resistance to assaults on its health. When man takes a plant out of its natural habitat and makes it fit his design, he needs also to take responsibility for the resulting problems he has caused the plant.

Diseases are some of the toughest problems to understand and correct. The purpose of this Guide is to explain the primary disease-related problems of landscape plants.

Types of plant pathogens and control tactics

This list of pathogens is by no means complete. Its intent is to help you become familiar with the types of plants pathogens you may encounter and to provide some generalized ideas concerning control. It is important to remember that generalities concerning biological phenomena are filled with exceptions.

Bacteria: Bacteria comprise a diverse group of single-celled microbes, which cause many diseases of ornamental plants. Commonly encountered diseases include bacterial leaf spot of English ivy; fireblight on crabapples, Mountain ash, hawthorn, Cotoneaster and Pyracantha; and crown gall on crabapples and Eucalyptus.

Control of bacterial diseases is usually a preventative (prior to infection).

Always begin with clean plant material from a reliable source. Resistant cultivars can be grown in many cases.

For fireblight, promptly prune out diseased plant parts. Be sure to sterilize your pruner with alcohol (70%) between cuts. Avoid mechanical damage to plants to reduce crown gall infection.

Nematodes: Several types of very tiny roundworms cause plant diseases on many ornamentals. Lesion nematodes (*Pratylenchus*) and pin nematodes (*Paratylenchus*) cause plant stunting and poor growth because they weaken the root system by feeding on it. The root knot nematode (*Meloidogyne*) causes nodules to form on roots, impairing root function and stunting the plant.

Good sanitation is the primary means of controlling these soil-borne pathogens. Soil fumigation will kill adults as well as eggs. After plants are growing, nematicides granules or drenches can be applied.

Generally, fumigation and/or nematicide treatments in landscapes should be done only after a nematode soil analysis indicates treatments are necessary.

Viruses and Mycoplasmas: These are systemic plant disease causing agents that live and multiply only within living cells of the host. They are most often spread by plant contact or by sucking insects, especially aphids and leafhoppers.

The symptoms they cause are very diverse, depending upon pathogen. Generally, vein banding, mosaic (a mixture of irregular-shaped dark and light green areas on the leaf), flecking, or spotting will show up on leaves. Sometimes, growth abnormalities



Anthracnose, left, is a fungus disease common to dogwoods. It attacks flowers first, then leaves and young twigs. Early fungicide application is important.

Apple scab, on crabapples, shown below, is a major disease requiring early application of fungicides and planting of resistant crabapple varieties.



will appear. This is often similar to damage caused by herbicides. Finally, they can cause stunting of plants.

You should try to prevent spread of viruses by controlling insects and avoiding unnecessary handling of plants.

Powdery Mildew Fungi: The powdery mildew causing fungi are very host specific. Generally, the powdery mildew that infects one plant will not infect any other.

Powdery mildew is commonly seen on roses, lilacs, English oak, deciduous azaleas and zinnias. The white growth appearing on leaves and stems is the fungus growing on the surface of the tissue. Small structures, called haustoria, grow within the host cells, injuring them as they obtain food.

Powdery mildew will not usually kill a plant but may weaken it and reduce winter hardiness. The unsightly fungus lesions greatly reduce

the quality of the plant.

Powdery mildew can be effectively treated with chemicals. The white lesions will remain, however, even though the fungus may be dead. For highly susceptible plants such as roses, a regular preventive spray program should be planned and carried out.

Rust Fungi: The rust fungi are also quite host specific. Rusts usually sporulate abundantly on leaf tissue. It is the masses of orange to dark red col-

SEASE CONTROL GUIDE

Some Common Diseases of Woody Ornamentals and Fungicides Registered for Their Control

Host	Disease	Fungicides
Crabapple	Scab	Benlate, Daconil 2787, Mancozeb, Phaltan, Zyban
Dogwood	Leaf spot	Benlate, Daconil 2787, Fixed coppers, Maneb, Zineb, Zyban
Hawthorne	Leaf spot	Benlate, Daconil 2787, Fixed coppers, Zyban
Hawthorne	Rust	Bayleton, Daconil 2787, Fixed coppers, Zyban
Juniper	Tip blight	Benlate, Fixed coppers, Zyban
Lilac	Powdery mildew	Bayleton, Karathane, Sulfur, Triforine, Zyban, Rubigan
Maple	Leaf spot	Fixed coppers
Pine	Tip blight	Benlate
Pyracantha	Scab	Benlate, Daconil 2787, Fixed coppers
Roses	Black spot	Benlate, Captan, Daconil 2787, Fixed coppers, Mancozeb, Maneb, Phaltan, Triforine, Zineb, Zyban, Rubigan
Roses	Powdery mildew	Benlate, Karathane, Milban, Triforine

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ored spores that we notice on plants when they become diseased.

Rusts are seen on many crops, but are most commonly seen on Washington or Lavalley hawthorne, chrysanthemums and snapdragons.

Rusts are, for the most part, cool-weather diseases. Rust spores are spread in air currents and splashing water. They must have water in order to germinate and infect the leaf. Therefore, control involves watering early in the day and using protective fungicide sprays.

Leaf Spotting and Blighting Fungi: Like the rusts or mildews, these fungi are spread either long distances by air or shorter distances by splashing water. Most notable among this group are *Entomosporium* leaf spot on hawthorn; scab on crabapple and Pyracantha; *Botrytis* flower blight; and anthracnose on shade trees.

To control leaf spotting fungi, main-

tain plant vigor. Grow resistant cultivars. Also, chemicals can be sprayed on the plant to prevent infections.

Water Molds: *Pythium* and *Phytophthora* fungi are often called water molds because they have a spore stage that is adapted to spread by swimming in water. These organisms attack a wide variety of plants, causing root rots, stem rots and cutting rots. Many times, they will not kill a plant. They will "prune" the root system, resulting in poor growth, yellowing or stunting of the top portion of the plant.

These organisms are generally found in all soils. Environmental control can be achieved by improving the drainage of the soil. The fungi do not survive well in properly drained planting beds. Finally, soil drench fungicides can be used prior to planting or routinely on plantings where high maintenance is possible.

Root and Crown Rotting Fungi:

Aside from water molds, many other fungi cause root and crown rots. The fungus *Rhizoctonia* lives in the soil and attacks a wide variety of crops. Some species of *Fusarium*, *Cylindrocladium*, *Sclerotinia* and *Thielaviopsis* behave similarly. All of these fungi can persist in the soil for many months through specially adapted resting structures.

Control of these fungi involves promoting vigorous growth through good horticultural programs. Do not plant transplants too deep. Soil drenches may be applied, although the materials used will generally be different from those used for water mold control.

Stem and Twig Cankering Fungi:

Many fungal organisms, such as *Phomopsis*, *Diplodia*, *Fusicoccum*, etc., cause stem or twig cankers. Most notable examples include twig blight on juniper, branch blight on Shumard oak, and tip blight on Red or Austrian pine. These pathogens primarily sporulate in the spring. The spores are spread by splashing water, insects and wind.

Fungicides that are currently available often do not effectively control these diseases. Cultural control involves maintaining plant vigor, protecting the plants from winter injury, pruning out diseased plant parts and growing resistant cultivars.

Plant Wilting Fungi: *Verticillium* is a fungus that causes wilting of a large number of woody ornamentals such as hard maples, redbud and Russian olive.

The fungus invades through injured roots, grows into the stem and plugs the vascular system of the plant. Along with wilting, it often causes browning of the vascular system. It also has a resting structure to help it resist adverse soil conditions.

Ceratocystis ulmi is the plant wilting fungus that causes Dutch Elm Disease. It is spread from plant to plant by root grafts or by being carried by elm bark beetles.

Control programs involve preventive fungicide injections and insecticide sprays. For infected trees, prompt removal of the tree or the infected portion is the only thing to do.

Plant wilting fungi cannot be controlled easily with chemicals. Once they are within plants, they are not subject to chemical killing. Therefore, we are once again dealing with control via sanitation, growing resistant plant types and maintenance of vigor.

Fungicides

Fungicides work in consort with other integrated practices of disease man-

continued on page 60

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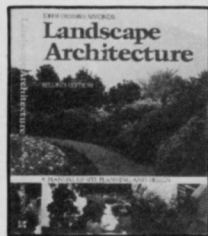
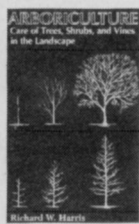


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YOUR CORNERSTONE OF VEGETATION MANAGEMENT

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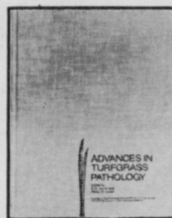
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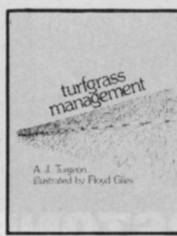
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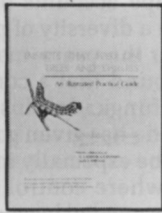
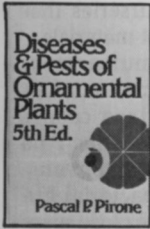
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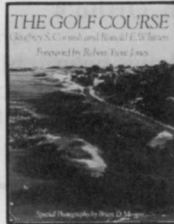
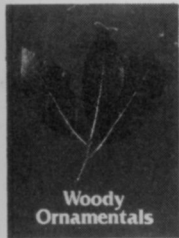
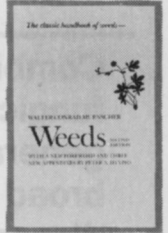
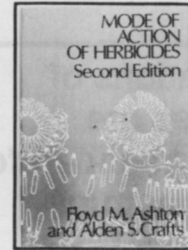
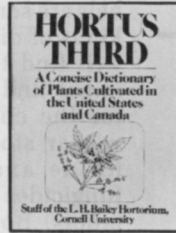
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agement. Control of stress, use of resistant plants, and sanitation remain as basic preventive elements of a good disease management program.

Fungicides generally act as preventives as well. If they are applied to the plant surfaces prior to the infection of the pathogen, they will prevent the infection and development of disease on that plant tissue.

There are several new products and new combinations of old fungicides available for use in landscapes and nurseries. Even though they are highly effective, they still

Combinations of fungicides are generally needed for broad spectrum disease control of diverse plants in landscape accounts.

must be considered preventives and used in consort with other integrated control practices. It is also important to remember that many of them are not necessarily better than the old products that we already have available to us!

One of the newest fungicides to become available for use on woody ornamentals has been Bayleton 25WP. This systemic fungicide is quite effective for many diseases, most notably the rusts and the powdery mildews. It is labeled on a good variety of plants in the landscape. Bayleton is a preventive fungicide that is best applied in cool weather to take advantage of the uptake and movement of the product within the plant tissues. The interval between applications can generally be lengthened to as many as 30 days under proper environmental conditions.

Rubigan is another systematic fungicide, especially effective on powdery mildew.

Another very useful product for nurserymen and landscapers is Zyban fungicide. This wettable powder product is a combination of a systemic fungicide (Thiophanate-methyl) plus a surface protectant (Mancozeb). As such, it truly provides broad spectrum control. Again, the product has a very good label and is therefore legally useful on many, many ornamentals in the nursery and landscape.

Daconil 2787 is a fungicide that is known by many nurserymen and

landscapers. What some may still fail to realize is that the Daconil label has been greatly expanded in recent years and now includes more than 40 different ornamentals and ornamental diseases. Again, as with the other products mentioned, Daconil is quite effective and would be quite useful on those products for which it is labeled.

There are two new products that are available for use for control of the *Botrytis* blight diseases we tend to see in the fall on flowering plants, most notably on herbaceous perennials and annuals. These products are Chipco 26019 and Ornalin. Whereas their labels are somewhat restricted as to the kinds of diseases they control, many will find them useful. Nurserymen might find them particularly useful for the control or management of winter storage mold diseases. Triforine and Milban are also new fungicides with modest ornamental labels. Both are effective against powdery mildews. Triforine is also used widely on roses for rust and black spot control. It is the active fungicidal ingredient in Ortho's Funginex and Orthenex.

Many fungicides that have been available for some years are still found by many to be extremely useful and possibly the most efficacious products that nurserymen and landscapers can use. These include the EBDC fungicides (Maneb., Zineb, and Mancozeb), the fixed copper fungicides (such as Kocide 101, or Bordeaux mix), Karathane (for powdery mildews, but temporarily suspended), Phalthan, Sulfur, and the systemic fungicide Benlate.

The label on Kocide 101 has recently been expanded to include many more ornamentals. It is especially useful for nurserymen. Benlate, as most of you know, is already widely labeled on all ornamentals for powdery mildews, anthracnose, and many other diseases. The EBDC fungicides are still not as widely labeled as we would like. They are very efficacious on a variety of diseases and are especially useful in combination sprays.

You will note that for most, there is one of the older products available as well as one or more of the new products. A careful study of the labels of fungicides currently available will enable landscapers and nurserymen to select products that are properly labeled and registered on the plants they wish to spray.

What about scheduling fungicide sprays into routine management programs. This is a difficult subject which can be approached in many different ways by many different practitioners.

Generally, we will need to combine

two fungicides together to net the broad spectrum of disease control that we would need when trying to service landscape accounts or nurseries that contain a diversity of plant materials.

Over the years, many nurserymen have found that a combination of an EBDC fungicide plus a fixed copper fungicide has given good results. This would be especially important in nurseries where control of bacterial fire blight is needed because of close spacings of large blocks of susceptible plants (such as crabapples, cotoneasters, pyracantha, etc.). Generally, these bacterial diseases are not successfully controlled with sprays by landscapers because of the need to spray frequently throughout the rainy periods of the growing season.

Many landscapers, on the other hand, have gained from a combination of an EBDC plus Benlate fungicide. Again, we are talking about products that have been available for some time! The new product Zyban is, in fact, a combination very similar in mode of action to that of an EBDC + Benlate.

Both Bayleton and Daconil 2787 are excellent products that are probably best used alone. Many landscapers and nurserymen are alternating one of the above combina-

Preventative programs with proper spray intervals are the secret to successful disease management.

tions with either Daconil 2787 or Bayleton. They are applying sprays monthly in the landscape and bi-weekly in the nursery. Bayleton would be an excellent fungicide to choose if there were a severe powdery mildew or rust disease that required special attention.

Whereas it may seem that the world of fungicides has changed a lot in recent years, one must realize that the basic approaches and the usefulness of chemicals in the landscape and nurseries to control infectious diseases has remained essentially the same. Preventive spray programs with proper intervals between applications are the secrets to successful disease management. Obtain labels of the new products, study them and see how they will fit into your disease management program.

continued on page 66