sprays in routine fungicide prgrammes at the rate of 1 g product/litre applied to run off.

a. Stock Plants: Rotation of prochloraz and carbendazim/maneb at monthly intervals during growing season, ensuring an application just prior to taking cutting.

b. During Propagation: Rotation of prochloraz, captan, benomyl, carbendazim/maneb and iprodione (Rovral) at fortnightly intervals.

c. During liner and first season of growth: Rotation of prochloraz and carbendazim/maneb at monthly intervals during the growing season, reducing to 2 to 3 month intervals during the autumn and winter.

CONCLUSION

Once a crop is infected with *Monochaetia karstenii* it is difficult to eradicate and use of fungicides alone will not give control under adverse growing conditions. Prevention is the most effective control, and much can be achieved by improved culture such as routine hygiene measures together with attention to detail in the production schedule, promoting active growth, and reducing as far as possible the factors causing stress. Once these measures are adopted fungicides become an important aid as a further means of protecting the plant against infection.

CONCERNS WHEN PROPAGATING PLANTS FOR THE URBAN ENVIRONMENT

JOHN A. WOTT

Center for Urban Horticulture, AR-10
University of Washington
Seattle, Washington 98195

The world population continues to grow and with it the demand for resources. The United States, the land of "never-ending" resources, is now also concerned about resource depletion, population growth and control and, most recently, people living in close proximity to their neighbors. These concerns, first discussed in greater degree in the 1960's, have lead to the simultaneous interest in and development of scientific programs called urban horticulture. They are concerned with the study of the interaction of people and plants in urban environments.

Traditional horticulture, being a part of agriculture, has developed systems whereby we can study and/or produce uniform plants of a single cultivar in large numbers within defined and controlled environments. These systems provide the consumer with plants of similar size, flowers, and harvest time. They are ideal for the massive uses intended.

However, each urban garden is different. An urban garden contains plants grown alone or in small groups in confined and often changing environments. The selection and management of such gardens requires new tools such as modeling techniques now available in our "electronic" age.

The implications for the critical selection of plants for these urban gardens are immense. The plant propagator, the person who often determines whether a plant is even available, will continue to be an even more vital person in the total scheme of getting plants from propagation to the ultimate consumer in the urban environment.

Areas of Concern. The selection of plant material begins with the individual plant's genetic make-up. In urban gardens, plants will be selected for their function (adaptability) as well as beauty. Traditionally, botanic gardens and arboreta have emphasized the species concept. In urban landscapes, more attention will be given to cultivars and varieties. Often these plants will come from amateur hybridizers or other plant enthusiasts. But we must collect and correctly classify these plants, so they can properly be introduced and named for the trade.

Increasing awareness for color, form, and texture contrasts will be necessary. The variegated foliages, distorted branching habits, or unusual flowering and fruiting habits will offer gardeners more contrasts in design. Many of these plant forms are already existing, but their specific adaptability for urban environments has not been defined.

Also the enthusiasm of the urban gardener (hobbyist) for specialty plants must be noted. Increased interest in unusual plants such as hardy perennials and cycads is specifically shown by the growth of local chapters of the Hardy Plant Society and the Cycad Society in the Pacific Northwest area. These plant society members will "sell" the use of these plants, but they will require the help of horticultural trained personnel in the selection of their propagation and cultural problems.

Urban gardens will require small plants for their smaller spaces. Thus more emphasis will be placed on dwarf and compact growing types. These types are often more difficult to

propagate and are usually slower to reach a saleable size. The propagator will be challenged to develop a system which efficiently produces these plants and even to obtain initially faster growth, perhaps through the use of chemical controls.

Basic botany informs us that plants need light to conduct photosynthesis. Furthermore, it's common practice to classify plants as shade or sun-loving. However, recent studies now indicate that light quality as well as quantity may affect the structural formation of leaves, nodal branching, and linear growth of plants. Much of our knowledge in this area comes from research with interior foliage plants. However, interior plants are really outdoor plants from subtropical and tropical areas. Therefore these light studies should begin to help us with our urban garden situations. In the future, specifications for plants in urban gardens may include requirements for propagation and production under specific light regimes, such as no direct sunlight, or highly reflected light (heat tolerant).

Moisture content of the soil is another consideration when selecting plants for urban gardens. The soil moisture supply will vary within even small areas of the landscape. Areas under eaves usually receive little rainfall and northern exposures of buildings as well as areas close to foundations are usually drier. Thus a plant moved as little as six inches in one direction can have a very different moisture site.

Urban planting sites have been excessively disturbed, and often are composed of only fill soil. This means that normal capillary water movement within the planting area is impaired. In such conditions, it has been most acceptable to amend these soil sites. But, modern theories now indicate we should select plants which can tolerate these unamended soil sites. Current studies involving mycorrhizae and plants which "fix" nitrogen will continue to tell us which plants have the potential for such sites. In addition, special techniques for the propagation of these plants may also be necessary.

Rainfall is usually sparse or even non-existent during the summer in many parts of the United States. Most of the landscape plant materials now used in such areas require summer irrigation. However, no one, even Pacific Northwesterners, are immune to water restrictions. Our planting designs will require the selection of more drought-tolerant plants as well as the implementation of efficient irrigation systems to conserve water.

All gardeners know that plants are ecotypically adapted to specific climatic zones; e.g., tropical, alpine, etc. However, astute gardeners also know that specific plants sometimes can tolerate a wider range of temperature conditions. In urban

gardens, extreme temperature fluctuations can occur. Thus the plants most useful in urban gardens must be able to tolerate such fluctuations.

Often plants appear to be growing normally, but still may be under some type of environmental stress. For instance, the white bark birches seem to grow satisfactorily in the central midwest. However they are very susceptible to bronze birch borer which seems to be related to stress. In more northern climates where the trees are not stressed, the borer problems are non-existent. In our future plant decisions, we will be concerned with total plant management systems. The new and growing program such as IPM (Integrated Pest Management) will help us decide which plants will be useful for specific stressful environments.

Market analysts tell us that today a larger number of landscape plants die after they are planted in the landscape than in the propagation-production phase. Many horticulturists feel this loss is not primarily due to the gardener's lack of or poor care. The problem may be concerned with the method in which the plant was originally propagated and/or grown.

Researchers are obtaining data which indicate that growing plants under "ideal" schemes may not be best for later adaptation into the urban environment. Studies are underway to determine if plants produced under "stress" will be better able to adapt to the adverse environment under which they will ultimately need to flourish.

Plants in urban gardens are also planted closely together. The study of allelopathy and the effect of one plant on another is now receiving increasing emphasis. Urban garden specifications of the future may well include schemes for companion plantings within all areas of landscape plants.

SUMMARY

In the past, landscape plants were primarily selected for their esthetic features. But modern plant selection will also consider the specific function/s the plants can perform; i.e., for an architectural, engineering, culinary, or climate control function.

Our smaller and more intimate urban gardens of the future will be viewed from a closer range. With closeness, the finite details of the plants are more noticeable. Plants with more delicate characteristics and less vibrant color will be necessary. Also, these gardens will offer the opportunity to use plants which appeal more to our senses.

In our futuristic selection and propagation of plant material, we will incorporate the esthetic and functional merits of the plants into creating an environment unique for the needs and lifestyle of each gardener. We will be creating our new smaller gardens with an even greater sensitivity for the type of plant material used. It is our responsibility as propagators to provide this plant material in an efficient and useful manner.

REFERENCES

Beatty, Russell, 1983. Urban horticulture: new dimension and new direction. *The Morton Arboretum Quarterly* 3:25-32.

Briskin, Dennis. 1983. City trees: apples make a case for urban forestry *Softalk* 211-214.

Tukey, H.B. 1983. Urban horticulture: horticulture for populated areas. *HortScience* 18(1):11-13.

Tukey, H.B. 1983. The talk of the town. *The New Yorker* 5:26-27.

Wott, J.A. 1982. Plant propagation from a utilization viewpoint. *Proc. Inter. Plant Prop. Soc.* 32:252-263.

NEW HERBICIDES FOR THE NURSERY INDUSTRY

ELTON M. SMITH

Department of Horticulture

The Ohio State University

Columbus, Ohio 43210

We categorize herbicides as pre-emergence (those applied prior to seed germination) and post-emergence (those applied to existing weeds). Among the best of the Federally registered herbicides in the U.S. are the following with a brief statement as to why they are being used extensively.

PRE-EMERGENCE HERBICIDES

Dichlobenil (Casoron) is definitely not new, but the most *effective pre-emergence herbicide for control of perennial* weeds in field (not container) nurseries. The use of post-emergence herbicides such as glyphosphate have reduced the use of this product in recent years. It is volatile and its use is limited to autumn and early winter when soil temperature is 50°F or lower.

Napropamide (Devrinol) is one of the newer products used in container nurseries because it effectively controls chickweed and groundsel, two very troublesome weeds. Napropamide is alternated with Oxadiazon (Ronstar) in container nurseries but is also registered for field grown trees, deciduous