CHALLENGES OF PROPAGATION FOR THE EIGHTIES

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Horticulture is described by Webster as the "art and science" of gardening, especially related to food and fiber crops. However, during the post-World War II growth period, a new field of horticulture has emerged and grown tremendously. The development of this field was fueled by rapidly increasing suburbanization, rapid job expansion, and the ease of personal mobility. This new field is the area of landscape horticulture which includes not only design but also encompasses the selection, propagation, growth, sales, and use of landscape plants.

Because there was a rapidly escalating need for landscape plants, even shortages, all commercial enterprises involved with landscape plants expanded, sometimes seeming to appear overnight. For some years, it appeared that anything green could be sold to the consumer.

Recently, the slowing economy, the over-supply of many types of landscape plants, and the growing knowledge base of the consumer are causing landcape horticulture to mature. The time is also appropriate for science to "catch up" with this field and to help all of us become better prepared as we meet the challenges of the 1980's.

Simultaneously around the world, academic institutions and botanical gardens established areas of urban horticulture in teaching, research, and public outreach. This science will study approaches to the interaction of people and plants, and attacks problems from the consumptive angle rather than from the typical production approach.

For the members of the International Plant Propagators' Society, the challenge of the 80's should be phrased, "who really has the responsibility for the ultimate success of the landscape plant?" Or paraphrased: "how often do you as a propagator, a grower, or a retailer think about the long-term survivability of the plant with which you are working?"

Seed science. During recent decades, we have searched for efficient methods of producing large numbers of identically selected plants to be grown in typical agricultural production style. In doing this, we have decreased the genetic base in our gene pools. In the landscape plant industry, we must be reminded of problems in other industries, e.g., the corn blight

problem of midwestern farmers. The same types of problem can and will happen in the landscape plant industry.

Today, networks of people in specific arboreta around the world are working together to save endangered species. These gardens are no longer just collecting plants, but today they are taking a more critical look at how they can serve as genetic "storehouses."

Also teams of plant experts are being assembled and sent to parts of the world where the plants have not been explored, or where they have been lost to western cultivation. For example, the U.S. National Arboretum has an extensive seed exchange and exploration program of Japanese flowering cherry with Japan. By collecting and enlarging a gene pool, the scientists can then work to improve the gene quality and diversity of the new plants they will introduce. Even the forest industries are looking in such places as China for exchanges in oaks, ashes, poplars, and alders.

Phenotypic expression. Plant scientists have long known that plants have both a genotypic and a phenotypic expression. While appearing to all look identical to the untrained observer, plants such as Eastern white pines, when collected from seed sources over its extensive range from Canada to Georgia will respond differently to environmental conditions such as light and temperature.

Such facts have immense implications when we have plants grown from southern seed sources produced for the northern market. Today, the original source for much of our plant material has often become so confused, that we really do not know the exact derivation of the seed. This means that the collector must return to the native gene pools, if possible, and recollect. In some cases, germplasm pools are being formed to preserve the diversification, e.g., the Rhododendron Species Foundation in Tacoma, Washington, and the Northwest Germplasm Repository in Corvallis, Oregon.

Psychological benefits. Using plants in the 80's will require that we broaden our perception and use of plants. Already the sciences of horticulture and psychology are combining to actually quantify the effects plants have on people. In one study, subjects who viewed nature slides consistently improved in their well-being, whereas subjects viewing urban slides tended to decline in emotional well-being.

Recently we have found that people who work in offices with plants, and/or have windows, consistently post better attendance records, and are more efficient. Studies indicate this may be related to blood sugar levels. In a recent study involving hospital patients, the patients who had the outside

views had shorter postoperative hospital stays, elicited fewer negative comments from nurses, required fewer moderate and strong analgesic doses, and had slightly lower scores for post-surgical complications

Color. Studies indicate that different colors elicit specific responses in humans How colors actually affect us is yet to be determined. In modern design technique, there is a disagreement among designers concerning whether artificial color materials can replace the colors designed by nature. Naturalists argue that we cannot desensitize people to the joys of an evolutionary habitat. Some designers feel that most colorful man-made materials can replace nature. Those who saw the colorful purple of the National Community Garden Display in the National Arboretum saw one such example Others argue that we should use more colorful plant materials such as the gold-variegated cultivars of aucuba, osmanthus, daphne, euonymus, the blues of spruces, winter browns of American arborvitaes, rose-purples of junipers, or the coppery cryptomerias. Add to this, the colors of many fruits and twigs.

Microclimate effects. The use of the term "native plant" is increasing in popularity. But just what is a native plant? In actuality, a plant is native only to the special environment for which it has become ecotypically in balance. In the Far West of the U.S. and in most other areas, many people are extremely excited about the use of their native plants. But beware of the problems in using native plants, e.g., a native plant, such as the alpine fir will seldom survive in the urban Puget Sound gardens of Washington State which do not duplicate its native alpine environment.

A challenge of the '80's will be to focus on the many microclimates created by our increasing urban environments. The mere creation of city canyons causes areas where light intensity is quite variable. In some urban sites, plants receive absolutely no direct sunlight. Studies are now finding that such plants take on a much different appearance after a period of time. For example, sweetgum trees planted on the streets of downtown Seattle, where they receive little direct sunlight are round-headed and misshapen. Trees in higher light locations appear normal.

Studies in the foliage plant industry have indicated that shade-produced plants do really have a different leaf structure than sun-produced plants. Similar effects certainly occur in many landscape plants. Now researchers are using scientific instruments to look at light effects on landscape plants. As a consequence, we must be prepared to select and grow species and cultivars of plants which will respond to these particular

low-light environments.

In most urban sites, the soil has been disturbed which means that drainage and/or nutrition patterns differ from undisturbed sites. Also, applying water without thought as to its over- or under-abundance is no longer an acceptable practice and the use of plants which require constant watering is becoming passé.

Researchers now tell us there is water stress even in supposedly stressless plants such as *Populus*. Such plants show stress in just a matter of days from both over- and under-watering. Such symptoms as leaf orientation, angle size, and nodal development are all affected. But in order to determine this, we must compare stressed and non-stressed plants.

Quality of production. Whose responsibility is it when a newly transplanted tree or shrub dies? The producer and/or retailer most often says it is the consumer. But new studies indicate that the homeowner may not be the culprit. In our haste to "assembly-line" plants like automobiles, we may have lost accountability for its long-term survivability.

In most disturbed sites, no longer are soil amendments recommended for addition to the planting site. However, our efficient (and economical) production techniques require us to grow plants in porous mixes which only turn to bathtubs when planted in the site. Growing techniques which produce tangled and misshapen roots, container-grown plants which topple over when planted, or graft incompatibilities, are certainly not the fault of the person who purchases the plants.

We must continue to search for techniques to propagate more of the difficult-to-root plants which make ideal landscape plants. And we must continue to search for better "bottoms" and methods for placing the "tops" on these "bottoms" for better graft compatibilities.

In order to produce quality plants, we are finding new techniques, such as the use of mycorrhizae, necessary for the successful establishment in new planting sites. As our sphere of knowledge increases in the "root-world", we will be able to select and use plants based upon greater pools of knowledge.

The latest technique in plant propagation — tissue culture — has opened a new door for producing many genetically identical individuals. However, by using this technique, we are also decreasing the gene pool dramatically. Thus we must use it only as an appropriate propagating technique.

One of the newest areas of basic research which may help us to increase our gene pools is genetic engineering. One specific method entails gene splicing, i.e., taking a desirable

gene (trait) from one chromosome and attaching or replacing it with other desirable genes from other chromosomes. This is a long and tedious process since the researchers must first isolate and determine all the chromosomes and the genes they contain.

Another new method is called protoplast fusion, a technique in which researchers remove cell walls of two or more cells of related organisms to leave the protoplasts. Then the protoplasts and all the DNA they contain can be mixed and fused. The researchers can then screen these mixes, and tissue culture the desirable cells. This technique has already been used to improve some tobacco cultivars and to invent a "pomato," a combination from a tomato and potato.

SUMMARY

The challenges for the 1980's are immense. We must work at increasing our gene pool base and preserving it. We must continue to build and select species and cultivars for the increasing number of urban environments and we must become more efficient in producing quality plants which will survive in these environments.

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Thursday Afternoon, December 13, 1984

The Thursday afternoon session convened at 1:30 p.m. with Clayton Fuller serving as moderator.