The Container Production of Herbaceous Perennials

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As a part of his M.S. degree program, James Locklear carried out a thorough search of literature on the container production of herbaceous perennials. His findings will be presented in a series of articles to be published in this and future issues of the News.

The production of perennials is a subject that is likely to draw more interest today than it would have a few years ago. According to writers in trade publications, speakers at industry conventions, and others in the business, there is a growing interest in perennials. Consumer demand and sales are up, and appear to be increasing. Growers, aware of the opportunity for expanding sales, are seeking ways to include perennials in their operations. Concurrently, there has been a need expressed for more information on propagation, production, and marketing of perennials.

Certain aspects of the growth and development of herbaceous perennials require production and marketing techniques often different from those employed with annual bedding plants or woody ornamentals. In addition, different propagation methods may be necessary if a variety of species are grown. The result is that, from the standpoint of commercial production, perennials are a special group requiring procedures sometimes unlike those needed for other horticultural crops.

Historical Overview and Current Trends

Although reports indicate a rising interest in perennials, it might be more correct to say that there is a renewed interest in these plants today. Perennials, as a group, were once a much more important part of the horticulture industry than they have been for the last couple of decades. Prior to the 1950's, there were many retail and wholesale perennial nurseries in the U.S., and many larger nurseries had their own perennial departments. Nurseries offered a wide selection of plants, and interest on the part of the gardening public was high.

In a 1960 article in the American Nurseryman on this subject, Robert Bennerup stated that the perennial business had probably changed more than any other phase of the nursery industry since World War II. The number of perennial nurseries, as well as garden centers and other operations offering perennials, had declined considerably. Fewer landscape nurserymen were using perennials in their plans, and home gardeners were often limited to mail-order companies as their only source of plants.

The primary factor behind this decline was that growers found it increasingly difficult to make a profit with perennials. Labor expenses, tied to certain production practices, resulted in rather high production costs, and it was difficult to charge enough for a herbaceous plant to cover these costs and still make a profit. Other nursery crops, such as flowering shrubs and evergreens, offered a greater margin of profit, and growers moved away from perennials in favor of such crops.

These relatively high production costs were primarily due to traditional methods of growing and selling perennials, which often required large amounts of labor. Perennials were mainly field-grown, which became an expensive practice for herbaceous plants unless done on a scale large enough to make mechanization practical. It was also common for retail operations to hand-dig plants for customers directly from the field. This certainly required more labor than modern practices of selling plants in containers. In addition, propagation often required considerable amounts of labor, particularly since the more desirable named cultivars required propagation by cuttings or division..

Production of perennials continued to decline over the years until today there are relatively few perennial nurseries still operating. These are mostly large wholesale specialists or retail mail-order nurseries which ship field-grown, bare-root plants throughout the U.S. In certain regions, smaller wholesale growers supply potted plants to a more local market which would include garden centers and landscape contractors.

While there may never again be the number of perennial specialists that existed in the past, an increasing number of growers are becoming interested in making these plants a part of their operation. Perennials are being looked at as a second new field for annual bedding plant growers. In addition, nurseries and garden centers could find these plants to be a source of additional sales, particularly during the slower summer months. A good offering of perennials could also provide an opportunity for getting business away from retail chain stores.
With the rise in interest in perennials today, many growers are looking to more modern production methods by which to grow and market these plants. Container production has become the standard practice, except in the case of the very largest wholesale specialists. However, while container production may be more economical and practical for the grower, container-grown plants may not give the consumer the same quality as a field-grown plant.

The difference is that a container-grown perennial may not bloom in the same year that it is planted in the garden. This means that the consumer, who purchased the plant for its flowers, will have to wait until the following spring or summer before their plant will bloom. The reason for this is that most perennials have certain physiological requirements for flowering, which are met naturally in the field, but may not be met in container production.

In order to produce a container-grown perennial that will bloom the year of its purchase, these physiological requirements must be understood and met. Doing so is not difficult, and may not require any great change in the operation and organization of a nursery or other business wanting to grow perennials. First of all, the grower needs a basic understanding of the factors that influence flower production in herbaceous perennials.

Before going further, the term perennial needs proper defining. Probably the best horticultural definition would be an herbaceous plant that normally lives at least three years under local conditions. Such a definition excludes plants with an annual or biennial life cycle, which at the same time allowing for the fact that a species may be perennial in one locality, but behave as an annual or biennial in another. Biennials such as foxglove and canterbury bells are often grouped with true perennials in the broadest usage of the term, although this would not be technically correct. Finally, while perennials are most often thought of as border plants (such as delphinium and Shasta daisy), rock garden plants, wildflowers, and many herbs also fall into this category.

Physiology of Flowering and Implications for Production

The production of flowers by herbaceous perennials is influenced by any factor that affects the general physiological condition of a plant, such as water relations or nutrition. The actual formation of flowers, however, is directly influenced by two environmental factors; light and temperature. An understanding of the role of these two factors in the process of flowering is important in establishing production methods for perennials.

Light influences flower production through the effect of daily alternating periods of light and darkness. For many plant species, seasonal variation in day and night length serves as a regulating mechanism, with flowering stimulated or inhibited depending on the relative number of hours of light and darkness. A number of horticultural crops exhibit this response, termed photoperiodism. For example, the florist's chrysanthemum is stimulated to produce flowers when nights are longer than a critical period of time. Growers are able to force plants into bloom at times of the year when the natural night length is not long enough by artificially extending the period of darkness through the use of blackcloth shading.

Certainly many species of perennials exhibit photoperiodic responses. The particular photoperiod requirements of a number of garden

perennials have been investigated, but these studies have been aimed primarily at developing these plants for florist cut-flower or potted plant production. In terms of the commercial production of perennials, however, these requirements would be met naturally, and thus be of little or no concern to the grower. A container-grown plant would be subjected to essentially the same variation in day and night length that a field-grown plant would receive, and would be expected to behave in the same manner as the field-grown plant.

Artificial manipulation of photoperiod could possibly find application in the production of perennials as a means of bringing plants into bloom during the time of peak sales in the spring. Bedding plant growers are looking at this in the production of annuals, but it is uncertain if it will ever become a commercially important practice. As for perennials, the great variety of species and cultivars grown, with widely varying periods of bloom (and presumably, photoperiodic response), would make such a practice a complicated and probably unprofitable one. A recent study of flowering responses in the gypsophila (baby's breath) cultivar 'Bristol Fairy' showed that a wide variation existed in the length of the inductive photoperiod, in plants of the same asexually reproduced cultivar.

While the photoperiod requirements of perennials are usually met naturally in container production, another important stimulus to flowering may not be. Many perennials and biennials require exposure to low temperatures during winter in order to flower. If, for instance, plants are started and grown during the winter to be sold in the spring (as in annual production), these plants will not have received the cold treatment necessary for flowering. Such plants would not bloom until after having been exposed to low temperatures the following winter in the consumer's garden. Providing for this low temperature requirement is termed vernalization.

In vernalization, the temperature changes that lead to flower initiation are perceived in the primary meristems of buds, while in photoperiodism the light stimulus triggering flowering is perceived by the leaves of the plant. Buds receiving the proper low temperature stimulus are induced to form flower primordia, while untreated buds will remain vegetative. Vernalization may be either independent from, or associated with photoperiodism, with some species not responding to an inductive photoperiod until they have first received the proper low temperature exposure.

Aside from these basics, there are not too many generalizations that can be made about the cold requirements of perennials. Some plants must be exposed to low temperatures in order to flower, while others need no such treatment at all. This varies between species, and can vary between plants of the same species. While the average temperature necessary to induce flowering in cold-requiring species is about 1-5°C (34-41°F), the range has been found to extend from -6-14°C (21-57°F). Species may also vary in the duration of exposure that is required to induce flowering, from several days to months.

An important consideration, particularly in terms of practical application, is that a certain stage of development may have to be reached by a plant before it will respond to vernalization. Prior to this stage, even if the plant is exposed to the proper low temperatures, no flowering will occur. The stage of development necessary to perceive the temperature stimulus can vary greatly between species. Some plants will flower if the seed alone receives the cold treatment, while others must reach a much more advanced stage, such as the development of a certain number of leaves.

Not all of the buds of a given plant will be induced to form flower primordia, even if provided the proper cold treatment. This helps maintain the perennial condition of perennials. Perennials are polycarpic plants, meaning that they can bloom and produce fruit (seeds) more than once. Annuals are monocarpic plants, that is, all of their buds produce flowers, and after flowering and fruiting once, the plant dies. If all of the buds of a perennial plant were induced to produce flower primordia, the plant would be monocarpic, dying after seed and fruit formation.

In perennial species, however, any shoots insufficiently developed at the time of cold treatment will not be induced to form flowers, thus remaining vegetative and insuring the perennial condition. In some species, secondary shoots, subterranean stems, or suckers may maintain the perennial condition. In addition, exposure to high or low light intensities, or high temperatures may result in "devernalization" of shoots.

Providing for the individual vernalization requirements of a number of perennial species would be a difficult task, particularly since these requirements are known only for the few species that scientists have studied so far. In reality, however, the perennial grower can easily provide the vernalization treatments necessary, even without knowing specific plant requirements. The keys are to provide exposure to temperatures low enough to induce flowering, and to do it at a stage of development when the plants are receptive to the temperature stimulus. A basic production scheme of starting plants in the summer, growing them on, and exposing them to natural winter temperatures is a relatively simple way of meeting the requirements of all of the plants grown, and of producing plants which will bloom the year of their purchase.

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