



Stem breakage in tall plantings (above) in *Campanula medium* (Canterbury Bells), 3 to 4 ft tall in May 1965 shows breakage on border while stems in the interior are mutually supporting. Stem breakage (right photo) occurs along a front so that a large gap appears in this entire planting of *Chrysanthemum morifolium* var. *Purple Waters*, 3 ft tall in May 1965.

Flower Beds in Public Places

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Garden flowers in public places can be as rewarding as any wildflower display of the desert, range, or alpine meadow. A few municipalities have had excellent experience with flower beds and maintain many, relatively small, plantings of herbaceous flowering materials under continuous cultivation. Small beds, planted to one or two species, make quite impressive displays. Although maintenance of flower beds and herbaceous materials is somewhat more difficult and costly than that for trees and shrubs, some problems have been exaggerated. This report on three successive years of trials with 50 species at Davis provides additional details to other information already available on maintenance costs, species selection, planting date, density, and useful life of plantings.

PUBLIC PLANTINGS IN CALIFORNIA concentrate on trees and shrubs, combined with selected ground covers. The species range may be great, but visual variety is usually limited to foliage characteristics and plant stature. Brilliant color is provided by a few flowering and fruiting trees and shrubs which are difficult or impossible to use where compact plantings are required.

Herbaceous, perennial and annual flowering plants are used rarely, yet within this category exist the greatest opportunities for achieving seasonal color, variety, and interest—particularly where space is limited. Official reluctance to use herbaceous materials is usually based on the greater susceptibility of such plant-

ings to vandalism and the higher cost of maintenance (per square foot of planting) as compared with shrubs and trees. However, experience in several city parks, malls and other public places suggests that the vandalism factor may be reduced by selecting sites with proper regard to pedestrian traffic and by avoiding play areas. Higher maintenance costs may be acceptable because of greater public interest in colorful and seasonal herbaceous plantings. Small beds (100 sq ft) are particularly effective on malls, at park entrances, before public buildings and at freeway exits.

Green thumb

Perhaps the greatest reservations in the use of herbaceous materials are founded upon insufficient information concerning proper horticultural practices. Trees and shrubs appear to "care for themselves," whereas there is a popular belief that a "green thumb" is required for success with herbaceous flowering plants.

The "green thumb" mystique can be eliminated by precise recommendations concerning soil preparation and nutrition, irrigation practices, and plant selection according to season and climate. Performance trials at the University of California, Davis, with about 40 popular herbaceous species, indicate that the greatest problems may be encountered with plant selection, planting date and density.

Soil preparation, irrigation

Even with heavy clay loams, soil preparation has been greatly simplified by use of amendments such as peat, bark, sawdust, and rice hulls. Adequate aeration and drainage can usually be obtained by using 50% native soil plus 50% peat (or other amendment). Flower beds should have 18 inches of well-aerated, well-drained soil for proper root growth; also, overall drainage of the area is necessary to prevent periodic flooding after heavy rains or irrigation. In Davis, most plantings required irrigation twice weekly during the June-to-September period. Some species are relatively drought tolerant, but under dry conditions flowering is delayed and sparse.

Nutrition

Nutritional problems may be solved by using any number of commercially available fertilizers, the most satisfactory of which can provide nitrogen for the entire growing season.

Many weeds can be controlled with preemergence herbicides incorporated

into the top 3 inches of soil, where they remain to inhibit root growth of germinating weed seeds. Roots of many ornamental species are either resistant to the herbicide, or sufficient numbers of roots are below the herbicide zone so that normal top growth is obtained. Another sometimes highly successful method of reducing weeds is to increase the planting density so that the desired plants rapidly crowd out weed growth.

Plant spacing

Species vary, but in general it is better to plant too many plants per bed than too few. High planting density insures rapid covering of the bed surface, which not only improves the appearance of the bed but also inhibits weed growth. At Davis, most species were planted on 6- to 8-inch centers, and no thinning was required. *Petunia*, *Rudbeckia*, *Chrysanthemum* and a few other species were spaced on 1-ft centers. Perennials, such as *Chrysanthemum maximum* and *C. morifolium* were thinned annually. All varieties of *C. morifolium* are rhizomatous, and the clumps were divided in late winter or early spring.

Planting dates

Planting dates and rotations depend also on the species and the climate. However, all species tested at Davis benefited by a late March planting date—eliminating the danger of frost. The frost guideline would appear to be valuable for all species. Earlier plantings of cold-tolerant species may permit earlier bloom, but prolonged periods of low temperature and low light intensity greatly retard plant development and often cause injuries (chlorosis, poor leaf development, weak stems) which affect the quality of the mature plant. In many areas of California, late April and May plantings are jeopardized by unfavorably high temperatures and low humidity. Regardless of the time of year, the major damage to newly transplanted seedlings is caused by drying winds; therefore, if beds are in unprotected areas, artificial wind barriers should be erected and remain in place for several days following transplanting.

To provide late-winter and early-spring color in flower beds the best practice is to winter-plant with bulbs, corms or tubers, followed in April by overplanting with warm season annuals to provide summer color. In Davis most bulbous species bloom in March or April and are removed or overplanted by mid-April. Beds should be completely cleared in

October or November, according to the species and climate, and re-treated with a preemergence herbicide or covered with additional organic amendment as required. A few of the perennial species tested proved satisfactory or outstanding into the second and third year after planting, but most were rarely superior to annual varieties or renewed plantings. There are some relatively expensive alternatives to bare winter beds. For example, in most areas of California, pot-grown azaleas with handsome foliage may be directly transplanted to outdoor beds in November or December and produce a spectacular floral display in early spring.

Selection

Plant selection and performance at the particular bed site depend on such factors as exposure (northern, western,

Deterioration in annuals maintained beyond the first year. Some annuals, such as the *Nierembergia* pictured below in May, 1965, tend to behave as perennials in California. Yet in the second and third year the plantings will deteriorate (arrows) and should be cleared. Annual plantings of *Nierembergia* retain satisfactory appearance for the entire year with no signs of senescence.



etc.), prevailing winds, humidity, light intensity, minimum temperatures, and water quality. Thus, within a valley or any climatic zone, numerous variations are possible. At Davis, plant performance was judged under harsh conditions; the beds were flat, in full sun, and completely unprotected from relatively high-velocity northerly and southerly winds. Regardless of the species, short-stemmed, dwarf varieties (6 to 8 inches tall) were preferable to their tall counterparts, because they are much less susceptible to wind damage. Data on plant species and performance, including flowering dates (greatest display period), height at flowering, and optimal plant spacing are available in a mimeographed listing by writing the Department of Landscape Horticulture, University of California, Davis. Wind and transplant damage were also noted. Many species not tested at Davis are particularly well suited for cooler and more humid climates; conversely, many plants that performed well in these tests will do poorly on the coastal plains.

Maintenance

Approximately 600 hours of maintenance were required annually for 15,000 sq ft of mixed flower beds at Davis; irrigation required 40 hours; transplanting, 250; and weeding, 310. March and November placed the heaviest demands on the maintenance staff, but there was surprisingly equal distribution of labor throughout the year. Seedlings of the species used may be purchased from local nurserymen. When large orders are to be placed, contact the nursery several months in advance so that plants of the desired varieties will be available on the desired date.

Location

To be appreciated, flower beds must be properly placed—always removed from play areas. They must be cleaned of dead or unsightly plant materials or other debris, and they must be irrigated at relatively frequent intervals. Although there is greater leeway in color selection than is popularly imagined, greatest effect is achieved by planting to a single color or to sizable blocks of compatible colors.

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Bloom Spraying with Gibberellin Loosens Clusters of Thompson Seedless Grapes

Applications of gibberellin to Thompson Seedless grapes during bloom produce a very loose cluster. Loose clusters may be less subject to summer bunch rot and are easier to pack than the more compact cluster often produced by the commercially accepted practice of spraying following bloom.

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THOMPSON SEEDLESS VINES sprayed with gibberellin at the shatter stage (in the usual practice) produce greatly enlarged berries. This stage occurs about 10 days after bloom—when the impotent flowers or berries have fallen. This is also the proper time for girdling. By 1962, only five years after the first testing was done at Davis, nearly all Thompson Seedless for table fruit in California were being sprayed with gibberellin. However, these large-berried clusters had to be heavily berry-thinned to reduce compactness. Even then, the clusters were often quite compact, encouraging the development of summer bunch rot and making packing more difficult.

Recent experiments have shown that loose clusters with large berries may be obtained by spraying at bloom stage. Mature Thompson Seedless grapes in an irrigated vineyard at the University of California, Davis, were used for these tests. The vines were pruned to four canes, and were cluster-thinned to 20 per vine. The retained clusters were berry-thinned by removing the apical half. In

one experiment, vines were sprayed at bloom stage on May 5, 1965 (40% of the calyptras had fallen) at 0, 10, 20, 40 and 80 ppm of gibberellin. Another series of vines were sprayed at the same concentrations at the shatter stage on June 4. The potassium salt of gibberellic acid (GA_3) was used and "Tween-20" was added as a wetting agent. The clusters and all foliage in the cluster area were thoroughly wetted. There were four vines per treatment. All vines were trunk girdled on June 6 to produce large and uniform berries.

Cluster rating

At harvest on September 1, three clusters were removed from each vine. The degree of looseness was estimated for each cluster. If the clusters were very loose and easily bent with spaces between the berries it was given a rating of "one." A rating of "three" meant the clusters were very compact and could not be bent without crushing the berries. A rating of "two" was intermediate. These clusters were slightly loose and flexible, but there