



Figure 3. Number of days to sale, before and after relandscaping.

finding is significant for homeowners contemplating relandscaping, because real estate professionals can influence list-

ing prices and potential homebuyers' perception of value as well. Further, the "Ugly Yard" contest used to select the subject properties for this study revealed considerable interest in relandscaping among central Florida residents. This interest may indicate an unmet need among homeowners for professional assistance with relandscaping. Experience among nursery operators in other areas has shown that homeowners willingly pay for relandscaping when dramatic "before" and "after" results can be demonstrated. The advent of digital photography has made customized "before" and "after" demonstrations practical and feasible for homeowners' specific properties. This technique has been used as a very effective sales tool (Fenn, 1994). The results of the present study, coupled with appropriate relandscaping planning and digital photography, could be used as effective market development tools for the Florida nursery industry.

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BEDDING PLANT SELECTION, ESTABLISHMENT AND MAINTENANCE

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Abstract. The variety of color and plant form make bedding plants the most versatile plants in the landscape. They can be used in beds and borders to provide that necessary touch of color to an often drab landscape. They can be grown in containers to add a splash of color to a porch, deck or patio. They can also be enjoyed as fresh-and dry-cut flowers. Most bedding plants will grow and flower best on well-drained sites which have exposure to full sunlight or partial shade. Because Florida's sandy soils have low nutrient and water -holding capacities, it is essential to incorporate organic matter and fertilizer into beds several weeks before planting. Bedding plants should be watered immediately after planting and daily until they become established. After establishment, they should be watered on an "as needed" basis. Weeds can be controlled either by mulching, applying preemergence herbicides and/or hand weeding. Insect and disease problems can be reduced by keeping the plants growing vigorously and free from stress.

Bedding plants, with their seemingly infinite variety of flower color and plant form, fit into almost any landscape. These plants may be grown in containers to add a splash of color to a porch, deck or patio area. They can be enjoyed as fresh- and dry-cut flowers and can be a very rewarding hobby.

Bedding plants can be annuals, biennials or perennials. Annuals are plants which are grown from seed, produce flowers and seed, and die in one growing season. Biennials complete their life span within 2 years, and perennials last for 3 years or longer. However, certain plants can be annuals, biennials or perennials depending on the locality or purpose for which they are grown.

Bedding plants are especially versatile in Florida. Many of them bloom during winter months, contributing splendidly to a colorful landscape and producing flowers for home decorations. Others grow and flower during the trying months of June, July, Aug. and Sep., persistently blooming through the heat and heavy rains of summer.

Cultivation of bedding plants in Florida is different from that in most states because Florida has three climatic regimes. During winter, nights are cool with an occasional freeze in central and south Florida and frequent freezes in north Florida. In early spring and late fall, nights are cool, whereas high night temperatures, heavy rains, and high relative humidity are typical during summer and early fall. Careful attention must be given to these climatic conditions if bedding plants are to be grown successfully in Florida. Petunias, pansies and snapdragons that grow well and flower under cool night temperatures (45-65°F) should be planted in the fall, winter and early spring. Bedding plants such as marigold, gazania, amaranthus, celosia, crossandra, impatiens, vinca and coleus that can tolerate high temperatures and humidity should be planted in late spring or early summer. Some plants such as wax begonias and salvias grow relatively well during both hot and cool seasons and can be planted year round in central and south Florida.

Florida's winter temperatures in the central and southern portions of the state are often not low enough to kill flowering plants such as geraniums and begonias. Although these plants are perennials and will grow outdoors for several years in mild climates, they should be treated as annuals and replaced with new, vigorous, disease- and insect-free plants each season. This will eliminate tall, unsightly plants and reduce the buildup of pathogens and insects.

While Florida gardeners are fortunate to have abundant sunshine and mild winters, they must contend with infertile sandy soils, plant pests and heavy rains which necessitate regular scouting and spot treatment of identified pests. The addition of bedding plants to the landscape will greatly increase maintenance. The home gardener should allocate more time for maintenance once the decision is made to grow bedding plants.

Where to Use Bedding Plants

Bedding plants should complement the home and other plants in the landscape. They should not be placed indiscriminately throughout the landscape so that they stand out more than any other feature. This is particularly important in the public area (that area in the front of the house) where all plantings should accent the house, not compete with it for attention. Limit bedding plants in the public area to planter boxes and areas within foundation plantings. Large islands of bedding plants in the front lawn should be avoided because they tend to focus attention away from the house.

Beds of flowering plants add considerable color and interest when planted near porches, patios, terraces and decks. If space around these outdoor living areas is limited, bedding plants can still be enjoyed by growing them in pots, tubs, planter boxes and hanging baskets.

Bedding plants can be very effective when used as borders along fences and shrub borders. The background provided by the dark color of a stained wood fence or green foliage of shrubs enhances the color of flowers. Because borders are usually viewed from one side only, they are easy to construct. The lowest growing bedding plants are planted in the front, medium size in the middle, and the tall plants in the back of the bed.

Attractive flower beds can be created with bedding plants. Flower beds are usually designed to stand alone and be viewed from several sides. They are more difficult to construct than borders and are best used in formal landscapes.

Other uses of bedding plants are for edging along walks and driveways and for adding a splash of color in or around vegetable gardens. In addition to making vegetable gardens more attractive, they are a good source of cut flowers for indoor arrangements.

Site Selection and Bed Design

Success in growing bedding plants depends on the characteristics of the planting site. The amount of sun or shade, salt spray, soil moisture and soil type dictate the kinds of bedding plants that can be successfully grown at a particular site. Although bedding plants have different requirements, most will grow and flower best on well-drained sites which have exposure to full sunlight or partial shade. Bedding plants will do very poorly when heavy rains continuously keep the planting beds saturated with water. With the exceptions of a few shade-

loving bedding plants, most planted in shady areas will be weak and spindly, with few flowers.

Start your flower beds and borders designs with drawings and sketches and make the mistakes on paper not on the landscape site. The shape of beds and borders will greatly influence character of your landscape. Beds and borders with straight, angular lines are usually uninteresting and monotonous because they are repeated in walks, drives and property lines. However, when the total design is composed of straight lines that form an over-all design, they can be used. Curved or free-flowing beds and borders are restful to the eye and create a relaxing, progressive, moving and natural feeling which contributes to an informal effect.

After you have determined the size and shapes of beds and borders, they can be laid out in the landscape with the help of a garden hose. Simply outline the shapes of the beds and borders on the ground with a flexible garden hose and dig and remove grass or other plants inside the outlined area.

Bed Preparation

Beds should be spaded or tilled at least six inches deep several weeks before planting. Florida's sandy soils have very low nutrient and water-holding capacities. Incorporation of 2 to 3 inches of organic matter into planting beds will increase nutrient and water-holding capacities of these soils. Organic materials such as compost or peat should be thoroughly mixed into the soil.

Garden soils, especially in recently developed areas, are frequently infertile. Flower beds should be fertilized prior to planting or at planting time and repeated on a monthly basis. Apply 6-6-6 or a similar complete fertilizer at the rate of 2 lb/100 ft² of bed area. Application rates for higher analysis fertilizers are presented in Table 1. Controlled-release fertilizers are ideal for Florida's sandy soils. Plants usually grow much better with a continuous nutrient supply. These fertilizers also help with maintenance as applications are required less often than with rapid-release fertilizers. Controlled-release fertilizers can be incorporated uniformly throughout the soil before planting and applied on the soil surface of established plantings.

Bedding plants can be damaged by nematodes. These microscopic worms are present in most soils in Florida and are likely to reach damaging levels when susceptible plants are grown repeatedly in the same area. Treating beds with a soil fumigant is highly desirable prior to planting. However, most fumigants are restricted-use pesticides and must be applied by a professional pesticide applicator.

Other options for controlling nematodes include soil solarization and replacement of nematode-infested soil in beds

Table 1. Suggested fertilizer application rates for annuals.

Fertilizer Analysis	lb/100 ft ²
6-6-6	2.0
8-8-8	1.5
10-10-10	1.2
12-4-12	1.0
12-12-12	1.0
15-30-15	0.8
16-4-8	0.8
16-8-24	0.8
20-20-20	0.6
25-5-20	0.5

(Dunn, 1992). Soil solarization is a non-chemical way to reduce soil pest populations, but it takes a lot of work and the area must be left bare 4 to 8 wks during the summer. Clear polyethylene is used to cover moist soil that is ready to be planted. The heat generated by sunlight hitting the soil will be trapped and the soil temperature will be high enough to kill many nematodes in the upper few inches of the bed. Replacement of nematode-infested soil with sterile soil or potting mix is a simple and fast method of managing nematodes, however, nematodes eventually will reinfest the "clean" soil.

Another approach to reducing nematode damage in bedding plants is to avoid planting nematode-susceptible plants. The susceptibility of some bedding plants to a common species of root-knot nematodes is presented in Table 2. This table should be used as a general guide, since it takes in account only one species of root-knot nematodes and different varieties and cultivars of bedding plants vary greatly in their susceptibility to damage by root-knot nematodes.

Selection

It is difficult for the average home gardener to germinate seed and grow seedlings; consequently, most gardeners purchase large seedlings or young plants. Before purchasing bedding plants, the home gardener should decide how the plants will be used in the landscape. Bedding plants should serve as an accent to the landscape, not a dominant feature in the setting. Those used around the home should harmonize with the setting, and colors should blend with each other and with the home.

When selecting bedding plants for beds or borders, it is best to limit the choice to as few kinds as possible. Combinations of many flower colors and plant forms can distract from the overall appearance of the display. Keep in mind that attractive flower beds can be created by using one plant species.

The color wheel can be used to obtain pleasing flower color combinations. Primary colors are red, blue and yellow. Orange, green and violet are called secondary colors because they are combinations of two primary colors. For example, yellow and red are combined to produce orange.

Tints refers to a light value and is accomplished by adding white to the pure color on the color wheel, while shade is a dark value and is created by adding black to the pure color on the color wheel. Black, white and gray are neutrals and are compatible with any color. Light colors and tints tend to attract attention as do bright, vivid colors.

There are three basic color schemes for mixing flower colors. A monochromatic color scheme consists of different tints and shades of one color on the color wheel. It includes the entire range of the color and is seldom achieved in its pure form in the landscape. An example of an incomplete monochromatic color scheme would include white and pink flowers with a background of dark pink.

Analogous color schemes combine colors which are adjacent or side-by-side on the color wheel. An analogous color scheme could include red, orange red, red orange, orange and yellow orange. This color scheme could be achieved by using orange red zinnias or gerbera daisies against a red brick house.

Complementary color scheme combine colors directly across the color wheel. For example, orange and blue would be complementary colors. A complementary color scheme may be achieved by combining orange calendulas with blue pansies.

Table 2. Susceptibility of some annual ornamental plants to root-knot nematodes in central Florida.*

Common Name	Scientific Name	Rating	Number of Tests
<u>Not Infested, No Galls Found</u>			
Marigold, African	<i>Tagetes</i> sp.	0	2
Marigold, French	<i>Tagetes</i> sp.	0	1
Coreopsis	<i>Coreopsis lanceolata</i>	0	2
Argemone	<i>Argemone</i> sp.	0	1
Rudbeckia	<i>Rudbeckia</i> sp.	0	1
Ageratum	<i>Ageratum</i> sp.	0	1
Evening Primrose	<i>Oenothera lamarckiana</i>	0	1
Gaillardia	<i>Gaillardia</i> sp.	0	2
<u>Very Lightly Infested, with One of Few Scattered Galls</u>			
Michaelmas Daisy	<i>Aster tradescanti</i>	1	2
Lupine	<i>Lupine</i> sp.	1	1
Calliopsis	<i>Coreopsis tinctoris</i>	4	3
Four-O'clock	<i>Mirabilis jalapa</i>	4	3
Cosmos	<i>Cosmos bipinnatus</i>	4	3
Zinnia, Small	<i>Zinnia elegans</i>	5	3
Zinnia, Giant	<i>Zinnia elegans</i>	11	1
Sweet Alyssum	<i>Lobularia maritima</i>	7	3
Torenia, blue	<i>Torenia fournieri</i>	17	2
Torenia, white	<i>Torenia</i> sp.	17	1
Thunbergia	<i>Thunbergia</i> sp.	22	1
Blue sage	<i>Salvia farinacea</i>	10	1
Scarlet sage	<i>Salvia splendens</i>	20	1
Arctotis	<i>Arctotis stoechadifolia</i>	14	3
Phlox, Big Drummond	<i>Phlox drummondii</i>	19	4
Phlox, Dwarf	<i>Phlox nana compacta</i>	31	1
Phlox, Starred	<i>Phlox drummondii stellaris</i>	26	1
Statice	<i>Limonium sinatum</i>	18	1
Globe Amaranth	<i>Gomphrena globosa</i>	25	1
Gerbera Daisy	<i>Gerbera jamesonii</i>	24	2
Vinca, Periwinkle	<i>Catharanthus roseus</i>	30	2
Stock	<i>Matthiola</i> sp.	31	2
Leptosyne	<i>Coreopsis</i> sp.	29	1
<u>Lightly Infested, with a Number of Small Galls</u>			
Godetia	<i>Godetia</i> sp.	36	2
China Aster	<i>Callistephus chinensis</i>	38	2
Pentstemon	<i>Pentstemon</i> sp.	38	1
Dianthus	<i>Dianthus</i> sp.	45	2
Portulaca	<i>Portulaca</i> sp.	40	2
Verbena	<i>Verbena</i> sp.	27	3
Lantern Groundcherry	<i>Physalis francheti</i>	40	1
Perennial Sweet Pea	<i>Lathyrus latifolius</i>	42	1
Liatris spicata	<i>Liatris spicata</i>	44	1
Clarkia	<i>Clarkia</i> sp.	23	2
Shasta Daisy	<i>Chrysanthemum maximum</i>	48	2
Candytuft	<i>Iberis umbellata</i>	46	2
Mignonette	<i>Reseda odorata</i>	50	1
Cypress Vine	<i>Quamoclit pennata</i>	50	1
Artemisia	<i>Artemisia sacrorum viride</i>	50	1
Petunia	<i>Petunia hybrida</i>	52	3
<u>Moderately Infested, with Galls More Numerous or Larger</u>			
Acroclinium	<i>Helipterum roseum</i>	55	2
Linaria	<i>Linaria</i> sp.	56	2
Poppy	<i>Papaver</i> sp.	56	1
Moonflower	<i>Calonyction</i> sp.	58	2
Perennial Chrysanthemum	<i>Chrysanthemum</i> sp.	59	1
Nicotiana	<i>Nicotiana alata</i>	59	1
Hunnemannia	<i>Hunnemannia fumariaefolia</i>	60	1
Annual Chrysanthemum	<i>Chrysanthemum coronarium</i>	65	1
Dimorphotheca	<i>Dimorphotheca aurantiaca</i>	66	2
English Daisy	<i>Bellis perennis</i>	67	1
Scarlet Climber or Cardinal Climber	<i>Quamoclit sloteri</i>	71	2

*(Goff, C. C. 1936. Relative Susceptibility of Some Annual Ornamentals to Root Knot. Univ. of Fla. Agr. Expt. Stn. Bull. 291). Plants were rated based on average gall ratings from all tests in which that plant species was included, on a scale from 0 (no galls) to 100 (all roots heavily galled).

Table 2. (Continued) Susceptibility of some annual ornamental plants to root-knot nematodes in central Florida.*

Common Name	Scientific Name	Rating	Number of Tests
California Poppy	<i>Eschscholtzia californica</i>	71	2
Heavily Infested, with Galls More Numerous or Larger			
Coleus	<i>Coleus</i> sp.	71	2
Columbine	<i>Aquilegia</i> sp.	74	1
Sunflower	<i>Helianthus annuus</i>	73	3
Chinese Forget-me-not	<i>Cynoglossum</i> sp.	73	3
Baby's Breath	<i>Gypsophila</i> sp.	77	2
Gilia	<i>Gilia</i> sp.	77	1
Matricaria	<i>Matricaria</i> sp.	80	1
Nasturtium	<i>Tropaeolum</i> sp.	85	2
Snapdragon	<i>Antirrhinum majus</i>	84	2
Hollyhock	<i>Althea rosea</i>	82	1
Salpiglossis	<i>Salpiglossis sinuata</i>	84	1
Pansy	<i>Viola tricolor</i>	87	2
Centaurea	<i>Centaurea cyanus</i>	90	3
Very Heavily Infested, Practically All Roots with Many Large Galls			
Butterfly Flower	<i>Schizanthus</i> sp.	87	1
Morning Glory	<i>Ipomoea</i> sp.	91	2
Larkspur	<i>Delphinium</i> sp.	90	1
Lobelia	<i>Lobelia erinus</i>	94	3
Helichrysum	<i>Helichrysum</i> sp.	96	2
Amaranthus	<i>Amaranthus</i> sp.	93	1
Calendula	<i>Calendula officinalis</i>	93	2
Calendula, Radio	<i>Calendula officinalis</i>	87	1
Balsam (Impatiens)	<i>Impatiens balsamina</i>	100	1
Blue Lace Flower (Didiscus)	<i>Trachymene caerulea</i>	73	3
Annual Sweet Pea	<i>Lathyrus odoratus</i>	96	2
Celosia	<i>Celosia argentea</i>	99	2
Dolichos	<i>Dolichos</i> sp.	100	1
Gourd	<i>Cucurbita</i> sp.	100	1

*(Goff, C. C. 1936. Relative Susceptibility of Some Annual Ornamentals to Root Knot. Univ. of Fla. Agr. Expt. Stn. Bull. 291). Plants were rated based on average gall ratings from all tests in which that plant species was included, on a scale from 0 (no galls) to 100 (all roots heavily galled).

Colors can be used to visually change distance perspective. Warm colors and light tints like red, orange, and yellow advance an object or area toward the observer. These colors and tints placed near the foundation of a house would make the house appear closer to the street. Cool colors and deep shades like blue and green recede and can be used to make the house appear farther from the street. Cool colors are restful while warm colors express action and are best used in filtered light or against a green or dark background.

Another characteristic to take into consideration when selecting bedding plants is flower form. Most bedding plant flowers can be classified as either spike form or round form. Examples of bedding plants with spike form flowers include salvia, snapdragon, and plume type celosia. Bedding plants with round form flowers far exceeds those with spike flowers and include such favorites as petunias, pansies, marigolds, begonias and impatiens. Bedding plants with spike flowers have very strong vertical lines and should be used sparingly to accent bedding plants with round form flowers.

Flower beds should be prepared before plants are purchased. Allowing plants to remain in their original containers for prolonged periods after purchase can have a negative effect on their performance after planting. Purchase plants when you're ready and plant them as soon as possible, preferably within twenty-four hours.

After beds are prepared and the kinds and quantity of bedding plants to be planted are determined, purchase good

quality plants. Look for young, healthy, disease- and insect-free plants with dark green foliage. It is not necessary that plants are in bloom when purchased. If plants are reduced-in-price and have been subjected to water stress, are tall and spindly, or have nutrient deficiency symptoms, they are certainly not a bargain and should not be purchased. Plants that have been improperly maintained or held too long seldom recover, and if they do, they will never reach their full potential. This is true especially with celosias, marigolds, pansies, salvias, snapdragons and zinnias.

Bedding plants can be purchased in compartmentalized plastic flats (cell packs) or in larger containers such as 4-inch pots. The plants grown in 4-inch pots are usually more expensive, but they are larger and therefore will produce more flowers sooner than plants grown in cell packs. As a result, beds established with plants grown in 4-inch pots are attractive sooner and for a longer period of the growing season than beds planted with plants grown in cell packs. Another advantage of planting plants grown in 4-inch pots is that because they are larger than cell pack plants, they will cover the bed sooner and help to control weeds.

Seasonal adaptation should be considered when purchasing bedding plants. Cool-season plants such as snapdragons and pansies that do well during winter are poor selections when purchased in Mar. or Apr.

Selection of bedding plants should be greatly influenced by the available light in an area. Some plants, such as marigold and ageratum, perform best in full sun. Others, such as coleus and dahlia, grow best in areas receiving several hours of morning or afternoon sun. There are no flowering plants that will perform well under heavy shade. However, plants such as crossandra and tuberous begonia grow best in areas receiving no direct sunlight.

Florida residents living within close proximity to beach-front areas need to select bedding plants that are more tolerant of high winds, salt spray and irrigation water containing high levels of salt. Unfortunately, there is limited information on the tolerance of many bedding plants to these harsh growing conditions. However, some have been tested on a beach-front area in Florida and the results are presented in Table 3 (Tjia & Rose, 1987).

Planting and Care

Bedding plants purchased in compartmentalized plastic flats may have pot-bound root systems. If planted intact, the

Table 3. Salt tolerance of selected bedding plants.

<u>Good Salt Tolerance</u>	
Begonia	Lisianthus
Calendula	Mint
Dusty Miller	Petunia
Gaillardia	Snapdragon
Gazania	Statice
Geranium	Strobilanthus
Gerbera	Vinca
Kale (Ornamental)	Zinnia
<u>Poor Salt Tolerance</u>	
Cleome	Pansy
Coleus	Red Salvia
Godetia	Torenia
Impatiens	Verbena

root system will be slow to establish in the surrounding soil and plants will suffer moisture stress. A preferred method is to loosen and untangle the root system without breaking the soil ball. Plants will usually recover rapidly and become established quickly. Tall and spindly plants should be pruned to half their original size to produce more attractive plants with more flowers. Spacing of plants in a bed should be based on the mature size of a particular plant.

Bedding plants should be watered immediately after planting and daily until they have become established. After establishment, they should be watered on an "as needed" basis. Wilting will reduce flowering on many bedding plants and should not be allowed to happen. The frequency of irrigation will depend on soil type, exposure to sunlight, kind of bedding plant and season of the year. Some bedding plants growing in full sun during the summer may continue to require daily watering.

Water applied by an overhead sprinkler system can destroy the beauty of a flower bed by causing the flowers to rot or deteriorate rapidly. Bedding plants vary in their sensitivity to damage by overhead irrigation. Geraniums, celosias, marigolds, gerberas, verbenas, petunias, phlox, portulacas, cannas, snapdragons, strawflowers and pentas are very sensitive to damage by overhead irrigation, while begonias, pansies, coleus, caladiums, impatiens and New Guinea impatiens are tolerant to damage by overhead irrigation. Bedding plants should be watered by hand using a hose with a breaker attached or with a microirrigation system where only the soil and the root systems of the plants are wetted and flowers are not disturbed by splashing water from the irrigation system.

Weeds can be controlled either by mulching, applying preemergence herbicides and/or hand weeding. Mulches suppress weeds when the mulch material itself is weed-free and applied deeply enough to prevent weed germination or smother existing smaller weeds. The amount of mulch to apply will depend on the texture and density of the mulch. Compost and many wood and bark mulches are composed of fine particles and should not be applied any deeper than 2-3 inches (after settling). Excessive amounts of these fine-textured mulches around shallow-rooted plants can suffocate their roots causing chlorosis and poor growth. Mulches composed solely of shredded leaves, small leaves (oak leaves) or grass clippings should never exceed a 2-inch depth. These materials have flat surfaces, and tend to mat together restricting water and air to plant roots. Mulching materials should not come in contact with plant stems. The high moisture environment created by mulch increases the chances of stem rot which can result in plant death.

Preemergence herbicides can be very effective in managing weeds in bedding plants. In most cases, they should be applied after transplanting bedding plants to weed-free beds. Preemergence herbicides act by inhibiting the normal root development of small weeds before they emerge from the soil. In some cases, bedding plants species are tolerant of the herbicide, but more often, selectivity and safety are attained by placement. Because most weed seeds germinate within the upper half inch of soil, surface herbicide applications control them without injury to the bedding plant, which has roots normally growing well below the treated zone.

A weed management program for bedding plants based on the use of preemergence herbicides is complicated by the diversity of plants usually growing in the same bed. The herbicide may be safe to use on one species in a bed, but can

cause severe damage to other species in the same bed. The matter can become even more complicated because cultivars of the same species can respond quite differently to the same herbicide. In order to reduce the chances of damage, always check the label of an herbicide to see if it is registered for use on the plant species growing in a bed. If a species does not appear on the herbicide label, it is illegal to use the herbicide on that species even though the applicator assumes all risks and liabilities.

Hand weeding can be a very effective component of a weed management program. It should be considered when managing weeds in a few small beds or when herbicides cannot be used. Hand weeding is also a good option when herbicides are not effective in controlling all the weeds in a bed. Cultivation by hoeing and tilling is also effective in controlling small annual weeds. However, cultivation can stimulate the germination of weed seeds and reduce the effectiveness of herbicides by disrupting the contact of the herbicide with germinating weed seedlings.

Another approach to the culture of bedding plants in Florida is to grow them in pots. In areas where the soil is very poor or where tree roots limit growth, it is easier to plant small plants into inexpensive plastic pots filled with good soil and place the pots into flower beds. Sink pots into the soil until the top surface of the pots is at soil level. In addition to growing bedding plants where normally they will not grow, growing annuals in pots eliminates nematode problems, reduces water and fertilizer usage, and allows for easy replacement of plants in the flower bed.

Pests and Diseases

Bedding plants may have insect and disease problems. To maintain healthy and attractive plants, these problems must be recognized and control measures initiated.

The best method of reducing insect and/or disease problems is to keep the plants growing vigorously and free from stress. Cultural practices that should help to reduce insect and disease problems are as follows:

- (1) Plant cool season bedding plants in the fall, winter and early spring and warm season bedding plants in the spring and summer months;
- (2) Select a planting site which provides desirable growing conditions for a particular bedding plant;
- (3) Avoid planting in corners where light intensity and air circulation are minimal;
- (4) Keep plants growing vigorously by following a regular fertilization and irrigation schedule;
- (5) Avoid frequent wilting since water-stressed plants are more susceptible to infestation by thrips and red spider mites;
- (6) Remove spent flowers that do not naturally fall from plants such as marigold, salvia, snapdragon and geranium;
- (7) Prevent pathogenic fungal spores from germinating by keeping water off plants as much as possible and providing good air circulation around plants by allowing ample space between plants at planting; and
- (8) Remove weeds from flower beds since they are frequently host to insects and/or disease organisms.

Bedding plants should be monitored frequently for insects and diseases. Infestations detected in the early stages can be controlled by spot treatment before the entire flower bed

is infested. An insect infestation on a few plants can be controlled by picking insects off by hand or in the case of disease, by removing infected leaves. For severe infestations, chemical control will be needed. Contact your local county extension office for recommendations on selection and application of pesticides.

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EVALUATION OF MARIGOLD CULTIVARS FOR THE LANDSCAPE IN WEST-CENTRAL FLORIDA

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Abstract. Marigold cultivars were evaluated for number of days to flower, flower size, flower color, foliar characteristics, plant dimensions and appearance during two seasons, spring and fall 1996. **Spring:** Days from sowing to first flower among 93 cultivars ranged from 39.3 days for 'Little Hero Fire' to 71.5 days for 'First Lady'. Flower size ranged from 1.5 inches for 'Harmony Boy' to 3.1 inches for 'Marvel Gold'. Plant height at 90-91 days after sowing ranged from 6.4 inches for 'Little Devil Fire' to 14.4 inches for 'Gold Lady'. Subjective ratings showed cultivars varied more in appearance later in the season than earlier. **Fall:** Days from sowing to first flower among 95 cultivars ranged from 38.8 days for 'Disco Queen' to 69.8 days for 'Primrose Lady'. Flower size ranged from 1.6 inches for 'Golden Boy' to 3.3 inches for 'Marvel Primrose'. Plant height at 81-87 days after sowing ranged from 9.4 inches for 'All Season Discovery Orange' to 17.0 inches for 'Gold Lady'. Subjective ratings showed greater differences in overall appearance among the cultivars later in the season.

The wholesale value of bedding plants produced in Florida was \$106.9 million in 1996 from growers with sales of products exceeding \$100,000 which made Florida the fourth largest producer behind California, Michigan and Texas (Fla. Agr. Stat. Serv., 1997). Details of the kinds of products sold, quantities produced, and value of the commodities have been quantified in federal economic reports for only a few select species (USDA, 1997), so it is difficult to quantify Florida's prominence in marigold bedding plant production. Even so, marigold is an integral part of the product mix from bedding

plant growers nationwide (Behe and Walker, 1996). Seventy-one percent of respondents to a Professional Plant Growers Assn. bedding plant survey reported that marigold was a part of their production as were impatiens (70%), petunia (72%), dianthus (70%) and salvia (70%).

Gardeners usually find two species of marigolds on the nursery shelf, *Tagetes erecta* and *Tagetes patula*. While the common names African (*T. erecta*) and French (*T. patula*) imply a place of origin, these species do not originate in Africa or France. Both species are native to the Americas from Argentina to New Mexico. Popularized in the United States beginning in 1915 by David Burpee, marigolds have assumed a prominent and enduring place in the garden and landscape industry.

African marigolds, also called American marigolds, are characterized by semi-double or fully double flowers sometimes referred to as "carnation". Available with orange, gold, primrose, yellow and white flowers, there are no bicolors or red hues. French marigolds have several flower forms, the most common ones being single, crested, anemone (broad petal), and carnation (fully double). French marigolds are available as solid colors or bicolor flowers in gold, yellow, orange, primrose and mahogany red.

The last comprehensive evaluation of marigold cultivars in Florida was completed in 1989 (Howe and Waters, 1990) and many cultivars have been released to the industry in more recent years. In view of the development and release of many new cultivars since 1989, two extensive field trials of marigold were conducted at the Gulf Coast Research & Education Center in Bradenton, FL during the spring and fall of 1996. Orange, yellow, gold, red, primrose, bicolors and novelty floral colors of African and French types were selected in order to survey 19 major series and several stand-alone cultivars currently available to the industry. The entries were evaluated for earliness of flowering, flower diameter, flower color, plant dimensions and habit, flower coverage, foliage appearance and plant uniformity.

Materials and Methods

Transplant Production—Seeds of marigold cultivars were sown by a hand into germination flats filled with 1 peat:1 ver-