

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.

Literature Cited

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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-

miculite medium (v:v), amended with dolomite, superphosphate and hydrated lime on 1-2 February 1996 and 19 August 1996 for the spring and fall trials, respectively. Seeds were germinated in the laboratory. Seedlings were transferred one week after sowing to 1.5 × 1.5 × 1.5-inch containerized cells (128-cell flats) filled with the same medium. Plugs were grown without plant growth regulators and fertilized with 20-4.4-16.6 or 14-0-11.6 (N-P-K) as necessary.

Field Preparation—Beds of Eau Gallie fine sand were formed to a width of 32 inches on 5 ft centers under full sun. Slow release fertilizer at 83 lb/1000 sq ft Nutricote™ 14-6.1-16.6 (N-P-K) with a 180 day release profile was applied over the entire bed surface and incorporated to a depth of 3-4 inches. Beds were fumigated with 67% methyl bromide: 33% chloropicrin at 350 lb/A and covered with white on black polyethylene film mulch. The area was irrigated by subsurface seepage via two ditches parallel to the beds spaced 42 feet apart. Ninety-three entries in the spring and 95 cultivars in the fall were set into beds on 12-inch centers in three rows across the bed on 5 March 1996 and 19 September 1996, respectively. Four replications of six plants per cultivar were arranged in a randomized complete block design. Marigold cultivars, characteristics and sources are listed in Table 1.

Data Collection—Cultivars were evaluated for number of days to flower, flower size and color, foliar characteristics, plant dimensions and habit. Subjective ratings were assigned using a 0 to 10 scale (where 10 was excellent) to assess plant uniformity, floriferousness and foliage appearance. Data collection and rating dates are noted in Tables 2 and 3. Trials were terminated on 30 June 1996 and 31 December 1996, for spring and fall, respectively. Quantitative data were analyzed by analysis of variance and means separated by Tukey's studentized range test at the 5% level.

Results and Discussion

In the spring, daily temperatures were below the 42-year averages in March and April, but above normal during May (Stanley, 1995). On average, March was three degrees below normal, but temperatures were wildly erratic throughout the month. In one instance, from March 6 through March 10, three days of 83°F daytime high temperatures were followed by two nights with overnight lows at 33 and 34°F. Rainfall was well above average during March and May, (+2.05 and +6.66 inches, respectively), slightly below average in April (-0.25 inches).

In the fall, maximum daily temperatures were normal or slightly above normal, while minimum daily temperatures were within two degrees of normal for the whole season. Rainfall was well below normal during September and November, slightly below normal in December and higher than average during October.

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' (Table 2). Only nine cultivars were not significantly different from 'First Lady' in the number of days to flower and all but one of these were African marigolds. Eleven French cultivars were similar to 'Little Hero Fire' in earliness to flower and include four of the other six 'Little Hero' cultivars. Flower size ranged from 1.5 inches for 'Harmony Boy' to 3.1 inches for 'Marvel Gold'. Eighteen other cultivars were similar to 'Harmony Boy' in flower size, all of which were French crested or French single cultivars. Five African entries

Table 1. Seed source, flower type, and flower color of marigold cultivars in field beds during spring and fall of 1996.

Series/Cultivar	Source	Flower Type	Flower Color
All Season Discovery	Bodger	African	
Orange			orange
Yellow			yellow
American Indian	Grimes	African	orange
Orange			
Antigua	Goldsmith	African	
Orange			orange
Primrose			pale yellow
Yellow			yellow
Aurora	Waller	French Anemone	
Fire			mahogany with orange edge
Gold			orange-gold
Light Yellow			light yellow
Orange			dark orange
Red			mahogany with gold edge
Yellow Fire			yellow with mahogany base
Bonanza	PanAmerican	French Crested	
Bee			mahogany with gold border
Deep Orange			dark orange
Flame			mahogany with orange border
Gold			gold
Harmony			mahogany skirt with orange crest
Orange			orange
Spry			mahogany skirt with gold crest
Yellow			yellow
Bounty	Sakata America	French Crested	
Gold			gold
Orange			orange
Spry			mahogany skirt with gold crest
Yellow			yellow
Boy	PanAmerican	French Crested	
Golden			gold
Harmony			mahogany skirt with orange crest
Orange			orange
Spry			mahogany skirt with gold crest
Yellow			yellow
Disco	Bodger	French Single	
Flame			mahogany with gold border
Golden Yellow			gold
Marietta			gold with mahogany base
Orange			orange
Queen			mahogany with orange edge
Red			mahogany with orange center
Yellow			yellow
Experimental	Bodger	African	
Orange			orange
Yellow			yellow
Gate	PanAmerican	French Anemone	
Garden			mix
Golden			gold with mahogany base
Orange			orange
Yellow			yellow
Girl	Grimes	French Crested	
Harmony			mahogany with orange crest

Table 1. (Continued) Seed source, flower type, and flower color of marigold cultivars in field beds during spring and fall of 1996.

Series/Cultivar	Source	Flower Type	Flower Color
Orange Granada	PanAmerican	French Single	orange orange with mahogany base
Hero Flame	Bodger	French Crested	mahogany skirt with orange crest
Gold Harmony			bicolor to gold mahogany with orange crest
Orange Red			orange mahogany with orange splotches
Spry			mahogany with yellow crest
Yellow Jacket	PanAmerican	French Anemone	yellow
Orange Yellow			orange yellow
Janie	Waller	French Crested	yellow dark orange mahogany with orange edge
Bright Yellow			orange mahogany with orange crest
Deep Orange			light yellow mahogany skirt with gold crest
Flame			dark orange
Gold Harmony			orange mahogany with orange crest
Primrose Spry			light yellow mahogany skirt with gold crest
Tangerine Lady	PanAmerican	African	dark orange
First Gold			yellow gold orange light green yellow
Orange Primrose			
Little Devil Bicolor	Ball	French Crested	mahogany skirt with yellow crest
Fire Flame			gold with red base orange with mahogany base
Gold Harmony			gold mahogany with orange crest
Orange Spry			orange mahogany skirt with gold crest
Yellow Little Hero	Bodger	French Crested	dark yellow/gold
Fire Flame			gold with mahogany base mahogany with orange border
Gold Harmony			gold mahogany skirt with orange crest
Orange Spry			orange mahogany with gold crest
Yellow Marvel	PanAmerican	African	yellow
Gold Orange			gold orange primrose yellow
Primrose Yellow			
Red Cherry	PanAmerican	French Crested	dark mahogany with gold edge
Royal Crested Goldfinch	PanAmerican	French Crested	gold
Honeycomb			orange with mahogany base

Table 1. (Continued) Seed source, flower type, and flower color of marigold cultivars in field beds during spring and fall of 1996.

Series/Cultivar	Source	Flower Type	Flower Color
Mandarin Orange Mix			orange mix
Safari	Bodger	French Anemone	
Bolero			gold with mahogany splotch
Gold Orange Primrose Queen			gold orange light yellow mahogany with orange edge
Red Scarlet Tangerine Yellow			mahogany red mahogany dark orange yellow
Spice	PanAmerican	French Anemone	
Orange Saffron			orange yellow
Troubadour Yellow	Waller	French Anemone	yellow

were similar to 'Marvel Gold' in large flower size. Plant height at 90-91 days after sowing ranged from 6.4 inches for 'Little Devil Fire' to 14.4 inches for 'Gold Lady'. Twenty-six other cultivars were not as tall as 'Gold Lady', whereas 14 cultivars were as short as 'Little Devil Fire'. Plant width ranged from 11.6 inches for 'All Season Discovery Yellow' to 19.2 inches for 'Safari Tangerine'. More than half of the entries in trial were not significantly different from 'Safari Tangerine' in plant width, whereas 24 entries were similar to 'All Season Discovery Yellow'. Subjective ratings of plant uniformity, floriferousness, lodging, and overall appearance showed cultivars varied from each other more later in the season than earlier. Flowering later in the season diminished and by 7 June ratings ranged from 4.8 for 'Disco Marietta' to 9.9 for 'Bounty Spry' and 'Janie Flame'. Eleven other cultivars were similar to 'Disco Marietta' in sparsity of flowering on 7 June.

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' (Table 3). Fifteen other cultivars, all but three of which were African types, were as late to flower as 'Primrose Lady'. Twenty-five French cultivars were similar in earliness to 'Disco Queen'. Flower size ranged from 1.6 inches for 'Golden Boy' to 3.3 inches for 'Marvel Primrose'. Only six cultivars, all African, were similar to 'Marvel Primrose' in flower size, whereas 32 French cultivars were similar in flower size to 'Golden Boy'. The 32 cultivars similar to 'Orange Boy' included all other 'Boy' cultivars and all 'Little Devil' cultivars. 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', while 20 cultivars were similar to 'All Season Discovery Orange', including all other 'Little Hero', 'Antigua', and 'All Season Discovery' cultivars. Heights could not be grouped by species, so the adage of 15 to 20 years ago that generally "African marigolds are tall and French marigolds are short", is not valid today (Anon., 1982). Subjective ratings showed greater differences among the cultivars in overall appearance later in the season.

Table 2. Description, growth, and performance of marigold cultivars in field beds during spring 1996.

Series/Cultivar	Days to First ^a Flower	Flower Size ^b (in.)	Plant Height ^c (in.)	Plant Width ^c (in.)	Plant Uniformity ^d Rating	Flowering ^{e,f} Rating	Lodging ^g Rating	Overall ^h Rating
All Season Discovery								
Orange	67.0 ^a	2.8	7.9	12.2	9.4/8.9	10.0/9.1	10.0/9.8	9.5/8.5
Yellow	69.0	2.7	8.0	11.6	9.8/9.4	10.0/9.5	10.0/10.0	9.8/8.9
Antigua								
Orange	64.5	2.8	8.8	13.6	9.0/8.7	10.0/9.3	10.0/9.8	9.1/8.4
Primrose	66.5	2.9	8.9	13.5	9.8/9.1	10.0/8.8	10.0/9.5	9.4/7.9
Yellow	66.5	2.6	7.9	12.5	9.5/9.4	10.0/8.6	10.0/10.0	9.6/8.5
Aurora								
Fire	51.5	2.0	11.8	17.0	9.1/8.9	10.0/9.4	10.0/8.5	9.3/8.1
Gold	50.0	2.1	11.3	16.9	9.4/9.2	9.8/9.3	10.0/8.1	9.4/8.5
Light Yellow	53.3	2.0	11.4	17.5	9.4/9.4	9.9/9.2	10.0/8.6	9.5/9.1
Orange	52.0	2.2	9.9	16.8	9.6/8.3	10.0/8.8	10.0/8.0	9.8/7.5
Red	55.3	2.0	10.6	16.1	8.9/8.4	10.0/9.5	10.0/7.5	8.9/7.8
Yellow Fire	70.3	2.2	10.3	13.3	9.4/9.5	9.9/9.1	10.0/9.8	9.0/9.1
Bonanza								
Bee Improved	45.5	2.0	10.2	17.2	10.0/9.9	9.9/9.9	10.0/8.8	9.9/9.3
Deep Orange	47.0	1.9	10.8	16.2	9.5/8.6	10.0/9.0	10.0/9.6	9.5/8.6
Flame	42.5	2.2	10.1	15.0	9.6/9.3	10.0/9.5	10.0/9.0	9.8/9.3
Gold Improved	49.0	2.1	12.3	16.8	9.5/9.0	9.8/8.9	10.0/8.3	9.5/8.5
Harmony	42.3	1.8	12.0	17.7	9.6/9.1	10.0/9.6	10.0/8.5	9.6/9.0
Orange	51.3	2.2	11.8	16.9	9.8/9.4	9.9/9.3	10.0/8.5	9.8/8.9
Spry	43.3	1.8	12.1	17.7	9.4/9.0	9.6/8.6	10.0/8.1	9.4/7.5
Yellow Improved	48.3	2.0	11.2	16.9	9.4/9.8	9.3/8.4	10.0/8.3	9.0/8.3
Bounty								
Gold	47.3	1.9	8.7	14.1	10.0/9.5	10.0/9.4	10.0/10.0	10.0/9.6
Orange	47.0	1.9	9.1	15.5	9.5/9.3	10.0/9.5	10.0/8.8	9.6/8.5
Spry	46.5	1.7	8.9	14.2	9.6/9.5	10.0/9.1	10.0/8.5	9.8/8.4
Yellow	53.3	1.9	10.8	16.3	9.6/9.5	10.0/9.9	10.0/9.3	9.6/9.4
Boy								
Golden	54.8	1.6	11.7	15.8	9.9/10.0	10.0/8.5	10.0/9.6	9.9/8.9
Harmony	48.0	1.5	10.6	16.7	10.0/9.3	10.0/9.3	10.0/7.5	10.0/7.9
Orange	51.0	1.7	11.2	17.9	10.0/9.8	9.6/9.4	10.0/8.4	9.6/9.0
Spry	49.5	1.6	10.5	16.9	9.8/9.5	10.0/9.8	10.0/8.8	9.8/8.9
Yellow	49.3	1.7	10.7	16.8	9.8/9.0	10.0/9.4	10.0/8.8	9.9/8.5
Disco								
Flame	46.0	1.7	9.8	14.8	9.4/8.9	9.6/9.5	10.0/9.8	8.0/7.0
Golden Yellow	47.8	2.0	11.6	17.2	9.9/8.9	10.0/8.3	10.0/9.9	9.9/8.4
Marietta	50.3	1.7	10.9	16.6	10.0/9.9	9.1/4.8	10.0/10.0	9.0/6.1
Orange	50.8	2.0	13.1	18.5	9.0/9.0	9.0/7.8	10.0/7.8	8.6/7.1
Queen	39.5	1.6	8.7	15.6	9.4/8.8	9.0/7.6	10.0/8.8	8.3/2.3
Red	50.3	1.8	12.0	17.5	8.8/8.9	9.4/8.3	10.0/7.8	8.8/7.6
Yellow	50.3	2.1	11.7	18.3	9.6/9.4	10.0/8.9	10.0/9.3	9.1/8.6
Experimental								
Orange	64.3	3.0	10.5	14.3	9.0/7.8	10.0/9.3	10.0/8.8	9.0/7.8
Yellow	67.5	2.8	11.0	14.5	8.5/8.3	10.0/9.0	10.0/8.3	8.8/8.0
Gate								
Garden	49.5	2.2	12.1	17.0	9.1/9.3	10.0/9.0	10.0/8.5	9.4/8.6
Golden	48.5	2.3	11.4	17.0	9.6/9.3	9.9/9.5	10.0/8.8	9.6/9.0
Orange	48.3	2.2	11.0	15.6	9.0/8.5	10.0/9.1	10.0/9.1	9.3/8.6
Yellow	54.5	2.2	11.5	17.6	8.8/8.4	9.8/7.4	9.5/9.5	8.8/7.5
Granada	54.8	1.9	11.4	16.4	8.8/8.6	9.9/8.0	10.0/9.0	8.9/7.6
Hero								
Flame	52.3	2.2	12.5	17.7	9.8/8.9	9.9/9.8	10.0/7.4	9.6/7.9
Gold	46.0	2.1	10.6	16.9	8.6/8.5	9.9/9.3	10.0/9.5	8.9/8.1
Harmony	49.5	2.3	10.5	15.4	9.4/9.0	10.0/8.8	10.0/7.8	9.5/8.0
Orange	49.3	2.1	11.0	16.1	9.1/8.8	10.0/8.9	10.0/8.5	9.4/8.4
Red	49.3	2.1	12.4	16.8	9.6/8.3	9.8/9.6	10.0/8.0	9.5/7.6
Spry	49.0	2.0	12.1	18.7	9.5/9.4	9.8/9.4	10.0/8.3	9.3/8.0
Yellow	47.3	2.1	11.5	18.0	9.4/9.3	9.8/9.2	10.0/9.3	9.4/8.8
Jacket								
Orange	47.5	1.9	11.3	17.2	9.9/9.6	10.0/9.5	10.0/9.1	9.9/9.3
Yellow	52.0	1.8	13.1	18.5	9.5/9.1	9.9/8.8	10.0/7.8	9.0/7.3
Janie								
Bright Yellow	47.5	1.6	8.5	13.6	9.6/9.3	10.0/9.6	10.0/9.8	9.6/9.4

^aFrom sowing 1 February 1996.^bFlowers measured 16-22 April 1996. Plant dimensions measured 1-3 May 1996.^cRating scale: 10 = excellent, 9 = superior, 8 = very good, 7 = good, 6 = fair, 5 = borderline acceptability, 1 = very poor, 0 = all dead. First rating each column 7 May and second rating each column 7 June 1996.^dFlower density and distribution.^eInclusive rating for appearance and vigor.^fMean separation by Tukey's studentized range test, HSD 5% level.

Table 2. (Continued) Description, growth, and performance of marigold cultivars in field beds during spring 1996.

Series/Cultivar	Days to First ^c Flower	Flower Size ^c (in.)	Plant Height ^c (in.)	Plant Width ^c (in.)	Plant Uniformity ^a Rating	Flowering ^{a,c} Rating	Lodging ^a Rating	Overall ^a Rating
Deep Orange	46.8	2.0	10.0	15.1	8.5/8.5	10.0/8.9	9.8/8.5	9.0/7.8
Flame	48.8	1.9	10.2	15.6	9.9/9.3	10.0/9.9	10.0/9.1	9.9/9.3
Gold	43.5	1.6	8.8	14.2	9.5/9.1	10.0/9.3	10.0/9.5	9.6/9.1
Harmony	47.8	1.9	9.7	14.9	10.0/9.1	10.0/9.6	10.0/9.1	10.0/8.4
Primrose	51.3	1.8	9.8	16.1	9.9/9.9	10.0/9.6	10.0/10.0	9.9/9.9
Spry	44.8	1.8	8.3	13.7	9.9/9.0	10.0/8.6	10.0/9.4	9.9/8.1
Tangerine	50.0	1.9	9.3	14.6	9.0/8.6	9.9/9.4	10.0/8.3	9.1/7.9
Lady								
First	71.5	2.5	13.9	15.4	8.8/8.1	9.9/9.4	10.0/8.3	8.9/7.6
Gold	71.0	2.8	14.4	16.4	9.4/8.3	10.0/9.1	9.5/6.8	9.3/7.3
Orange	66.0	2.7	12.4	15.4	9.6/9.0	10.0/9.1	10.0/8.8	9.6/8.4
Primrose	70.0	2.6	13.7	15.8	9.3/8.0	9.0/8.9	10.0/7.8	8.9/7.0
Little Devil								
Fire	44.3	1.8	6.4	11.7	9.4/8.6	10.0/8.9	10.0/9.8	9.0/8.5
Orange	40.5	1.7	9.2	15.4	9.5/8.5	10.0/9.3	10.0/9.1	9.6/8.9
Yellow	42.3	1.6	8.9	15.4	9.8/8.1	10.0/9.1	10.0/8.5	9.8/7.5
Little Hero								
Fire	39.3	1.8	7.9	13.6	9.5/9.1	10.0/9.3	10.0/9.8	9.5/8.8
Flame	41.8	1.9	7.2	12.8	9.8/9.7	10.0/9.4	10.0/10.0	9.9/9.4
Gold	42.5	1.8	8.3	13.9	9.1/9.1	10.0/9.0	10.0/9.9	9.3/9.3
Harmony	42.0	1.8	7.2	13.0	9.3/9.0	10.0/9.5	10.0/9.8	9.3/8.6
Orange	43.3	2.0	7.6	13.2	9.3/9.0	10.0/9.5	10.0/8.8	9.4/8.9
Spry	49.0	1.9	8.9	14.5	7.8/8.0	9.9/8.6	10.0/8.8	7.8/7.6
Yellow	44.8	1.9	8.9	14.2	9.4/9.4	10.0/9.8	10.0/9.8	9.5/9.6
Marvel								
Gold	70.0	3.1	13.9	15.7	8.6/7.1	9.8/8.9	10.0/7.5	8.8/6.6
Orange	68.8	3.0	13.1	16.5	9.3/8.4	9.6/9.0	10.0/8.5	9.1/8.3
Yellow	71.0	2.9	12.9	15.2	9.1/7.9	9.6/8.9	10.0/7.8	8.9/7.1
Red Cherry	49.5	2.0	13.0	17.9	9.4/9.0	9.6/9.0	9.5/7.5	9.1/8.0
Royal Crested								
Goldfinch	53.3	2.0	12.9	16.7	9.8/9.5	9.3/7.4	10.0/9.0	9.3/7.8
Honeycomb	56.5	1.9	13.2	17.1	9.4/8.8	9.8/8.9	10.0/8.3	9.1/8.0
Mandarin Orange	51.0	1.6	12.6	17.7	9.5/8.9	9.1/7.8	9.8/7.5	8.6/7.4
Mix	54.0	1.9	12.9	17.2	9.5/8.8	9.3/7.0	10.0/7.5	9.0/7.1
Safari								
Bolero	45.5	2.3	10.8	16.6	9.9/9.2	10.0/9.6	10.0/9.0	9.9/9.0
Gold	55.3	2.3	11.5	16.8	9.1/8.8	9.4/8.3	10.0/8.8	9.0/7.9
Orange	55.0	2.5	13.4	18.6	9.6/9.4	9.9/8.9	10.0/7.8	9.6/8.4
Primrose	50.1	2.2	12.6	18.1	8.9/9.1	9.1/8.3	9.8/8.8	8.5/7.5
Queen	51.3	2.2	12.2	16.3	8.8/8.2	9.8/9.1	10.0/8.4	8.8/8.0
Red	51.0	2.1	11.7	16.5	10.0/9.1	9.9/9.4	10.0/8.6	9.8/8.1
Scarlet	51.3	2.2	13.3	18.2	9.3/9.1	9.9/8.9	10.0/8.0	9.4/7.8
Tangerine	50.3	2.3	13.5	19.2	9.9/9.3	10./9.4	9.5/6.8	9.6/7.5
Yellow	49.5	2.4	10.8	16.5	9.9/9.6	9.5/8.8	10.0/9.9	9.5/9.0
Spice								
Orange	53.0	2.1	10.3	15.2	9.4/9.1	10.0/8.6	10.0/9.5	9.4/8.6
Saffron	54.5	2.0	10.1	14.9	9.6/9.2	9.6/6.3	10.0/9.8	9.4/7.0
Troubadour Yellow	54.5	2.4	10.9	16.2	10.0/9.3	9.6/8.0	10.0/10.0	9.6/8.5
HSD 5%	4.6	0.3	2.4	3.2				

^aFrom sowing 1 February 1996.^bFlowers measured 16-22 April 1996. Plant dimensions measured 1-3 May 1996.^cRating scale: 10 = excellent, 9 = superior, 8 = very good, 7 = good, 6 = fair, 5 = borderline acceptability, 1 = very poor, 0 = all dead. First rating each column 7 May and second rating each column 7 June 1996.^dFlower density and distribution.^eInclusive rating for appearance and vigor.^fMean separation by Tukey's studentized range test, HSD 5% level.

Summary

Selection of marigold cultivars for landscape use from among those examined can be based on several criteria. Ignoring quantitative analysis, choice might be made on flower color, and plant habit alone. However, information about earliness to flower, flower size, mature plant size, floriferousness, plant uniformity, and foliage condition allow a more definitive selection.

The greatest differences between spring and fall flowering times were for 'All Season Discovery' (an average among the cultivars in the series being seven days later in the fall), 'Royal Crested' (on average ten days later in the fall), and 'Red Cherry' (13 days later in the fall). The rest of the series were no more than 3 days different in flowering time between spring and fall. Plant heights were greater in the fall than in the spring, even though measured 3 to 11 days closer to the sowing date. While absolute values for general appearance

Table 3. Description, growth, and performance of marigold cultivars in field beds during fall 1996.

Series/Cultivar	Days to ^a First Flower	Flower Size ^b (in.)	Plant Height ^c (in.)	Plant Width ^d (in.)	Plant Uniformity ^e Rating	Flowering ^{g,h} Rating	Lodging ⁱ Rating	Overall ^k Rating
All Season Discovery								
Orange	60.3 ^a	2.6	9.4	10.2	8.6	9.6	9.0	7.3/1.5
Yellow	62.0	2.7	11.1	11.8	8.9	10.0	9.3	8.1/1.8
American Indian Orange	63.0	3.0	10.4	12.6	8.8	9.6	7.5	6.9/2.5
Antigua								
Orange	63.0	2.9	11.2	13.2	8.8	9.6	9.5	7.8/3.5
Primrose	63.8	3.0	10.6	13.0	8.8	9.8	9.5	8.6/3.8
Yellow	60.8	3.0	10.6	13.3	9.3	9.9	9.3	8.9/3.5
Aurora								
Fire	57.8	2.1	14.2	17.4	9.6	10.0	10.0	9.4/3.8
Gold	50.8	2.1	12.1	16.6	9.8	10.0	9.3	9.5/3.8
Light Yellow	52.0	2.0	11.4	14.7	9.5	9.9	9.8	9.4/3.8
Orange	60.5	2.3	12.1	15.2	9.1	9.6	10.0	9.0/3.0
Red	61.5	2.1	12.5	15.8	9.1	10.0	10.0	9.5/3.3
Yellow Fire	63.8	2.2	11.3	12.7	9.4	9.9	10.0	9.4/2.8
Bonanza								
Bee	45.3	2.1	10.0	13.0	9.5	9.9	10.0	9.6/2.8
Flame	44.0	2.2	12.3	15.5	9.8	10.0	10.0	9.9/4.0
Gold	55.5	2.1	15.5	18.5	9.8	10.0	8.8	8.8/4.0
Harmony	42.5	2.1	15.3	19.6	9.4	10.0	9.0	8.9/5.5
Orange	49.8	2.0	14.0	17.9	9.3	10.0	9.5	9.0/5.5
Spry	43.8	2.0	15.3	20.1	9.4	10.0	7.8	7.9/4.8
Yellow	45.8	2.1	14.3	18.0	8.9	9.9	8.8	8.4/4.3
Bounty								
Gold	47.8	1.9	12.0	14.6	9.3	9.9	9.8	9.3/3.5
Orange	43.3	1.7	12.7	17.0	8.9	9.6	8.3	7.9/3.8
Spry	41.0	1.9	12.7	16.6	9.5	10.0	9.5	9.3/4.8
Yellow	50.8	1.9	13.7	16.0	9.6	10.0	10.0	9.8/5.3
Boy								
Golden	52.5	1.6	15.2	17.7	10.0	10.0	10.0	10.0/6.5
Harmony	51.8	1.7	13.6	17.2	9.9	9.8	10.0	9.8/4.8
Orange	58.5	1.7	13.3	16.3	9.3	10.0	9.5	9.0/5.0
Spry	56.3	1.7	14.7	17.0	9.5	10.0	10.0	9.5/4.5
Yellow	51.8	1.7	13.0	16.2	9.8	10.0	10.0	9.5/5.5
Disco								
Flame	44.5	1.9	12.5	15.8	9.1	9.1	10.0	8.6/3.0
Golden Yellow	44.3	2.2	16.7	19.5	9.5	9.6	9.8	9.4/3.8
Marietta	54.3	1.9	14.0	16.5	9.9	9.9	10.0	9.9/3.0
Orange	53.5	2.1	16.3	19.1	9.3	9.6	9.8	9.4/3.0
Queen	38.8	1.9	11.4	15.6	9.0	6.8	9.5	4.5/1.0
Red	44.8	1.9	15.0	19.2	9.5	9.8	9.8	9.1/3.0
Yellow	55.0	2.1	15.4	18.5	8.4	9.6	10.0	8.1/3.0
Gate								
Garden	53.5	2.2	13.8	17.5	9.3	9.5	9.5	8.4/3.0
Golden	48.8	2.3	15.2	18.5	9.5	10.0	9.3	9.0/4.5
Orange	57.3	2.4	14.3	16.5	9.3	10.0	8.8	8.8/3.8
Yellow	60.8	2.2	13.2	16.9	9.4	9.8	10.0	9.4/3.0
Girl								
Harmony	51.0	1.7	13.7	17.6	10.0	10.0	10.0	10.0/4.8
Orange	46.0	1.8	12.3	16.1	9.6	10.0	10.0	9.9/4.0
Granada	55.8	2.2	14.3	17.2	10.0	9.8	10.0	9.9/4.0
Hero								
Flame	53.0	2.0	15.1	18.5	10.0	10.0	9.0	9.3/4.3
Gold	54.0	2.0	14.2	17.1	9.9	10.0	10.0	9.8/2.5
Harmony	47.0	2.2	13.5	17.9	9.9	10.0	9.0	8.9/3.5
Orange	47.5	2.3	15.8	21.3	9.1	9.9	7.3	7.4/4.5
Red	50.8	1.9	12.9	14.8	9.4	10.0	9.5	7.3/3.0
Spry	42.0	2.1	15.4	19.7	8.9	9.9	8.8	8.4/4.3
Yellow	44.3	2.1	15.0	18.9	9.3	10.0	9.0	8.6/4.5
Janie								
Bright Yellow	49.3	1.8	10.4	13.6	9.6	9.6	10.0	9.6/3.8
Deep Orange	52.0	2.1	12.5	15.1	9.6	9.9	9.8	9.8/3.8
Flame	53.5	2.1	13.3	16.5	9.6	10.0	10.0	9.8/4.5
Gold	46.5	1.7	13.0	16.7	9.1	10.0	9.8	9.3/4.0

^aFrom sowing 19 August 1996.^bFlowers and plant dimensions measured 7-13 November 1996.^cRating scale: 10 = excellent, 9 = superior, 8 = very good, 7 = good, 6 = fair, 5 = borderline acceptability, 1 = very poor, 0 = all dead. First rating each column 8 November and second rating each column 31 December 1996.^dFlower density and distribution.^eInclusive rating for appearance and vigor.^fMean separation by Tukey's studentized range test, HSD 5% level.

Table 3. (Continued) Description, growth, and performance of marigold cultivars in field beds during fall 1996.

Series/Cultivar	Days to ^c First Flower	Flower Size ^e (in.)	Plant Height ^e (in.)	Plant Width ^e (in.)	Plant Uniformity ^a Rating	Flowering ^{a,b} Rating	Lodging ^d Rating	Overall ^a Rating
Harmony	49.0	2.0	13.0	15.7	9.8	10.0	10.0	9.9/4.0
Primrose	48.3	1.8	11.8	15.9	9.1	9.9	9.0	8.5/4.5
Spry	42.0	1.8	10.0	15.2	9.1	10.0	8.8	7.4/3.0
Tangerine	53.0	2.0	11.7	14.3	9.4	10.0	10.0	9.4/4.0
Lady								
First	68.5	2.8	15.7	17.7	9.6	10.0	9.3	9.3/1.5
Gold	69.3	2.9	17.0	17.1	9.1	10.0	8.5	8.4/1.5
Orange	69.0	2.9	15.8	16.6	8.4	9.8	9.5	7.9/2.8
Primrose	69.8	2.8	14.3	16.8	9.3	10.0	8.8	7.8/2.0
Little Devil								
Bicolor	44.3	1.7	11.1	13.9	9.0	10.0	10.0	9.1/3.8
Fire	45.8	1.9	9.9	13.1	9.3	10.0	10.0	9.0/4.0
Flame	50.3	1.8	11.5	15.0	9.6	10.0	10.0	9.6/3.5
Orange	43.5	1.8	12.5	17.5	9.6	9.9	10.0	9.9/3.5
Yellow	41.8	1.7	12.8	18.3	9.6	9.9	8.8	8.4/3.5
Little Hero								
Fire	40.0	2.0	10.2	16.6	9.4	9.9	9.0	8.6/3.5
Flame	41.3	2.0	11.5	16.0	8.9	10.0	10.0	9.0/3.5
Gold	42.0	1.9	10.9	15.5	9.1	9.9	9.3	8.8/3.3
Harmony	39.8	1.7	11.1	14.7	8.6	10.0	9.5	8.6/3.5
Orange	44.8	2.2	10.9	14.6	9.4	9.9	10.0	9.5/4.0
Spry	44.8	1.9	11.6	16.4	9.1	9.5	8.8	8.1/4.3
Yellow	40.3	1.9	11.2	16.1	9.1	9.8	9.3	8.8/4.0
Marvel								
Gold	69.3	3.1	14.9	16.3	8.8	9.8	8.3	8.3/2.5
Orange	67.5	3.2	15.9	17.2	8.4	10.0	9.0	8.0/3.0
Primrose	67.8	3.3	13.5	17.7	9.0	10.0	7.5	8.1/1.5
Yellow	66.3	3.2	13.5	16.6	8.5	10.0	7.8	6.9/2.0
Red Cherry	62.8	2.2	16.3	19.8	9.8	10.0	8.0	8.0/2.8
Royal Crested								
Goldfinch	65.8	2.1	14.8	16.5	9.5	10.0	10.0	9.6/4.0
Honeycomb	66.3	2.1	15.9	17.3	9.9	10.0	10.0	10.0/3.8
Mandarin Improved	60.8	1.8	16.7	18.2	9.8	10.0	9.5	9.5/5.3
Mix	64.3	1.9	16.3	17.6	9.3	10.0	9.8	9.4/4.5
King Bicolor	61.8	2.2	15.2	18.1	9.8	9.9	9.3	9.5/3.0
Safari								
Bolero	52.0	2.3	13.9	17.5	9.6	10.0	10.0	9.6/3.3
Gold	53.8	2.3	13.8	16.4	9.4	9.5	9.8	9.1/2.5
Orange	56.5	2.5	16.1	21.2	9.4	10.0	6.8	6.4/3.5
Primrose	51.8	2.3	14.7	17.4	9.1	9.5	9.3	8.9/2.8
Queen	56.8	2.3	14.2	17.2	9.4	10.0	9.8	9.5/2.8
Red	57.0	2.4	13.4	16.8	10.0	10.0	10.0	10.0/3.5
Scarlet	59.5	2.3	14.9	17.0	9.1	10.0	10.0	9.4/3.3
Tangerine	51.3	2.4	16.6	21.2	9.8	10.0	7.3	6.6/4.0
Yellow	50.5	2.3	13.1	15.0	9.9	9.8	10.0	9.5/2.5
Spice								
Orange	53.3	2.1	12.0	15.2	9.8	10.0	10.0	9.5/3.0
Saffron	54.0	2.2	12.9	14.5	9.9	10.0	10.0	9.9/3.0
Troubadour Yellow	54.8	2.3	12.2	15.0	10.0	9.9	10.0	9.9/2.5
HSD 5%	7.7	0.4	2.8	3.7				

^aFrom sowing 19 August 1996.

^bFlowers and plant dimensions measured 7-13 November 1996.

^cRating scale: 10 = excellent, 9 = superior, 8 = very good, 7 = good, 6 = fair, 5 = borderline acceptability, 1 = very poor, 0 = all dead. First rating each column 8 November and second rating each column 31 December 1996.

^dFlower density and distribution.

^eInclusive rating for appearance and vigor.

^fMean separation by Tukey's studentized range test, HSD 5% level.

and vigor ratings late in both seasons were vastly different, relative differences within each season were in good agreement as to which series held up the longest. The 'Bonanza', 'Bounty' and 'Boy' series did well spring or fall. However, series comparisons cannot indicate the performance of individual varieties. After a comparison of individual varieties from both spring and fall 1996, ten varieties were outstanding in performance both seasons: 'Bonanza Flame', 'Bonanza Harmony', 'Bonanza Orange', 'Golden Boy', 'Yellow Boy', 'Golden

Gate', 'Janie Primrose', 'Little Hero Orange', 'Little Hero Yellow' and 'Safari Bolero'.

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EVALUATION OF BULBOUS PERENNIALS FOR USE IN CENTRAL FLORIDA

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Additional index words. *Amaryllis*, × *Amarcrinum*, *Brodiaea*, *Crinodonna*, *Hippeastrum*, knight's star lily, *Narcissus*, daffodil, *Triteleia*, grassnut, triplet lily, *Watsonia*, bugle lily.

Abstract. In December 1994, × *Amarcrinum memoria-corsii*, *Hippeastrum* 'Germa', three species and 28 cultivars of *Narcissus*, two *Triteleia* species, and seven *Watsonia* cultivars were planted in Tavares-Millhopper fine sand soil in Apopka, FL. The bulbs and corms were grown under one or more shade levels (0, 30, 50 and 80%), depending on the plant. Plots were mulched and irrigated based on tensiometer readings using overhead sprinklers. Chilling-degree hours and plant survival and flowering were monitored during 1995, 1996, and 1997. Chilling-degree hours were 194, 455 and 157, respectively, for the winters of 1994-95, 1995-96, and 1996-97. Plant survival varied from 0% to 100% after three years. × *Amarcrinum memoria-corsii*, *Hippeastrum* 'Germa', *N. canaliculatus*, *N. 'Golden Perfection'*, and *N. 'Silver Chimes'* had 100% survival. Flowering was also variable, with × *Amarcrinum memoria-corsii*, *Hippeastrum* 'Germa', *N. 'Golden Perfection'*, *Triteleia hyacinthina* and *T. laxa* flowering all three years. Several of the *Narcissus* cultivars flowered the first two springs but not after the warmest winter. *Watsonias* did not perform well, in part, due to cold damage occurring each winter. Shade level had little effect on plant survival or flowering (number and longevity).

Interest in perennial flowering plants continues to increase nationwide and central Florida horticulturists are not immune to the siren call of these plants. A subgroup that is of interest to many is that of bulbous perennials. These are plants that have storage organs (true bulbs, corms, rhizomes, or tubers) that develop to carry the plant through dormancy. Although many easy-to-grow bulbous perennials are recommended for use in Florida, others of these plants are less well

known or are not recommended because it is not known if they will thrive and/or flower here.

One of the reasons this project was started was because the senior author had planted bulbs of *Narcissus* (daffodil) 'Carlton' in his yard in 1983 and this daffodil had persisted and flowered every year since then, without any special care or the need to dig and chill the bulbs as is often recommended to Florida gardeners. *N. 'Carlton'* is touted as a super perennializer, especially in the south (Heath and Heath, 1994) and, yet, daffodils are not recommended for central Florida because of their need for winter cold (MacCubbin, 1997).

Narcissi are bulb-producing members of the family Amaryllidaceae, a group of monocots that include many that are bulbous and herbaceous. Because of the experience with *N. 'Carlton'*, other daffodil cultivars and species were acquired for testing. In addition, two other bulb-producing members of the Amaryllidaceae with potential for use in central Florida were tested—× *Amarcrinum* and *Hippeastrum* (*Amaryllis*). × *Amarcrinum* (formerly *Crinodonna*) are intergeneric hybrids between *Amaryllis* spp. and *Crinum* spp., both of which thrive in central Florida (MacCubbin, 1997). Herbaceous cormous perennializer from two other plant families were also tested. They included two species of *Triteleia* (grassnut, triplet lily, family Liliaceae) and seven cultivars of *Watsonia* (bugle lily, family Iridaceae). The purpose of this experiment was to evaluate bulbous perennials for their ability to grow and flower in central Florida under various shade levels ranging from 0% to 80%.

Materials and Methods

This research was conducted at the Central Florida Research and Education Center in Apopka, FL. Donated bulbs and corms (The Daffodil Mart, Gloucester, VA 23061) were planted under various shade levels (0, 30, 50 and 80%), depending on the plant (Table 1).

Plants arrived on 12 Dec. 1994. Twenty-eight cultivars and three species of *Narcissus* (daffodils) were planted on 16 and 19 Dec. 1994 and the other bulbs and corms were planted on 23 Dec. 1994. The selection of daffodils included representatives from ten of the twelve daffodil divisions. The soil was Tavares-Millhopper fine sand [hyperthermic; uncoated Typic Quartzipsamments (Tavares), Grossarenic Paleudults (Mill-

Florida Agricultural Experiment Station Journal Series No. N-01503. Generous contributions of plant material by Brent and Becky Heath of the Daffodil Mart, 7463 Heath Trail, Gloucester, VA, are greatly appreciated.