

Evaluation of Marigold Cultivars as Bedding Plants in Central Florida

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SUMMARY. Annual bedding plants comprised 50% of the \$4.6 billion wholesale value of United States floricultural crops in 2000. Florida is one of the top wholesale producers of bedding plants in this industry, and in 2000 was number one in the production of potted marigolds. Evaluation of marigold cultivars is vital for continued growth of the industry. We evaluated 84 cultivars of african marigold (*Tagetes erecta*) and french marigold (*T. patula*) in replicated class tests at the University of Florida's Gulf Coast Research and Education Center at Bradenton, Fla. (lat. 27°4' N, long. 82°5' W; AHS Heat Zone 10; USDA Cold Hardiness Zone 9b) in Fall 1999. In this report, we provide objective plant measurements of vegetative and floral characteristics as well as six weekly subjective ratings. Subjective ratings were on a 1 to 7 scale with the highest rating of 7 for excellent. In general, cultivars with vegetative and floral ratings ≥ 5 were considered outstanding, 4 to 4.9 as good performers, and ≤ 3.9 as fair to poor. These ratings permit readers to evaluate foliage and floral characteristics at different times during the season, and to evaluate performance over time. Cultivars were grouped into classes based on species, plant height, flower type, and flower color. Outstanding cultivars (those cultivars with an overall rating ≥ 5) and their class were: 'Inca Gold' and 'Royal Gold' [african marigold (African)—gold class]; 'Mesa

Orange' and 'Royal Orange' (African—orange class); 'Inca Yellow', 'Mesa Yellow', and 'Perfection Yellow' (African—yellow class); 'Disco Granada' [french marigold (French) dwarf—single gold/red class], 'Disco Flame' (French dwarf—single red/gold class); 'Golden Boy' and 'Hero Gold' (French dwarf—double gold class); 'Bonanza Orange', 'Orange Boy', 'Girl Orange', 'Jacket Orange' (French dwarf—double orange class); 'Yellow Boy', 'Girl Primrose', and 'Jacket Yellow' (French dwarf—double yellow class); 'Harmony Boy' (French dwarf—double orange/red class); 'Hero Flame' (French dwarf—double red/orange class); 'Bonanza Flame Improved' (French dwarf—double red/yellow class); 'Legend Gold' (French double—gold class); 'Legend Orange Improved' (French—double orange class); 'Spry Boy' (French double—yellow/red class); 'Durango Bee', 'Durango Red', and 'Hyper Red/Yellow' (French—double red/yellow class). We believe these cultivars would perform well in the southern U.S. or areas of the world with similar heat and cold hardiness zones.

The United States wholesale value of floricultural crops was \$4.6 billion in 2000, estimated from growers with sales \geq \$10,000. (U.S. Department of Agriculture, 2001). Bedding and garden plants comprised 50% of the floriculture value at \$2.12 billion. Florida (\$107.4 million) ranked fifth behind California, Michigan, Texas and Ohio, which together generate 42% of the bedding/garden plant wholesale value. Hybrid marigolds were first introduced in 1939 by David Burpee (Burpee Seeds and Plants, 1999), and are now ranked fourth and eleventh in the United States for wholesale value in flat and pot culture, respectively (U.S. Department of Agriculture, 2001). Florida was number one (growers with sales \geq \$100,000) in the United States for the number of potted marigolds produced, and their wholesale value was \$1.2 million in 1999–2000 (United States Department of Agriculture, 2001).

The bedding plant industry by its nature requires timely evaluation of cultivars for a competitive market. Many of the bedding plant cultivar trials currently conducted in the United States are performed without replicated experimental units. While those trials provide valuable observational information,

they require replication over years to gain the benefits from statistical analysis. Since seed companies are releasing new cultivars yearly, timely evaluations are critical to provide growers with non-biased performance evaluations to help them make decisions concerning cultivar selection. Standards have not been developed for marigolds and thus new cultivars are often compared with a random number of cultivars chosen from over 100 commercially available cultivars. This study was done to evaluate marigold cultivar performance in a seasonal replicated trial to provide timely evaluations that may be used by growers, landscapers, consumers and seed companies as well as the scientific community. These trials also were to establish cultivars to be used as standards (best-of-class), thus reducing the number of cultivars needed in future trials to these established standards and new releases.

Materials and methods

Seeds of 29 cultivars of african marigolds and 55 cultivars of french marigolds were sown on 10 Aug. 1999 into a soil mix containing 1 peat : 1 vermiculite (by volume) amended with dolomite 6.7 kg·m⁻³ (11.3 lb/yard³), superphosphate 3.3 kg·m⁻³ (5.6 lb/yard³) and hydrated lime 1.7 kg·m⁻³ (2.8 lb/yard³). Seeds were allowed to germinate at 22.2 to 23.9 °C (72 to 75 °F) in a growth room with a photosynthetic photon flux of 30 μ mol·m⁻²·s⁻¹ for 12 h per day from cool-white fluorescent lamps. Immediately after germination, seedlings were transplanted into Todd, planter flats (model 128; Speedling Inc., Sun City, Fla.) [3.8 × 3.8 × 6.4-cm cells (1.5 × 1.5 × 2.5 inches)] and placed into a screen sided, fiberglass covered greenhouse. Seedlings were fertilized weekly with a 20N–16.6P–8.7K water soluble fertilizer (20–20–20 Ca–Mg Excel; Scotts Co., Marysville, Ohio) solution containing nitrogen at 500 mg·L⁻¹ (ppm).

On 22 Sept., plugs were transplanted into raised ground beds with six plants per plot spaced 30.5 cm (12 inches) apart in a staggered layout. Beds were 81.3 cm wide × 20.3 cm high (32 × 8 inches). Nutricote 14N–6.1P–11.6K fertilizer (14–14–14, 180-d slow release type; Florikan, Sarasota, Florida) was broadcast across the width of the bed at 3587.7 kg·ha⁻¹ (3201 lb/acre) and incorporated to a depth of 7.6 to 10.2 cm (3 to 4 inches). Beds were

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Table 1. Statistical means for height, width, and flower diameter of african marigolds (African), marigold (*Tagetes erecta* L.) and french marigolds (French), (*Tagetes patula* L.), marigold cultivars grouped within classes grown at Bradenton, Fla. Seeds were sown 10 Aug. 1999 and plugs transplanted to ground beds 22 Sept. 1999. Dwarf marigolds are those ≤10 inches (25.4 cm).

Cultivar	Seed source ^y	Plant measurements (cm) ^z		
		Ht	Width	Flower diam
African dwarf—orange class				
Pumpkin Crush	Ball	20 b ^y	26 b	7.3 a
Discovery Orange	Bodger	25 a	29 a	6.7 b
African—gold class				
Antigua Gold	Goldsmith	31 c	37 cd	7.2 cd
Inca Gold	Goldsmith	42 b	48 ab	9.3 a
Lady Gold	PanAmerican	50 a	48 ab	8.5 a–c
Marvel Gold	PanAmerican	44 b	41bc	8.0 bc
Mesa Gold	PanAmerican	30 c	37 cd	8.2 a–c
Perfection Gold	Goldsmith	50 a	53 a	8.0 bc
Royal Gold	PanAmerican	44 b	45 b	8.8 ab
Sunspot Gold	Floranova	34 c	34 d	6.5 d
African—orange class				
American Indian Orange	Grimes	30 e	38 de	7.6 cd
Antigua Orange	Goldsmith	29 e	36 e	7.3 d
Atlantis Orange	Bodger	29 e	35 ef	8.0 bc
Inca Orange	Goldsmith	45 a	47 ab	9.2 a
Lady Orange	PanAmerican	40 b	40 cd	7.2 d
Marvel Orange	PanAmerican	37 c	39 de	7.3 d
Mesa Orange	PanAmerican	32 c	37 de	8.1 bc
Perfection Orange	Goldsmith	47 a	50 a	8.6 b
Royal Orange	PanAmerican	41 b	44 bc	8.6 b
Sunspot Orange	Floranova	35 c	31 f	5.9 e
African—yellow class				
American Indian Yellow	Grimes	32 d	38 bc	7.8 cd
Antigua Primrose	Goldsmith	29 de	35 cd	7.4 de
Antigua Yellow	Goldsmith	27 e	33 d	7.0 e
Atlantis Yellow	Bodger	35 c	36 cd	7.3 de
Inca Yellow	Goldsmith	43 b	45 a	9.7 a
Lady Primrose	Pan American	43 b	43 a	7.3 de
Marvel Yellow	Pan American	42 b	44 a	8.4 b
Mesa Yellow	Pan American	37 c	43 ab	8.3 bc
Perfection Yellow	Goldsmith	49 a	47 a	8.0 bc
French dwarf—single gold/red class				
Disco Granada	Bodger	28	40	5.6
Disco Marietta	Bodger	27 ^{NS}	43 ^{NS}	5.1 ^{NS}
French dwarf—single red/gold class				
Disco Flame	Bodger	27 c	44 b	5.0 b
Disco Queen	Bodger	23 d	39 b	4.8 c
Red Cherry Improved	PanAmerican	33 b	50 a	5.0 b
Red Marietta	PanAmerican	41 a	53 a	5.3 a
French dwarf—double gold class				
Bonanza Gold Improved	PanAmerican	33 a	45 a	5.3 bc
Golden Boy	PanAmerican	29 b	38 bc	3.9 d
Girl Gold	Grimes	24 c	35 c	4.9 c
Hero Gold	Bodger	35 a	43 ab	5.5 b
Safari Gold Improved	Bodger	33 a	42 ab	6.0 a
French dwarf—double orange class				
Bonanza Orange	PanAmerican	27 cd	45 b	5.4 b
Orange Boy	PanAmerican	35 ab	44 b	4.0 d
Orange Gate	PanAmerican	34 ab	42 c	6.1 a
Girl Orange	Grimes	27 cd	37 de	5.9 ab
Hero Orange	Bodger	28 c	40 cd	6.2 a
Orange Jacket	PanAmerican	33 b	47 b	4.7 c
Little Hero Orange	Bodger	24 d	37 e	6.1 a
Safari Orange Improved	Bodger	---	---	---
Safari Tangerine	Bodger	37 a	54 a	5.8 ab

Table 1. Continued.

Cultivar	Seed source ^y	Plant measurements (cm) ^z		
		Ht	Width	Flower diam
French dwarf—double yellow class				
Bonanza Yellow Improved	PanAmerican	28 cd	42 bc	5.2 bc
Yellow Boy	PanAmerican	31 bc	42 bc	4.1 d
Yellow Gate	PanAmerican	31 bc	39 c	5.3 bc
Girl Primrose	Grimes	26 cd	40 c	4.3 d
Hero Yellow	Bodger	30 bc	40 c	5.6 ab
Yellow Jacket	PanAmerican	36 a	47 a	4.3 d
Little Hero Yellow	Bodger	23 e	38 c	5.0 c
Safari Primrose	Bodger	36 a	45 ab	5.9 a
Safari Yellow	Bodger	32 bc	42 bc	6.0 a
French dwarf—double orange/red class				
Harmony Boy	PanAmerican	29 a	41 a	4.0 b
Safari Bolero	Bodger	35 a	45 a	6.3 a
French dwarf—double red/gold class				
Golden Gate	PanAmerican	32 b	42	6.0
Safari Queen	Bodger	36 a	44	6.0
Safari Red	Bodger	36 a	47 ^{NS}	6.1 ^{NS}
French dwarf—double red/orange class				
Hero Flame	Bodger	32 b	45 b	5.3
Hero Harmony	Bodger	30 b	40 c	5.2
Safari Scarlet	Bodger	41 a	49 a	6.2 ^{NS}
French dwarf—double red/yellow class				
Bonanza Bee Improved	PanAmerican	30 a	45	5.5 a
Bonanza Flame Improved	PanAmerican	27 b	40	5.8 a
Harmony Girl	Grimes	27 b	37	5.9 a
Hero Spry	Bodger	30 a	44 ^{NS}	4.7 c
French dwarf—double yellow/red class				
Spry Boy	PanAmerican	32 a	42	4.0 c
Girl Spry	Grimes	24 b	---	4.7 b
Hero Bee	Bodger	24 b	36	5.7 a
Little Hero Fire	Bodger	24 b	42 ^{NS}	5.0 b
French—double gold class				
Durango Gold	PanAmerican	42 a	49 a	7.0 a
Legend Gold	Floranova	34 b	46 b	5.0 b
French—double orange class				
Hyper Orange	Floranova	24 b	36 b	4.6
Legend Orange Improved	Floranova	36 a	47 a	5.0 ^{NS}
French—double yellow class				
Durango Light Yellow	PanAmerican	40 a	48	6.0 a
Durango Yellow	PanAmerican	28 bc	40	5.3 ab
Hyper Yellow	Floranova	28 c	43	4.2 cb
Legend Yellow	Floranova	31 b	44 ^{NS}	5.1 ab
French—double red/yellow class				
Durango Bee	PanAmerican	30 b	38	5.7 a
Durango Red	PanAmerican	31 b	38	5.7 a
Honeycomb	PanAmerican	34 a	42	5.4 a
Hyper Red/Yellow	Floranova	26 bc	40 ^{NS}	4.0 b

^z1.0 inch = 2.54 cm.

^yBall = Ball Seed Co., West Chicago, Ill.; Bodger = Bodger Seeds Ltd., South El Monte, Calif.; Floranova = Floranova Ltd., Saint Charles, Ill.; Goldsmith = Goldsmith Seeds, Inc., Gilroy, Calif.; Grimes Seeds and Plants, Concord, Ohio; Pan American = Pan American Seed Co., West Chicago, Ill.

^{NS}Mean separation within classes by least significant difference (LSD) at $P < 0.05$.

^{NS}Nonsignificant.

fumigated 21 d before planting with a mixture of 66% methyl bromide and 33 % chloropicrin at 392 kg·ha⁻¹ (350 lb/acre) and covered with white-on-black polyethylene film. Subsurface seepage irrigation water was supplied from lateral ditches spaced 12.8 m (42 ft) apart (Howe and Waters, 1997).

Integrated pest management was used to determine when pesticide applications were needed to control arthropod pests and plant pathogens. Temperature [University of Florida's Gulf Coast Research and Education Center at Bradenton, Fla.; lat. 27°4' N, long. 82°5' W; AHS Heat Zone 10 (American Horticultural Society, 1999); USDA Cold Hardiness Zone 9b (U.S. National Arboretum, 1990)] at 61 cm (2 ft) above the ground during the remainder of the experiment ranged from a low of 6.2 °C (43 °F) to a high of 32.4 °C (90 °F) with a total rainfall of 6.9 cm (2.7 inches), (Florida Automated Weather Network, 2002).

On 9 to 10 Nov., plant height (from the stem base to the inflorescence tip), plant width at the widest point and flower diameter were recorded for three plants selected from the center and edge of each plot. Subjective ratings were made by the senior author on 27 Oct., 3, 10, 17, and 23 Nov., and 1 Dec. (evaluations were across all six plants resulting in one value per plot). A 1 to 7 scale was used with the highest rating a 7. Floral characteristics were rated within a scale as follows: 7 = flowers were numerous, uniformly distributed over all plants, flowers were free from pest symptoms; 4 = average floral display, may have some pest damage but not severe enough to cause flowers to be unacceptable; and 1 = unacceptable flower number or display, and/or pest damage severe resulting in unattractive flowers. Foliage ratings were as follows: 7 = all plants in a plot had full and uniform foliage, plants were free of pest symptoms and abnormalities or weaknesses such as lodging; 4 = average foliage density, minimal lodging, and/or some insect damage but foliage was still acceptable; 1 = foliage sparse, stem lodging, and/or unacceptable pest damage making plants undesirable. For a measure of performance over time, six weekly flower or foliage ratings were added and divided by six to provide an average flower or foliage rating. For a measure of overall performance (i.e., performance over time with combined floral and foliage performance), an overall

rating was derived by taking the sum of the average floral and foliage ratings and dividing by two. In general, cultivars with vegetative and floral ratings ≥ 5 were considered outstanding, 4 to 4.9 as good performers, and ≤ 3.9 as fair to poor.

To provide meaningful performance comparisons, cultivars were divided into classes based on species (african marigold or french marigold), height [dwarf ≤ 25.4 cm (10 inches); >25.4 cm], flower form (double if crested, anemone, or single), and flower color (gold, orange, red, yellow, and bicolored). Bicolored classes were represented as x/y, with x = primary color and y = secondary or less predominant color.

Each class was analyzed as a separate experiment. A randomized complete block experimental design was used with three blocks containing six plants per plot. The experimental unit for objective data was the average measurement from three plants, and for subjective data, one rating value considering all six plants in the plot. All data were analyzed by analysis of variance (ANOVA) methods, and means of dependent variables significant at the 0.05 level of probability were separated using Duncan's multiple range test (PROC ANOVA, SAS Institute, Cary, N.C.).

Results and discussion

AFRICAN DWARF—ORANGE CLASS.

'Pumpkin Crush' plants were smallest at 20 cm (7.9 inches) high and 26 cm (10.2 inches) wide, but they had the largest flowers 7.3 (2.9 inches) (Table 1). Flower ratings were high (4.7 to 6.0) for 'Pumpkin Crush' and 'Discovery Orange' on 27 Oct. and 3 Nov. However, later ratings decreased rapidly indicating a narrow window of peak performance (Table 2).

AFRICAN—GOLD CLASS. Plant height ranged from 30 cm (11.8 inches) for 'Mesa Gold' to 50 cm (19.7 inches) for 'Lady Gold' and 'Perfection Gold'. Plant width ranged from 34 cm (13.4 inches) for 'Sunspot Gold' to 53 cm (20.9 inches) for 'Perfection Gold'. Flower diameters were from 6.5 cm (2.6 inches) for 'Sunspot Gold' to 9.3 cm (3.7 inches) for 'Inca Gold'. 'Lady Gold' (3.8) and 'Sunspot Gold' (3.4) had below average foliage ratings, while 'Sunspot Gold' (3.1) and 'Mesa Gold' (3.1) had below average flower ratings. Overall ratings were above average (4.6 to 5.0) for most members of this class

except 'Sunspot Gold' (3.2) and 'Lady Gold' (4.2).

AFRICAN—ORANGE CLASS. Plant height ranged from 29 cm (11.4 inches) for 'Antigua Orange' and 'Atlantis Orange' to 47 cm (18.5 inches) for 'Perfection Orange'. Plant width ranged from 31 cm (12.2 inches) for 'Sunspot Orange' to 50 cm (19.7 inches) for 'Perfection Orange'. Flower diameters were from 5.9 cm (2.3 inches) for 'Sunspot Orange' to 9.2 cm (3.6 inches) for 'Inca Orange'. 'Mesa Orange' (6.6) had the best average foliage rating, while 'Atlantis Orange' (3.3), 'American Indian Orange' (3.2) and 'Sunspot Orange' (2.7) had poor average foliage ratings. Good flower ratings on 27 Oct. and 3 Nov. were received for all cultivars except 'Mesa Orange' (2.3 to 3.0). Flower ratings were good for 'Marvel Orange' (4.7) and 'Antigua Orange' (4.8) to 10 Nov., and to 17 Nov. for 'Royal Orange' (5.3) and 'Inca Orange' (4.0). Average flower ratings were fair to low for this class (4.4 to 2.8).

AFRICAN—YELLOW CLASS. Plant height ranged from 27 cm (10.6 inches) for 'Antigua Yellow' to 49 cm (19.3 inches) for 'Perfection Yellow'. Plant width ranged from 33 cm (13 inches) for 'Antigua Yellow' to 47 cm (18.5 inches) for 'Perfection Yellow'. Flower diameter ranged from 7.0 cm (2.8 inches) for 'Antigua Yellow' to 9.7 cm (3.8 inches) for 'Inca Yellow'. 'Inca Yellow' (5.3) and 'Mesa Yellow' (6.2) had the highest average foliage ratings, followed by 'Perfection Yellow' (5.4) and 'American Indian Yellow' (4.9). Early flower ratings, 27 Oct., were fair to low for 'Mesa Yellow' (3.0) and 'Perfection Yellow', but flower ratings were good through 10 Nov. for most cultivars, only falling lower after that date. However, 'Perfection Yellow' had extended good ratings to the end of the test.

FRENCH DWARF—SINGLE GOLD/RED CLASS. Plant and flower measurements for 'Disco Granada' and 'Disco Marietta' were not significantly different. 'Disco Granada' (5.6) had an average foliage rating significantly better than 'Disco Marietta' (4.1). Both cultivars had equally good flower ratings (5.0) from 10 Nov. to 17 Nov.

FRENCH DWARF—SINGLE RED/GOLD CLASS. Plant height ranged from 23 cm (9.1 inches) for 'Disco Queen' to 41 cm (5.5 inches) for 'Red Marietta'. Plant width ranged from 39 cm (15.4 inches) for 'Disco Queen' to 53 cm (19.7 inches)

Table 2. Statistical means for foliage and flower performance ratings of african marigold (African) (*Tagetes erecta* L.), and french marigold (French) (*T. patula* L.), marigoldmarigold cultivars grouped within classes grown at Bradenton, Fla. Seeds were planted 10 Aug. 1999 and plugs transplanted to ground beds 22 Sept. 1999. Dwarf marigolds are those ≤10 inches (25.4 cm).

Cultivar	Foliage rating ^a							Flower rating ^b							Overall rating
	27 Oct.	3 Nov.	10 Nov.	17 Nov.	23 Nov.	1 Dec.	Avg	27 Oct.	3 Nov.	10 Nov.	17 Nov.	23 Nov.	1 Dec.	Avg	
African dwarf—orange class															
Pumpkin Crush	2.3 a ^w	3.0 a	2.7 a	2.7 a	1.7 a	2.0 a	2.4 a	5.0 a	4.7 a	1.3 b	1.0 a	1.0 a	1.0 a	2.3 b	2.4 a
Discovery Orange	3.3 b	3.3 a	3.3 a	3.0 a	3.0 a	3.0 a	3.2 a	5.7 a	6.0 a	4.3 a	2.7 a	2.0 a	2.3 a	3.8 a	3.5 a
African—gold class															
Antigua Gold	5.0 d	4.7 cd	4.7 b-d	4.7 bc	4.7 ab	4.7 ab	4.7 bc	4.7 b	5.0 b	5.0 ab	5.0 a	4.7 ab	5.0 a	4.9 a	4.8 a
Inca Gold	6.0 ab	6.3 a	6.0 ab	5.3 ab	5.0 ab	4.0 ab	5.4 ab	4.7 b	5.3 ab	5.3 ab	4.7 a	5.3 a	4.0 ab	4.9 a	5.2 a
Lady Gold	4.0 e	4.0 d	4.0 cd	3.7 c	3.7 b	3.7 b	3.8 cd	5.7 a	5.7 a	5.3 ab	4.3 a	3.0 b	2.7 cd	4.4 a	4.2 ab
Marvel Gold	5.0 d	4.7 cd	4.3 cd	4.3 bc	4.3 b	4.3 ab	4.5 b-d	5.7 a	6.0 a	5.7 a	4.0 a	3.7 a	3.3 b-d	4.7 a	4.6 a
Mesa Gold	6.3 a	6.3 a	6.3 a	6.3 a	6.3 a	6.3 a	6.3 a	2.0 c	2.3 c	4.0 bc	4.3 a	3.7 ab	2.3de	3.1 b	4.7 a
Perfection Gold	5.3 cd	5.3 cb	5.3 a-c	4.3 bc	3.7 b	2.7 b	4.4 b-d	6.0 a	6.0 a	5.7 a	4.7 a	4.7 ab	4.3 ab	5.2 a	4.9 a
Royal Gold	5.7 bc	5.7 ab	5.3 a-c	4.7 bc	4.0 b	4.0 ab	4.9 bc	6.0 a	6.0 a	5.7 a	5.0 a	4.7 ab	3.3 b-d	5.1 a	5.0 a
Sunspot Gold	4.0 e	4.0 d	3.3 d	3.3 c	3.0 b	2.7 b	3.4 d	5.7 a	5.7 a	3.3 c	1.7 b	1.0 c	1.0 e	3.1 b	3.2 b
African—orange class															
American Indian Orange	3.7 e	3.7 d	3.3 e	3.3 e	2.3 cd	2.7 e	3.2 d	6.0 a	5.7 a	3.7 b-d	2.7 bc	1.7 c	1.7 b	3.6 cd	3.4 d
Antigua Orange	4.3 c-d	5.0 bc	5.0 b-d	5.0 bc	5.0 b	4.7 ab	4.8 bc	6.0 a	5.7 a	4.7 ab	3.3 bc	3.3 ab	3.7 a	4.4 a	4.7 ab
Atlantis Orange	3.7 de	3.7 d	3.3 cd	3.0 e	3.0 cd	3.0 c-e	3.3 d	6.0 a	5.7 a	3.3 cd	2.7 bc	1.7 c	1.7 b	3.5 cd	3.4 d
Inca Orange	5.7 ab	5.7 b	5.7 b	5.3 b	5.0 b	4.0 b-d	5.2 b	5.0 bc	5.0 a	5.0 ab	4.0 ab	3.7 ab	3.7 a	4.4 a	4.8 ab
Lady Orange	4.7 bc	4.7 c	4.3 d	4.0 c-e	3.7 bc	4.0 b-d	4.2 c	5.7 ab	5.7 a	4.0 bc	2.3 cd	1.7 c	1.0 b	3.4 de	3.8 cd
Marvel Orange	5.3 ab	5.0 bc	4.7 cd	4.7 c-d	4.7 b	4.3 a-c	4.8 bc	5.0 bc	5.7 a	4.7 a-c	3.7 bc	2.3 bc	1.0 b	3.7 b-d	4.3 bc
Mesa Orange	6.7 a	7.0 a	7.0 a	6.7 a	6.7 a	5.7 a	6.6 a	2.3 d	3.0 b	3.7 b-d	3.3 bc	4.0 a	3.3 a	3.3 de	5.0 a
Perfection Orange	5.7 ab	5.0 bc	4.7 cd	3.7 ed	3.0 cd	3.3 c-e	4.2 c	5.7 ab	5.3 a	4.3 bc	3.7 bc	3.3 ab	3.0 a	4.2 a-c	4.2 bc
Royal Orange	5.7 ab	5.3 b	5.3 bc	5.3 b	4.7 b	4.7 ab	5.2 b	4.7 c	5.7 a	6.0 a	5.3 a	4.0 a	3.7 a	4.9 a	5.1 a
Sunspot Orange	3.3 e	3.0 d	3.0 e	3.0 e	2.0 d	2.0 e	2.7 d	6.0 a	5.3 a	2.3 d	1.0 d	1.0 c	1.0 b	2.8 e	2.8 e
African—yellow class															
American Indian Yellow	5.0 b-d	5.3 a-c	5.0 a-c	5.0 ab	4.7 b	4.7 ab	4.9 bc	5.3 a	5.7 a	5.0 b	3.3 cd	3.0 b-d	3.3 b	4.3 bc	4.6 ab
Antigua Primrose	4.0 d	4.7 b-d	5.0 a-c	4.3 bc	4.0 b	4.0 bc	4.3 c	6.0 a	5.7 a	5.0 b	2.7 d	2.3 cd	2.3 b-d	4.0 cd	4.2 bc
Antigua Yellow	4.0 d	4.7 b-d	4.7 bc	4.3 bc	4.0 b	3.7 bc	4.2 c	6.0 a	5.3 a	4.3 c	3.3 cd	3.3 bc	3.0 bc	4.2 c	4.2 bc
Atlantis Yellow	4.3 cd	4.3 cd	4.3 b-d	4.0 d	4.0 b	4.3 b	4.2 c	5.0 a	5.0 a	5.0 b	3.3 cd	2.0 d	1.7 d	3.7 d	4.0 cd
Inca Yellow	5.3 a-c	5.7 ab	5.7 ab	5.3 ab	5.0 ab	5.0 ab	5.3 ab	5.0 a	5.3 a	5.7 a	4.7 ab	4.0 ab	3.3 b	4.7 ab	5.0 a
Lady Primrose	4.7 cd	4.3 cd	4.0 cd	4.0 cd	4.0 b	4.0 bc	4.2 bc	5.7 a	5.7 a	5.0 b	4.0 bc	2.7 cd	2.7 b-d	4.3 bc	4.2 bc
Marvel Yellow	4.3 cd	3.7 d	3.0 d	3.0 d	2.7 c	2.7 c	3.2 d	5.3 a	5.3 a	4.0 c	3.3 cd	3.0 b-d	2.0 cd	3.8 cd	3.6 d
Mesa Yellow	6.3 a	6.3 a	6.3 a	6.0 a	6.0 a	6.0 a	6.2 a	3.0 b	4.0 b	5.0 b	4.3 a-c	4.0 ab	2.7 b-d	3.8 cd	5.0 a
Perfection Yellow	6.0 ab	6.3 a	5.7 ab	5.7 a	4.7 b	4.3 b	5.4 ab	3.7 b	5.0 a	5.3 ab	5.3 a	4.7 ab	4.7 a	4.8 a	5.1 a
French dwarf—single gold/red class															
Disco Granada	5.7	5.7	5.7 a	5.7 a	5.3	5.3	5.6 a	4.0	5.0	5.0	5.0	4.3	4.0	4.7	5.1
Disco Marietta	4.3 ^{NS}	4.3 ^{NS}	4.0 b	4.0 b	4.0 ^{NS}	4.0 ^{NS}	4.1 b	4.7 ^{NS}	5.3 ^{NS}	5.0 ^{NS}	5.0 ^{NS}	4.0 ^{NS}	4.0 ^{NS}	4.5 ^{NS}	4.4 ^{NS}
French dwarf—single red/gold class															
Disco Flame	5.3 b	5.3 ab	5.0 ab	5.0 a	4.7 a	4.7 a	5.0 a	5.0 b	5.0	6.0 a	5.0	4.7 a	4.0 a	4.9 a	5.0 a
Disco Queen	3.7 c	3.0 c	3.0 c	2.0 b	2.0 b	1.7 b	2.6 b	6.0 a	5.7	5.0 b	3.7	2.3 cb	1.7 b	3.7 c	3.3 b
Red Cherry Improved	4.3 c	4.3 bc	3.3 bc	3.0 b	2.7 b	2.7 b	3.4 b	4.7 b	5.0	5.0 b	2.7	1.3 c	1.7 b	3.8 c	3.4 b
Red Marietta	6.3 a	6.3 a	5.3 a	5.3 a	5.0 a	5.0 a	5.6 a	4.7 b	5.3 ^{NS}	5.7 a	5.0 ^{NS}	3.0 b	2.3 b	4.4 b	4.9 a
French dwarf—double gold class															
Bonanza Gold Improved	4.0	4.3	4.3 a	4.7 b	4.7 ab	4.3 a-c	4.4 b	3.0	4.0	5.0	5.0 ab	4.3 b	4.3 a	4.2 a	4.3 ab
Golden Boy	5.0	5.7	5.7 a	5.7 a	5.7 a	5.7 a	5.6 a	2.3	3.3	5.0	5.3 a	5.7 a	5.3 a	4.6 a	5.0 a
Girl Gold	4.0	4.3	4.0 b	4.0 bc	4.0 bc	4.0 bc	4.1 b	3.7	5.0	5.3	5.3 a	5.0 ab	4.7 a	4.6 a	4.4 ab
Hero Gold	4.7	5.3	5.7 a	5.7 a	5.7 a	5.3 ab	5.4 a	3.3	5.7	6.0	6.0 a	5.0 ab	4.3 a	5.0 a	5.2 a
Safari Gold Improved	4.7 ^{NS}	4.3 ^{NS}	4.0 b	3.7 c	3.0 c	3.0 c	3.8 b	3.7 ^{NS}	5.0 ^{NS}	5.3 ^{NS}	4.0 b	1.7 c	1.0 b	3.4 b	3.6 b
French dwarf—double orange class															
Bonanza Orange	5.3	5.7	5.3 ab	5.0 b	5.0 ab	4.3 a	5.1 ab	4.7 ab	6.0 a	6.0 a	5.0 a-c	4.7 a-c	4.3 a	5.1 a	5.1 ab
Orange Boy	6.0	6.3	6.7 a	6.7 a	5.7 a	4.3 a	5.9 a	3.3 c	5.0 bc	6.0 a	6.0 a	5.3 a	5.0 ab	5.2 a	5.5 a
Orange Gate	5.0	5.0	5.0 a-c	4.7 b	4.7 a	4.7 a	4.8 ab	3.3 c	4.7 bc	5.7 ab	5.7 ab	4.7 a-c	4.3 ab	4.6 c	4.8 b
Girl Orange	4.7	5.0	4.7 b-d	4.7 b	4.3 b	4.7 a	4.7 b	5.0 ab	6.0 a	6.0 a	5.3 a-c	5.0 ab	5.0 ab	5.3 a	5.0 ab
Hero Orange	5.0	5.0	5.3 ab	5.3 b	5.3 ab	5.3 a	5.2 ab	3.3 c	4.3 c	5.0 c	5.0 a-c	5.3 a	4.7 ab	4.7 bc	4.9 ab
Orange Jacket	5.0	5.3	5.0 a-c	4.7 b	4.7 ab	4.3 a	4.8 ab	5.3 ab	6.0 a	6.0 a	5.0 a-c	4.3 bc	4.3 ab	5.1 ab	5.0 ab
Little Hero Orange	5.0	5.0	4.7 b-d	4.7 b	4.7 ab	4.7 a	4.8 ab	4.7 ab	5.3 ab	5.3 bc	4.7 bc	4.7 a-c	4.0 ab	4.8 a-c	4.8 b
Safari Orange Improved	5.7	4.3	3.3 cd	2.0 c	1.7 c	1.3 b	3.1 c	4.3 bc	5.0 bc	5.0 c	4.3 c	2.7 d	2.0 c	4.5 d	3.5 c
Safari Tangerine	5.7 ^{NS}	4.3 ^{NS}	3.0 d	2.0 c	1.7 c	1.3 b	3.0 c	5.7 a	5.3 ab	5.3 bc	4.7 bc	4.0 c	3.7 b	4.3 c	3.9 c
French dwarf—double yellow class															
Bonanza Yellow Improved	4.3 b-d	4.7 bc	4.7 b	4.7 bc	4.3 b	4.0 c	4.4 b	2.3 d	4.0 bc	5.0 ab	5.0 a	4.3 b	4.7 ab	4.2 cd	4.3 b
Yellow Boy	5.3 ab	6.0 a	6.0 a	6.0 a	5.7 a	5.7 a	5.8 a	2.7 d	4.3 b	5.0 ab	5.3 a	6.0 a	5.3 a	4.9 a	5.3 a
Yellow Gate	3.0 ef	3.3 de	3.3 cd	3.0 de	2.7 c-d	2.3 d	2.9 d	4.0 bc	4.7 b	5.0 ab	2.7 d	1.3 f	1.7 f	3.3 e	3.1 d
Girl Primrose	5.0 bc	5.0 ab	5.0 b	4.7 bc	4.3 b	4.3 bc	4.7 b	6.3 a	6.0 a	5.7 a	5.0 a	4.0 b	4.3 bc	5.2 a	5.0 a
Hero Yellow	2.7 f	3.0 e	2.7 d	2.7 e	2.3 d	2.3 d	2.6 d	2.3 d	3.3 c	4.7 b	4.7 ab	3.7 bc	3.7 cd	3.4 e	3.2 d
Yellow Jacket	6.0 a	6.0 a	6.0 a	5.7 ab	5.7 a	5.3 ab	5.8 a	3.0 cd	4.0 bc	5.0 ab	5.0 a	5.3 a	5.3 a	4.7 ab	5.2 a
Little Hero Yellow	3.7 de	3.7 c-d	3.3 cd	3.3 de	3.0 c-d	3.0 cd	3.3 cd	6.0 a	5.7 a	5.0 ab	3.7 c	2.0 ef	2.3 ef	4.1 cd	3.7 c
Safari Primrose	4.0 cd	4.3 b-d	4.0 bc	4.0 cd	4.0 b	4.3 bc	4.1 bc	4.3 b	4.7 b	4.3 b	3.7 c	3.0 cd	2.7 e	3.4 d	3.9 cb
Safari Yellow	4.7 b-d	4.7 bc	4.7 b	4.0 cd	3.7 bc	3.3 cd	4.2 b	4.7 b	6.0 a	5.7 a	4.0 bc	2.7 de	3.0 de	4.3 bc	4.3 cb
French dwarf—double orange/red class															
Harmony Boy	5.3	5.7	5.7	5.7	5.3	5.0	5.4	3.7	5.0 b	5.0 b	5.7	5.7 a	5.3 a	5.1	5.3
Safari Bolero	5.0 ^{NS}	5.0 ^{NS}	5.0 ^{NS}	5.0 ^{NS}	5.0 ^{NS}	4.7 ^{NS}	4.9 ^{NS}	4.3 ^{NS}	6.0 a	6.0 a	5.0 ^{NS}	2.7 b	2.3 b	4.4 ^{NS}	4.7 ^{NS}
French dwarf—double red/gold class															
Golden Gate	4.3	4.3 b	4.3	4.3	4.0	3.3	4.1	4.0	5.0	5.0 b	5.0	4.3 a	4.0 a	4.4	4.3
Safari Queen	5.3	5.3 b	5.3	5.0	4.3	4.0	4.9	5.0	5.3	6.0 a	5.0	3.7 ab	2.3 b	4.6	4.7
Safari Red	5.7 ^{NS}	5.7 a	5.3 ^{NS}	5.0 ^{NS}	4.3 ^{NS}	3.7 ^{NS}	4.9 ^{NS}	4.7 ^{NS}	5.0 ^{NS}	6.0 a	5.0 ^{NS}	3.0 b	2.7 b	4.4 ^{NS}	4.7 ^{NS}

Table 2. Continued.

Cultivar	Foliage rating ^z							Flower rating ^y							Overall rating ^x
	27 Oct.	3 Nov.	10 Nov.	17 Nov.	23 Nov	1 Dec.	Avg	27 Oct.	3 Nov.	10 Nov.	17 Nov.	23 Nov	1 Dec.	Avg	
French dwarf—double red/orange class															
Hero Flame	5.7 ab	5.7	5.7	5.7	5.3	4.7	5.4	3.7 b	5.7	6.0	5.7	5.7	4.7 a	5.2 a	5.3
Hero Harmony	5.0 b	4.7	4.7	4.3	4.3	4.3	4.6	5.3 a	5.7	6.0	5.3	4.7	4.3 a	5.1 a	4.9
Safari Scarlet	6.0 a	6.0 ^{NS}	5.3 ^{NS}	4.3 ^{NS}	4.3 ^{NS}	3.3 ^{NS}	4.9 ^{NS}	4.7 ab	5.3 ^{NS}	6.0 ^{NS}	5.0 ^{NS}	3.3 ^{NS}	2.0 b	4.3 b	4.6 ^{NS}
French dwarf—double red/yellow class															
Bonanza Bee Improved	4.7	6.0	4.0	3.7 b	2.7	2.7	3.8	4.3 ab	5.0 ab	5.3 b	5.0	4.7	4.0 b	4.5 b	4.3
Bonanza Flame Improved	5.0	5.0	5.0	5.0 a	4.7	5.0	4.9	5.7 a	5.7 a	6.0 a	5.3	4.7	4.7 ab	5.2 a	5.1
Harmony Girl	4.7	5.0	5.0	5.3 a	5.0	5.0	5.0	4.7 a	5.7 a	6.0 a	4.7	4.3	4.0 b	5.0 ab	4.9
Hero Spry	4.3 ^{NS}	5.0 ^{NS}	4.7 ^{NS}	5.0 a	4.3 ^{NS}	4.3 ^{NS}	4.6 ^{NS}	3.0 b	4.3 b	5.0 b	5.3 ^{NS}	5.3 ^{NS}	5.3 a	4.7 b	4.7 ^{NS}
French dwarf—double yellow/red class															
Spry Boy	5.3 a	5.7 a	6.0 a	6.0 a	5.7 a	5.3 a	5.7 a	4.0 b	5.3	6.0	6.0 a	6.0 a	5.3 a	5.4 a	5.6 a
Girl Spry	4.0 b	3.3 b	3.0 b	2.3 c	2.0 c	1.7 c	2.7 c	5.7 a	5.7	5.7	5.0 b	4.3 b	4.3 ab	4.7 b	3.9 b
Hero Bee	3.7 b	3.7 b	3.7 b	3.7 b	3.7 b	3.3 b	3.6 b	4.3 b	4.7	5.3	5.0 b	4.3 b	3.7 b	4.3 b	4.1 b
Little Hero Fire	3.7 b	4.0 b	4.3 b	3.7 b	3.7 b	3.7 b	3.8 b	4.3 b	5.0 ^{NS}	5.0 ^{NS}	5.0 b	5.0 ab	5.0 b	4.7 b	4.4 b
French—double gold class															
Durango Gold	6.0 a	5.7	5.0	3.7 b	2.7 b	1.3	4.1 b	5.0 a	5.0	5.7	5.0 b	3.7 b	3.0 b	4.3 b	4.3 b
Legend Gold	5.0 b	6.0 ^{NS}	6.0 ^{NS}	6.0 a	4.7 a	4.0 ^{NS}	5.3 a	4.7 b	5.7 ^{NS}	6.0 ^{NS}	6.0 a	5.3 a	5.0 a	5.4 a	5.4 a
French—double orange class															
Hyper Orange	3.3 b	3.7 b	4.3	4.3	4.3	4.7	4.1	3.7	5.0	5.7	5.0	5.3	5.0	4.8	4.5 b
Legend Orange Improved	6.0 a	5.3 a	5.3 ^{NS}	5.3 ^{NS}	4.3 ^{NS}	4.0 ^{NS}	5.1 ^{NS}	5.3 ^{NS}	5.3 ^{NS}	6.0 ^{NS}	5.7 ^{NS}	5.0 ^{NS}	4.7 ^{NS}	5.3 ^{NS}	5.2 a
French—double yellow class															
Durango Light Yellow	4.0	4.7	5.3	4.3	4.0	3.3	4.3	3.0 a	3.7 b	5.0 b	5.0	3.3 b	3.3 b	3.8 b	4.1
Durango Yellow	3.7	4.0	4.0 ^{NS}	4.0	4.0	4.0	3.9	4.0 ab	5.3 a	5.3 b	4.3	3.0 b	3.3 b	4.2 b	4.1
Hyper Yellow	3.7	4.7	4.0	3.7	3.3	3.0	3.7	5.3 a	6.0 a	6.0 a	5.3	5.0 a	5.0 a	5.2 a	4.6
Legend Yellow	5.3 ^{NS}	5.3 ^{NS}	5.0 ^{NS}	3.7 ^{NS}	3.3 ^{NS}	2.0 ^{NS}	4.1 ^{NS}	5.0 a	5.7 a	6.0 a	5.7 ^{NS}	3.0 b	2.3 b	4.3 b	4.4 ^{NS}
French—double red/yellow class															
Durango Bee	5.0	5.3	5.7	5.7	5.3 a	5.3 a	5.4	2.7 c	4.7 ab	6.0 a	6.0 a	4.7 b	4.7 a	4.7 a	5.1
Durango Red	5.3	5.3	5.0	5.0	5.0 ab	5.0 ab	5.1	4.0 b	5.3 a	5.7 a	5.0 a	5.0 b	4.3 a	4.9 a	5.0
Honeycomb	4.7	5.3	5.7	5.7	5.7 a	5.7 a	5.4	1.0 db	2.7 b	4.7 b	5.3 b	5.7 a	5.0 a	4.1 b	4.8
Hyper Red/Yellow	5.0 ^{NS}	5.0 ^{NS}	5.0 ^{NS}	4.7 ^{NS}	4.0 b	4.0 b	4.6 ^{NS}	5.7 a	6.0 a	6.0 a ^{NS}	5.0 b ^{NS}	4.7 b	4.7 a ^{NS}	5.3 a	5.0 ^{NS}

^zFoliage ratings on a 1 to 7 scale: 7 = all plants in a plot had full and uniform foliage, plants were free of pest symptoms and abnormalities or weaknesses such as lodging; 4 = average foliage density, minimal lodging, and/or some insect damage but foliage was still acceptable; 1 = foliage sparse, stem lodging, and/or unacceptable pest damage making plants undesirable.

^yFlower ratings on a 1 to 7 scale: 7 = flowers were numerous, uniformly distributed over all plants, flowers were free from pest symptoms; 4 = average floral display, may have some pest damage but not severe enough to cause flowers to be unacceptable; and 1 = unacceptable flower number or display, and/or pest damage severe resulting in unattractive flowers.

^xOverall rating: Sum of average flower and foliage ratings divided by 2, where cultivars >5 were considered outstanding, 4 to 4.9 as good performers, and <3.9 as fair to poor.

^wMean separation within classes by least significant difference (LSD) at $P < 0.05$.

^{NS}Nonsignificant.

for ‘Red Marietta’. Flower diameters were from 4.8 cm (1.9 inches) for ‘Disco Queen’ to 5.3 cm (2.1 inches) for ‘Red Marietta’. ‘Disco Flame’ and ‘Red Marietta’ had significantly better average foliage (5.0 and 5.6, respectively) and combined (5.0 and 4.9, respectively) ratings. All members of the class had good flower ratings to 10 Nov. (5.0 to 6.0), and ‘Disco Queen’ (6.0) had a very good flower rating on 27 Oct. However, the flower rating averages for ‘Disco Flame’ (6.0) and ‘Red Marietta’ (5.7) were significantly better than ‘Disco Queen’ and ‘Red Cherry Improved’ on 10 Nov., and the latter cultivar ratings decreased rapidly for the rest of the test.

FRENCH DWARF—DOUBLE GOLD CLASS. Plant height ranged from 24 cm (9.4 inches) for ‘Girl Gold’ to 35 cm (13.8 inches) for ‘Hero Gold’. Plant width ranged from 35 cm (13.8 inches) for ‘Girl Gold’ to 45 cm (17.7 inches) for ‘Bonanza Gold Improved’. Flower diameter ranged from 3.9 cm (1.5 inches) for ‘Golden Boy’ to 6.0 cm (2.4

inches) for ‘Safari Gold Improved’. ‘Golden Boy’ (5.6) and ‘Hero Gold’ (5.4) had good foliage ratings all season. ‘Safari Gold Improved’ (3.7) was the only member of this class that failed to have good flower ratings on 17 Nov. It also had a low average foliage (3.8) and flower (3.4) ratings.

FRENCH DWARF—DOUBLE ORANGE CLASS. Plant height was 24 cm (9.4 inches) for ‘Little Hero Orange’ to 37 cm (14.6 inches) for ‘Safari Tangerine’. Plant width ranged from 37 cm (14.6 inches) for ‘Little Hero Orange’ to 54 cm (21.3 inches) for ‘Safari Tangerine’. Flower diameters were from 4.0 cm (1.6 inches) for ‘Orange Boy’ to 6.2 cm (2.4 inches) for ‘Hero Orange’. Most cultivars had good foliage and flowers ratings for the entire evaluation period except for ‘Safari Orange Improved’ (3.1, 3.5) and ‘Safari Tangerine’ (3.0, 3.9) with poor average foliage and flower ratings, respectively.

FRENCH DWARF—DOUBLE YELLOW CLASS. Plant height ranged from 23 cm (9.1 inches) for ‘Little Hero Yellow’ to

36 cm (14.2 inches) for ‘Yellow Jacket’ and ‘Safari Primrose’. Plant width ranged from 38 cm (15.0 inches) for ‘Little Hero Yellow’ to 47 cm (18.5 inches) for ‘Yellow Jacket’. Flower diameters were from 4.1 cm (1.6 inches) for ‘Yellow Boy’ to 6.0 cm (2.4 inches) for ‘Safari Yellow’. ‘Yellow Boy’ and ‘Yellow Jacket’ received high average foliage (5.8) and flower ratings (4.7 to 4.9). ‘Girl Primrose’ (5.2) had higher flower ratings with good but significantly lower foliage ratings (4.7) than the former cultivars. ‘Yellow Boy’ (5.3), ‘Yellow Jacket’ (5.2) and ‘Girl Primrose’ (5.0) had significantly higher overall ratings than other cultivars in the class.

FRENCH DWARF—DOUBLE ORANGE/RED CLASS. Plant heights [29 cm (11.4 inches) and 35 cm (13.8 inches)] and widths [41 cm (16.1 inches) and 45 cm (17.7 inches)] were similar for the two cultivars ‘Harmony Boy’ and ‘Safari Bolero’, respectively. ‘Safari Bolero’ [6.3 cm (2.4 inches)] had significantly larger flowers than ‘Harmony Boy’ [4.0 cm (1.6 inches)]. Foliage and overall ratings were

not significantly different at all evaluations. 'Safari Bolero' (6.0) had significantly better flower ratings than 'Harmony Boy' (5.0) early in the season (3 Nov. and 10 Nov.), but 'Harmony Boy' (5.7 and 5.3) had better flower ratings than 'Safari Bolero' (2.7 and 2.3) later in the season (23 Nov. and 1 Dec., respectively).

FRENCH DWARF—DOUBLE RED/GOLD CLASS. Plant height ranged from 32 cm (12.6 inches) for 'Golden Gate' to 36 cm (14.2 inches) for 'Safari Queen' and 'Safari Red'. Plant width ranged from 42 cm (16.5 inches) for 'Golden Gate' to 47 cm (18.5 inches) for 'Safari Red', and flower diameters were 6.0 to 6.1 cm (2.4 inches) for 'Golden Gate', 'Safari Queen', 'Safari Red', but neither the differences in plant width nor flower diameter were significantly different. Foliage ratings were not significantly different among cultivars in all evaluations. 'Golden Gate' (5.0), 'Safari Queen' (6.0 to 5.0) and 'Safari Red' (6.0 to 5.0) had good to very good flower ratings between 3 Nov and 10 Nov., but ratings quickly dropped after that period.

FRENCH DWARF—DOUBLE RED/ORANGE CLASS. Plant height ranged from 30 cm (11.8 inches) for 'Hero Harmony' to 41 cm (16.1 inches) for 'Safari Scarlet'. Plant width ranged from 40 cm (15.7 inches) for 'Hero Harmony' to 49 cm (19.3 inches) for 'Safari Scarlet'. Flower diameters were similar ranging from 5.2 cm (2.0 inches) for 'Hero Harmony' to 6.2 cm (2.4 inches) for 'Safari Scarlet'. Foliage ratings were not significantly different for cultivars in this class for all evaluations. 'Hero Harmony' (5.3) and 'Safari Scarlet' (4.7) had higher flower ratings than 'Hero Flame' (3.7) on 27 Oct. However, average flower ratings for 'Hero Flame' (5.2) and 'Hero Harmony' (5.1) were higher than those of 'Safari Scarlet' (4.3) by the end of the test.

FRENCH DWARF—DOUBLE RED/YELLOW CLASS. Plant height ranged from 27 cm (10.6 inches) for 'Bonanza Flame Improved' and 'Harmony Girl' to 30 cm (11.8 inches) for 'Bonanza Bee Improved' and 'Hero Spry'. Plant widths were not significantly different at 37 cm (14.6 inches) for 'Harmony Girl' to 45 cm (17.7 inches) for 'Bonanza Bee Improved'. Flower diameter ranged from 4.7 cm (1.9 inches) for 'Hero Spry' to 5.9 cm (2.3 inches) for 'Harmony Girl'. Foliage ratings were similar for all evaluations except 'Bonanza Bee Improved' (3.7) had low foliage ratings on 10 Nov. Flower ratings were good

on 10 Nov. for 'Bonanza Bee Improved' (5.3) and 'Hero Spry', while they were very good for 'Bonanza Flame Improved' (6.0) and 'Harmony Girl' (6.0).

FRENCH DWARF—DOUBLE YELLOW/RED CLASS. Plant height ranged from 24 cm (9.4 inches) for 'Girl Spry', 'Hero Bee', and 'Little Hero Fire' to 32 cm (12.6 inches) for 'Spry Boy'. Plant widths were not significantly different and ranged from 36 cm (14.2 inches) for 'Hero Bee' to 42 cm (16.5 inches) for 'Spry Boy' and 'Little Hero Fire'. Flower diameter ranged from 4.0 cm (1.6 inches) for 'Boy Spry' to 5.7 cm (2.2 inches) for 'Hero Bee'. Average foliage ratings for 'Spry Boy' (5.7) were significantly better than 'Girl Spry' (2.7), 'Hero Bee' (3.6), and 'Little Hero Fire' (3.8). Average flower ratings were also higher for 'Spry Boy' (5.4) than 'Girl Spry' (4.7), 'Hero Bee' (4.3), and 'Little Hero Fire' (4.7). Every weekly foliage and flower rating for 'Spry Boy' was better than the other cultivars in the class except on 27 Oct. The flower rating for 'Girl Spry' (5.7) was the best on 27 Oct, indicating a superior early performer.

FRENCH—DOUBLE GOLD CLASS. 'Durango Gold' [42 cm (16.5 inches)] was significantly taller than 'Legend Gold' [34 cm (13.4 inches)]. Plant width was also significantly greater for 'Durango Gold' (49 cm; 19.3 inches) than for 'Legend Gold' (46 cm; 18.1 inches). Flower diameter for 'Durango Gold' (7.0 cm; 2.8 inches) was significantly greater than 'Legend Gold' (5.0 cm; 2.0 inches). 'Durango Gold' had significantly higher foliage (6.0) and flower (5.0) ratings Oct. 27 than 'Legend Gold'. However, 'Legend Gold' had significantly higher foliage (4.0 to 6.0) and flower (5.0 to 6.0) ratings on Nov. 17 and 23, and a significantly higher overall rating (5.4) than 'Durango Gold' (4.3).

FRENCH—DOUBLE ORANGE CLASS. Plant height was 24 cm (9.4 inches) for 'Hyper Orange' and 36 cm (14.2 inches) for 'Legend Orange Improved'. Plant widths were 36 (14.2 inches) for 'Hyper Orange' and 47 cm (18.5 inches) for 'Legend Orange Improved'. Flower diameters were not significantly different at 4.6 cm (1.8 inches) for 'Hyper Orange' and 5.0 cm (2.0 inches) for 'Legend Orange Improved'. 'Legend Orange Improved' had significantly better foliage ratings 23 Oct. (6.0) and 3 Nov. (5.3) compared to 'Hyper Orange' ratings of 3.3 and 3.7 for those dates. Flower ratings were not signifi-

cantly different for all evaluations. Overall ratings were higher for 'Legend Orange Improved' (5.2) compared to 'Hyper Orange' (4.5).

FRENCH—DOUBLE YELLOW CLASS. 'Durango Light Yellow' was 40 cm (15.7 inches) tall and was significantly taller than 'Durango Yellow' and 'Hyper Yellow' at 28 cm (11.0 inches), and 'Legend Yellow' at 31 cm (12.2 inches). 'Durango Light Yellow' flowers (6.0 cm; 2.4 inches) were significantly wider than 'Durango Yellow' (3.7 cm; 1.5 inches), but similar to the other cultivars in this class. There were no significant differences in foliage ratings for all evaluations of these cultivars. The average flower rating for 'Hyper Yellow' (5.2) was significantly better than the ratings for other cultivars in the class, which ranged from 3.8 to 4.3.

FRENCH—DOUBLE RED/YELLOW CLASS. Plant height ranged from 26 cm (10.2 inches) for 'Hyper Red/Yellow' to 34 cm (13.4 inches) for 'Honeycomb'. Plant widths were not significantly different. Flower diameter was 5.7 cm (2.2 inches) for 'Durango Bee' and 'Durango Red', 4.0 cm (1.6 inches) for 'Hyper Red/Yellow', and 5.4 cm (2.1 inches) for 'Honeycomb'. The average flower rating was significantly lower for 'Honeycomb'. However, the overall ratings were not significantly different for the members of this class.

Selecting outstanding cultivars

While early or late season performance, a particular plant height, or shade of the same color may be a selection criteria outweighing seasonal performance, the overall ratings (combined foliage and flower ratings) represent the best view of performance for each cultivar in its class over the entire season. We considered cultivars with an overall rating ≥ 5 as outstanding, 4 to 4.9 as good performers, and ≤ 3.9 as fair to poor. The following is a summary of overall performance by class. African dwarf—orange class: 'Pumpkin Crush' and 'Discovery Orange' performed poorly; African gold class: seven of the eight cultivars were good to outstanding, only 'Sunspot Gold' had poor ratings; African—orange class: 'Mesa Orange' and 'Royal Orange' had outstanding performance ratings, and 'Antigua Orange' and 'Inca Orange' had similar good ratings. 'Sunspot Orange' was the poorest in its class; African—yellow class: 'Inca Yellow', 'Mesa Yellow', and 'Per-

fection Yellow' had outstanding performance ratings, and 'American Indian Yellow' had a similar good rating, while 'Marvel Yellow' performed poorly; French dwarf—single gold/red class: 'Disco Granada' and Disco Marietta' were similar with good to outstanding performance; French dwarf—single red/gold class: 'Disco Flame' and 'Red Marietta' were outstanding; French dwarf—double gold class: 'Golden Boy' and 'Hero Gold' were outstanding and similar to 'Bonanza Gold Improved' and 'Girl Gold'; French dwarf—double orange class: seven of the nine cultivars in this group were good to outstanding, only 'Safari Orange Improved' and 'Safari Tangerine' were fair; French dwarf—double yellow class: 'Yellow Boy', 'Girl Primrose' and 'Jacket Yellow' were outstanding in the class of nine; French dwarf—double bicolor class: cultivars were not significantly different within the orange/red, red/gold red/orange and red/yellow classes, but the yellow/red, 'Spry Boy' received the highest rating within that class; French double—gold class: 'Legend Gold' was outstanding, while 'Durango Gold' had a good rating; French—double orange class: 'Legend Orange Improved' was outstanding; French—double yellow class: 'Durango Light Yellow', 'Durango Yel-

low', 'Hyper Yellow' and 'Legend Yellow' had good ratings; French—double red/yellow class: 'Durango Bee', 'Durango Red' and 'Hyper Red/Yellow' had outstanding ratings, while 'Honeycomb' had a good rating.

Those cultivars with the highest overall rating in their class will be considered as standards for comparison with new releases in future tests, thus eliminating the need for reevaluation of so many cultivars. While our irrigation/soil type/fertilization practices may not represent cultural practices in other landscape situations, our choice of these growing conditions was to provide uniform and satisfactory nutrients and moisture to allow for outstanding growth and flowering of marigolds. Soil amendments and irrigation are typically used in bedding plant trials (Pemberton and Roberson, 2001), and indeed most gardeners and landscapers modify their soil and provide irrigation/fertilizer to maximize growth and flowering. Thus, performance evaluations for bedding plants are more likely influenced by climatic conditions than by culture. We believe these performance evaluations would provide useful information for the bedding plant industry in the southeastern United States or other parts of the world with similar climatic conditions.

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