

Evaluation of Impatiens Cultivars as Bedding Plants – Spring 2001

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Summary. We evaluated 26 cultivars of *Impatiens walleriana* Hook. f. (syn. *I. sultana* Hook. f.) (impatiens or sultana) in replicated class tests at the University of Florida Gulf Coast Research and Education Center at Bradenton, Fla. [lat. 27.4 N, long. 82.5 W; AHS Heat Zone 10; USDA (American Horticultural Society, 1999); USDA Cold Hardiness Zone 9b (U. S. National Arboretum, 1990) in the spring of 2001. In this report we provided objective plant measurements of vegetative and flower characteristics, earliness of flowering, flower divergence (Table 1), as well as 2 subjective ratings (early and late May) that permit readers to evaluate foliage and flower characteristics (Table 2, sprayed field) and the affects of pests (Tables 3 and 4, unsprayed field) at different times during the season, and to evaluate performance over time. Subjective ratings were on a scale from 1 to 7 with the highest rating of 7 for excellent. Cultivar performance in this trial was good in most classes; no cultivar exhibited poor overall performance. As a result, cultivar performance standards were very high in this trial, with adjusted overall performance ratings > 6.0 being considered outstanding, 5.5-5.9 as very good, 5.4-5.0 as good and 4.0-4.9 as fair, and < 4.0 as poor. Cultivars were grouped into classes based on flower type (the doubles class combines semi and full doubles together; all “doubles” in this trial are semi doubles) and flower color, and are listed here by performance within class. **Outstanding** cultivars (> 6.0) were: ‘**Super Elfin Deep Pink**’ (single flower – pink shades/tints class); ‘**Dazzler Blue Pearl**’ and ‘**Super Elfin Blue Pearl**’ (single flower – purple, blue-violet shades/tints class); and ‘**Stardust Rose Improved**’ (single flower – rose/white shades/tints class). **Very Good** cultivars (5.5– 5.9) were: ‘**Fanciful Deep Coral**’ and ‘**Fanciful Salmon**’ (double flower – orange shades/tints class); ‘**Fanciful Red**’ (double flower – red class); ‘**Dazzler Star Mix**’, ‘**Showstopper Cotton Candy**’, and ‘**Tempo Crystal Mix**’ (single flower – mixes class); ‘**Dazzler Pink Improved**’ (single flower – pink class); ‘**Carnival Lavender Blue**’ (single flower – purple, blue-violet shades/tints class); ‘**Stardust Violet**’ (single flower – purple, red - violet/white shades/tints class); ‘**Super Elfin Ruby**’, ‘**Tempo Cinnamon**’, and ‘**Tempo Lipstick**’ (single flower – red shades/tints class);. **Good** cultivars (5.4-5.0) were: ‘**Fanciful Orchid Rose**’ (double flower – rose shades/tints class); ‘**Showstopper Tropical Flair Mix**’ and ‘**Tempo Butterfly Mix**’ (single flower – mixes class); ‘**Tempo Peach Butterfly**’ (single flower – orange shades/tints class); ‘**Stardust Salmon**’ (single flower – orange/white shades/tints class); ‘**Tempo Cherry Butterfly**’ and ‘**Tempo Strawberry Butterfly**’ (single flower – pink shades/tints class); ‘**Raspberry Swirl**’ and ‘**Tempo Lavender Butterfly**’ (single flower – purple, red – violet shades/tints class). The **Fair** cultivar (4.0-4.9) was ‘**Circus Orange White**’ (double flower – orange/white shades/tints class).

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INTRODUCTION

The United States wholesale value of floricultural crops was \$4.7 billion in 2001, estimated from growers with sales = (\$10,000; €10,248). Bedding and garden plants comprise 46% of the floriculture value at \$2.18 billion (€2.23 billion), (United States Department of Agriculture, 2002). Florida (\$101.6 million; €104.1 million) ranks fifth behind California (\$303.5 million; €311.0 million), Michigan (\$189.4 million; €194.1 million), Texas (\$187.2 million; €191.8 million), and Ohio (\$131.8 million; €135.1 million), who together generate 42% of the bedding/garden plant wholesale value. In the *1997 Census of Agriculture*, impatiens was ranked first (\$98.9 million; €101.3 million) and fourth (\$18.9 million; €19.4 million) in the United States for wholesale value in flat and pot culture, respectively. Today, the wholesale value of impatiens flats (\$117.5 million; €120.4 million) is second only to potted geraniums, which include both seed and cutting geraniums. (United States Department of Agriculture, 1998 and 2002). Most of the bedding plant variety trials currently conducted in the United States are performed without multiple experimental units replicated in an appropriate experimental design that allows statistical analysis, thus these variety trials provide results that are of questionable scientific merit. This study was conducted to evaluate impatiens performance in a seasonal replicated trial in order to provide timely evaluations that may be used by growers, landscapers, consumers and seed companies as well as the scientific community.

MATERIALS AND METHODS

Seeds of 26 cultivars of impatiens were sown between 6 and 13 Feb. into a soil mix containing peat and vermiculite (1:1, volumetric) prepared and amended with dolomite 11.3 lbs./yd³ (6.7 kg/m³), superphosphate 5.6 lbs./yd³ (3.3 kg/m³) and hydrated lime 2.8 lbs./yd³ (1.7 kg/m³) and used for seed germination at 72 to 75 °F (22 to 24 °C) in a growth room with a photosynthetic photon flux (PPF) of 30 μmol·m⁻²·s⁻¹ for 12 h from cool-white fluorescent lamps. Immediately after germination, seedlings were transplanted into Todd ® planter flats [model 128: 1.5 inches x 1.5 inches x 2.5 inches (3.8 cm x 3.8 cm x 6.4 cm) cells; Speedling Incorporated, P. O. Box 7220, Sun City, Florida] containing the same soil mix used in sowing, and placed into a screen-sided, fiberglass-covered greenhouse. Seedlings were fertilized with a 15N-0.87P-16.5K water soluble fertilizer (15-2-20 Ca-Mg Excel; Scotts Co., Maryville, Ohio) solution applied at the rate of 250 mg·L⁻¹ twice weekly.

On 13 Mar., plugs were transplanted into raised ground beds with five plants per plot,

with one plant in the center and four plants spaced 12 inches (30.5 cm) apart from it in a staggered layout in a saran covered structure with 30% shade. Beds were 32 inches (81.3 cm) wide x 6 inches (20.3 cm) high, spaced 6.5 ft (2 m) apart from center. Nutricote® 13N-5.7P-10.8 K fertilizer (13-13-13 100-d slow release type with micronutrients; Florikan, Sarasota, Florida) was applied by hand to each plant on the soil surface approximately an inch from the plant stem under the plastic mulch at 262 lb/row acre (294 kg·ha⁻¹) of nitrogen. Beds were fumigated > 14 d prior to 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. Irrigation water was supplied through two trickle tubes (Chapin Turbulent Twin-Wall®; Chapin Watermatics Inc., Watertown, NY.) placed on either side of the center plants.

Integrated pest management was employed to determine when pesticide applications were needed to control arthropod pests and plant pathogens. Temperature @ 2 ft (61.0 cm) during the remainder of the experiment ranged from a low of 3.8 °C (39 °F) to a high of 34.2 °C (94 °F) for the ratings period in the sprayed lands. Total rainfall of 35.1 cm (13.8 inches) occurred through 6 June. Only 0.02 cm (0.01 inches) fell in April. Three plants per plot were selected (7 May) from the center and edge of each plot, and the plant height (from the stem base to the inflorescence tip) and plant width were recorded for each plot. Plants in each plot were selected from the same positions in that plot. Days from sowing to first open flower and flower divergence were recorded. Flower divergence represents the number of days required for the first plant in a plot to unfurl the first flower to the last plant to unfurl its first flower in that plot. Subjective ratings for foliage and flower quality were made for each cultivar on 1 and 26 May. Average foliage and flower ratings represent relative cultivar quality within a class, measured in a field sprayed on demand, following pest scouting. Pest symptoms were rated on 2 and 26 May in an unsprayed field (simulating a homeowner environment). Where necessary, the causal agents were confirmed by a plant pathologist or entomologist. Each cultivar was rated on a 1 to 7 scale with the highest rating of 7 for excellent. Plant characteristics that merited a 7 were: (1) all plants in a plot had full and uniform foliage; (2) foliage and flowers were free of pest symptoms; (3) plants were free of abnormalities or weaknesses such as lodging; and (4) flowers were numerous and uniformly distributed over the plant.

In order to provide meaningful performance comparisons, cultivars were divided into classes based on color and plant growth habit. Color hues with similar shades and tints were grouped together into one class. The choice of best-of-class for 2001 was determined by comparing the adjusted overall performance ratings. This value was arrived at using the formula $OP = (Q + P)/2$, where Q = overall foliage/flower ratings (Table 2) and P = overall pest ratings (Table 4). $OP_{adj} = (Q + P_{adj})/2$, where $P_{adj} = P - (dp \times dpf)$; and where dp = number of dead plants/plot and dpf = dead plant factor. The value dpf = number plants per plot/highest rating possible (7). Impatiens dpf was 5 plants/7, or 0.71. It was necessary to use OP_{adj} , as opposed to OP, to account for plant loss due to soilborne pests. The cultivar with the highest adjusted overall performance received best-of-class honors. Differences in these ratings may not be statistically significant. If two or more cultivars had equal overall ratings, another rating category, such as overall

foliage/flower ratings (Table 2) was used to make the choice, and so forth, until a better performer was selected. This type of choice is necessary in order to select a single cultivar every season as the standard by which all others in the class may be compared in future seasons, thus limiting the number of cultivars necessary in a trial. If a class only contains one cultivar, that cultivar becomes the uncontested best-of-class.

Each class was analyzed as a separate experiment. A randomized complete block experimental design was used with three blocks each containing six plants that represented the experimental unit. 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, North Carolina).

RESULTS AND DISCUSSION

Double flower – orange/white shades/tints class. Plant height was 23 cm (9.1 inches) for 'Circus Orange White', plant width was 34 cm (13.4 inches), and flower diameter was 3.7 cm (1.5 inches). The first open flower was 6.2 d, and flower divergence was 6.7 d. The average foliage rating was 4.5, and the average flower rating was 2.7. The overall foliage/flower rating was 3.6. The overall foliage pest rating was 4.9, and the overall flower pest rating was 7.0. The overall foliage/flower pest rating was 5.9. The adjusted overall performance rating was 4.7. 'Circus Orange White' (Ball Seed) was best-of-class, uncontested.

Double flower – orange shades/tints class. Plant height ranged from 22 cm (8.7 inches) for 'Fanciful Deep Coral' to 23 cm (9.1 inches) for 'Fanciful Salmon'. Plant width ranged from 39 cm (15.4 inches) for 'Fanciful Deep Coral' to 38 cm (15.0 inches) for 'Fanciful Salmon'. Flower diameter ranged from 3.8 cm (1.5 inches) for 'Fanciful Deep Coral' to 4.0 cm (1.6 inches) for 'Fanciful Salmon'. The first open flower ranged from 66 d for 'Fanciful Deep Coral' to 55 d for 'Fanciful Salmon'. Flower divergence ranged from 7.3 d for 'Fanciful Deep Coral' to 13.0 d for 'Fanciful Salmon'. Average foliage ratings ranged from 5.8 for 'Fanciful Salmon' to 6.0 for 'Fanciful Deep Coral'. Average flower ratings ranged from 4.0 for 'Fanciful Deep Coral' to 4.3 for 'Fanciful Salmon'. Overall foliage/flower ratings ranged from 5.0 for 'Fanciful Deep Coral' to 5.1 for 'Fanciful Salmon'. Overall foliage pest ratings ranged from 5.9 for 'Fanciful Salmon' to 6.1 for 'Fanciful Deep Coral'. The overall flower pest rating was 5.6 for 'Fanciful Deep Coral' and 'Fanciful Salmon'. Overall foliage/flower pest ratings ranged from 6.4 for 'Fanciful Salmon' to 6.5 for 'Fanciful Deep Coral'. The adjusted overall performance rating was 5.8 for 'Fanciful Deep Coral' and 'Fanciful Salmon'. 'Fanciful Salmon' (Ball Seed) was best-of-class, based on the overall foliage/flower rating.

Double flower – red class. Plant height was 21 cm (8.3 inches) for 'Fanciful Red', plant width was 35 cm (13.8 inches), and flower diameter was 4.1 cm (1.6 inches). The first open flower was 59 d, and flower divergence was 9.7 d. The average foliage rating was 5.8, and the average flower rating was 4.5. The overall foliage/flower rating was 5.2. The overall foliage pest rating was 6.2, and the overall flower pest rating was 7.0. The overall foliage/flower pest rating was 6.3. The adjusted overall performance rating was 5.3. 'Fanciful Red' (Ball Seed) was best-of-class, uncontested.

Double flower – rose shades/tints class. Plant height was 19 cm (7.5 inches) for

'Fanciful Orchid Rose', plant width was 32 cm (12.6 inches), and flower diameter was 3.9 cm (1.5 inches). The first open flower was 64 d, and flower divergence was 6.3 d. The average foliage rating was 5.2, and the average flower rating was 3.8. The overall foliage/flower rating was 4.5. The overall foliage pest rating was 5.6, and the overall flower pest rating was 7.0. The overall foliage/flower pest rating was 6.3. The adjusted overall performance rating was 5.3. 'Fanciful Orchid Rose' (Ball Seed) was best-of-class, uncontested.

Single flower – mixes class. Plant height ranged from 17 cm (6.7 inches) for 'Dazzler Star Mix', 'Showstopper Cotton Candy', 'Tempo Butterfly Mix' and 'Tempo Crystal Mix' to 21 cm (8.3 inches) for 'Showstopper Tropical Flair Mix'. Plant width ranged from 35 cm (13.8 inches) for 'Tempo Crystal Mix' to 43 cm (16.9 inches) for 'Showstopper Tropical Flair Mix'. Flower diameter ranged from 4.5 cm (1.8 inches) for 'Dazzler Star Mix' to 4.8 cm (1.9 inches) for 'Tempo Butterfly Mix' and 'Tempo Crystal Mix'. The first open flower ranged from 53 d for 'Tempo Butterfly Mix' to 55 d for 'Tempo Crystal Mix'. Flower divergence ranged from 4.7 d for 'Tempo Butterfly Mix' to 13.0 d for 'Showstopper Cotton Candy'. Average foliage ratings ranged from 4.7 for 'Showstopper Tropical Flair Mix' to 5.2 for 'Dazzler Star Mix', 'Showstopper Tropical Flair Mix' and 'Dazzler Star Mix'. Average flower ratings ranged from 4.3 for 'Dazzler Star Mix' to 5.0 for 'Showstopper Cotton Candy' and 'Tempo Crystal Mix'. Overall foliage/flower ratings ranged from 4.7 for 'Showstopper Tropical Flair Mix' to 5.4 for 'Tempo Butterfly Mix. Overall foliage pest ratings ranged from 5.3 for 'Tempo Butterfly Mix' to 6.2 for 'Showstopper Cotton Candy'. Overall flower pest ratings ranged from 6.8 for 'Dazzler Star Mix' and 'Tempo Butterfly Mix' to 6.9 for 'Showstopper Cotton Candy', 'Showstopper Tropical Flair Mix', and 'Tempo Crystal Mix'. Overall foliage/flower pest ratings ranged from 6.0 for 'Tempo Butterfly Mix' to 6.5 for 'Showstopper Cotton Candy'. The adjusted overall performance ratings ranged from 5.1 for 'Tempo Butterfly Mix' to 5.8 for 'Showstopper Cotton Candy' and 'Tempo Crystal Mix'. 'Showstopper Cotton Candy' (Ball Seed) was best-of-class, based on the overall foliage/flower pest rating..6

Single flower – orange shades/tints class. Plant height was 91 cm (35.8 inches) for 'Tempo Peach Butterfly', plant width was 32 cm (12.6 inches), and flower diameter was 3.9 cm (1.5 inches). The first open flower was 58 d, and flower divergence was 3.0 d. The average foliage rating was 4.5, and the average flower rating was 4.3. The overall foliage/flower rating was 4.5. The overall foliage pest rating was 5.8, and the overall flower pest rating was 7.0. The overall foliage/flower pest rating was 6.4. The adjusted overall performance rating was 5.3. 'Tempo Peach Butterfly' (Bodger Seeds) was best-of-class, uncontested.

Single flower – orange/white shades/tints class. Plant height was 16 cm (6.3 inches) for 'Stardust Salmon', plant width was 36 cm (14.2 inches), and flower diameter was 4.3 cm (1.7 inches). The first open flower was 55 d, and flower divergence was 14.0 d. The average foliage rating was 5.5, and the average flower rating was 4.5. The overall foliage/flower rating was 5.0. The overall foliage pest rating was 5.0, and the overall flower pest rating was 5.8. The overall foliage/flower pest rating was 5.9. The adjusted overall performance rating was 5.4. 'Stardust Salmon' (PanAmerican Seed) was best-of-class, uncontested.

Single flower – pink class. Plant height was 17 cm (6.7 inches) for ‘Dazzler Pink Improved’, plant width was 40 cm (15.7 inches), and flower diameter was 4.7 cm (1.9 inches). The first open flower was 52 d, and flower divergence was 13.0 d. The average foliage rating was 5.3, and the average flower rating was 5.2. The overall foliage/flower rating was 5.3. The overall foliage pest rating was 5.7, and the overall flower pest rating was 7.0. The overall foliage/flower pest rating was 6.3. The adjusted overall performance rating was 5.8. ‘Dazzler Pink Improved’ (Ball Seed) was best-of-class, uncontested.

Single flower – pink shades/tints class. Plant height ranged from 14 cm (5.5 inches) for ‘Tempo Cherry Butterfly’ to 17 cm (6.7 inches) for ‘Super Elfin Deep Pink’. Plant width ranged from 32 cm (12.6 inches) for ‘Tempo Cherry Butterfly’ to 36 cm (14.2 inches) for ‘Super Elfin Deep Pink’. Flower diameter ranged from 4.5 cm (1.8 inches) for ‘Tempo Strawberry Butterfly’ to 5.1 cm (2.0 inches) for ‘Super Elfin Deep Pink’. The first open flower ranged from 54 d for ‘Tempo Strawberry Butterfly’ to 56 d for ‘Super Elfin Deep Pink’ and ‘Tempo Cherry Butterfly’. Flower divergence ranged from 5.3 d for ‘Tempo Cherry Butterfly’ to 10.0 d for ‘Super Elfin Deep Pink’. Average foliage ratings ranged from 4.2 for ‘Tempo Cherry Butterfly’ to 5.8 for ‘Super Elfin Deep Pink’. Average flower ratings ranged from 3.8 for ‘Tempo Cherry Butterfly’ to 5.2 for ‘Super Elfin Deep Pink’. Overall foliage/flower ratings ranged from 4.0 for ‘Tempo Cherry Butterfly’ to 5.5 for ‘Super Elfin Deep Pink’. Overall foliage pest ratings ranged from 5.8 for ‘Super Elfin Deep Pink’ to 6.3 for ‘Tempo Cherry Butterfly’ and ‘Tempo Strawberry Butterfly’. Overall flower pest ratings ranged from 6.6 for ‘Tempo Cherry Butterfly’ to 7.0 for ‘Super Elfin Deep Pink’. Overall foliage/flower pest ratings ranged from 6.4 for ‘Super Elfin Deep Pink’ and ‘Tempo Cherry Butterfly’ to 6.6 for ‘Tempo Strawberry Butterfly’. The adjusted overall performance ratings ranged from 5.1 for ‘Tempo Cherry Butterfly’ to 6.0 for ‘Super Elfin Deep Pink’. ‘Super Elfin Deep Pink’ (PanAmerican Seed) was best-of-class.

Single flower – purple, blue-violet shades/tints class. Plant height ranged from 16 cm (6.3 inches) for ‘Super Elfin Blue Pearl’ to 18 cm (7.1 inches) for ‘Carnival Lavender Blue’ and ‘Dazzler Blue Pearl’. Plant width ranged from 38 cm (15.0 inches) for ‘Super Elfin Blue Pearl’ to 41 cm (16.1 inches) for ‘Dazzler Blue Pearl’. Flower diameter ranged from 4.6 cm (1.8 inches) for ‘Dazzler Blue Pearl’ and ‘Super Elfin Blue Pearl’ to 4.8 cm (1.9 inches) for ‘Carnival Lavender Blue’. The first open flower was 54 d for ‘Carnival Lavender Blue’, ‘Dazzler Blue Pearl’ and ‘Super Elfin Blue Pearl’. Flower divergence ranged from 27.0 d for ‘Carnival Lavender Blue’ to 6.0 d for ‘Super Elfin Blue Pearl’. Average foliage ratings ranged from 5.5 for ‘Carnival Lavender Blue’ to 6.0 for ‘Dazzler Blue Pearl’. Average flower ratings ranged from 4.8 for ‘Carnival Lavender Blue’ to 5.8 for ‘Super Elfin Blue Pearl’. Overall foliage/flower ratings ranged from 5.2 for ‘Carnival Lavender Blue’ to 5.9 for ‘Super Elfin Blue Pearl’. Overall foliage pest ratings ranged from 5.7 for ‘Super Elfin Blue Pearl’ to 5.9 for ‘Dazzler Blue Pearl’. Overall flower pest ratings were 6.8 for ‘Carnival Lavender Blue’, ‘Dazzler Blue Pearl’ and ‘Super Elfin Blue Pearl’. Overall foliage/flower pest ratings ranged from 6.2 for ‘Super Elfin Blue Pearl’ to 6.3 for ‘Carnival Lavender Blue’ and ‘Dazzler Blue Pearl’. The adjusted overall performance ratings ranged from 5.8 for ‘Carnival Lavender Blue’ to 6.1 for ‘Super Elfin Blue Pearl’. ‘Super Elfin Blue Pearl’ (PanAmerican Seed) was best-of-class.

Single flower – purple, red – violet shades/tints class. Plant height ranged from 16 cm (6.3 inches) for ‘Raspberry Swirl’ to 17 cm (6.7 inches) for ‘Tempo Lavender Butterfly’. Plant width ranged from 37 cm (14.6 inches) for ‘Raspberry Swirl’ to 38 cm (15.0 inches) for ‘Tempo Lavender Butterfly’. Flower diameter ranged from 4.6 cm (1.8 inches) for ‘Raspberry Swirl’ to 5.0 cm (2.0 inches) for ‘Tempo Lavender Butterfly’. The first open flower ranged from 50 d for ‘Raspberry Swirl’ to 55 d for ‘Tempo Lavender Butterfly’. Flower divergence ranged from 3.0 d for ‘Tempo Lavender Butterfly’ to 8.0 d for ‘Raspberry Swirl’. Average foliage ratings ranged from 3.7 for ‘Tempo Lavender Butterfly’ to 4.5 for ‘Raspberry Swirl’. The average flower rating was 4.7 for ‘Raspberry Swirl’ and ‘Tempo Lavender Butterfly’. Overall foliage/flower ratings ranged from 4.2 for ‘Tempo Lavender Butterfly’ to 4.6 for ‘Raspberry Swirl’. Overall foliage pest ratings ranged from 4.9 for ‘Raspberry Swirl’ to 6.2 for ‘Tempo Lavender Butterfly’. Overall flower pest ratings ranged from 6.9 for ‘Tempo Lavender Butterfly’ to 7.0 for ‘Raspberry Swirl’. Overall foliage/flower pest ratings ranged from 6.0 for ‘Raspberry Swirl’ to 6.5 for ‘Tempo Lavender Butterfly’. The adjusted overall performance ratings ranged from 5.2 for ‘Raspberry Swirl’ to 5.3 for ‘Tempo Lavender Butterfly’. ‘Tempo Lavender Butterfly’ (Bodger Seeds) was best-of-class.

Single flower – purple, red - violet/white shades/tints class. Plant height was 13 cm (5.1 inches) for ‘Stardust Violet’, plant width was 32 cm (12.6 inches), and flower diameter was 4.0 cm (1.6 inches). The first open flower was 51 d, and flower divergence was 6.3 d. The average foliage rating was 5.0, and the average flower rating was 5.5. The overall foliage/flower rating was 5.3. The overall foliage pest rating was 6.1, and the overall flower pest rating was 7.0. The overall foliage/flower pest rating was 6.6. The adjusted overall performance rating was 5.8. ‘Stardust Violet’ (PanAmerican Seed) was best-of-class, uncontested.

Single flower – rose/white shades/tints class. Plant height was 14 cm (5.5 inches) for ‘Stardust Rose Improved’, plant width was 35 cm (13.8 inches), and flower diameter was 4.2 cm (1.7 inches). The first open flower was 50 d, and flower divergence was 6.0 d. The average foliage rating was 5.3, and the average flower rating was 5.2. The overall foliage/flower rating was 5.3. The overall foliage pest rating was 6.5, and the overall flower pest rating was 6.8. The overall foliage/flower pest rating was 6.7. The adjusted overall performance rating was 6.0. ‘Stardust Rose Improved’ (PanAmerican Seed) was best-of-class, uncontested.

Single flower – red shades/tints class. Plant height was 15 cm (5.9 inches) for ‘Super Elfin Ruby’ and ‘Tempo Cinnamon’ to 19 cm (7.5 inches) for ‘Tempo Lipstick’. Plant width ranged from 33 cm (13.0 inches) for ‘Super Elfin Ruby’ and ‘Tempo Cinnamon’ to 35 cm (13.8 inches) for ‘Tempo Lipstick’. Flower diameter ranged from 4.4 cm (1.7 inches) for ‘Super Elfin Ruby’ to 5.1 cm (2.0 inches) for ‘Tempo Cinnamon’. The first open flower ranged from 51 d for ‘Super Elfin Ruby’ to 55 d for ‘Tempo Lipstick’. Flower divergence ranged from 5.3 d for ‘Tempo Cinnamon’ to 15.3 d for ‘Super Elfin Ruby’. Average foliage ratings ranged from 5.0 for ‘Super Elfin Ruby’ and ‘Tempo Lipstick’ to 5.2 for ‘Tempo Cinnamon’. Average flower ratings ranged from 4.2 for ‘Tempo Cinnamon’ to 4.3 for ‘Super Elfin Ruby’ and ‘Tempo Lipstick’. Overall foliage/flower rating was 4.7 for ‘Super Elfin Ruby’, ‘Tempo Cinnamon’ and ‘Tempo Lipstick’. Overall foliage pest ratings ranged from 5.5 for ‘Super Elfin Ruby’ to 6.4 for ‘Tempo Lipstick’. Overall flower pest ratings ranged from 6.7 for ‘Tempo Cinnamon’ to

7.0 for 'Tempo Lipstick'. Overall foliage/flower pest ratings ranged from 6.2 for 'Super Elfin Ruby' to 6.7 for 'Tempo Lipstick'. The adjusted overall performance ratings ranged from 5.5 for 'Super Elfin Ruby' and 'Tempo Cinnamon' to 5.7 for 'Tempo Lipstick'. 'Tempo Lipstick' (Bodger Seed) was best-of-class.

CONCLUSIONS AND COMMENTS

OVERALL PERFORMANCE AND BEST-OF-CLASS 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 combined foliage and flower ratings represent an overall view of performance for each cultivar in its class over the entire season. We consider cultivars with an adjusted overall performance rating > 6.0 as outstanding, 5.5– 5.9 as very good performers, 5.4 – 5.0 as good and 4.0 – 4.9 as fair. This is a summary of cultivar selections listed by performance and class order, with best-of-class indicated with an asterisk (*): **Outstanding** cultivars (> 6.0) were: '**Super Elfin Deep Pink**'* (single flower – pink shades/tints class); '**Dazzler Blue Pearl**' and '**Super Elfin Blue Pearl**'* (single flower – purple, blue-violet shades/tints class); and '**Stardust Rose Improved**'* (single flower – rose/white shades/tints class); and. **Very Good** cultivars (5.5– 5.9) were: '**Fanciful Deep Coral**' and '**Fanciful Salmon**'* (double flower – orange shades/tints class); '**Fanciful Red**'* (double flower – red class); '**Dazzler Star Mix**', '**Showstopper Cotton Candy**'*, and '**Tempo Crystal Mix**' (single flower – mixes class); '**Dazzler Pink Improved**'* (single flower – pink class); '**Carnival Lavender Blue**' (single flower – purple, blue-violet shades/tints class); '**Stardust Violet**'* (single flower – purple, red - violet/white shades/tints class); '**Super Elfin Ruby**', '**Tempo Cinnamon**', and '**Tempo Lipstick**'* (single flower – red shades/tints class);. **Good** cultivars (5.4-5.0) were: '**Fanciful Orchid Rose**'* (double flower – rose shades/tints class); '**Showstopper Tropical Flair Mix**' and '**Tempo Butterfly Mix**' (single flower – mixes class); '**Tempo Peach Butterfly**'* (single flower – orange shades/tints class); '**Stardust Salmon**'* (single flower – orange/white shades/tints class); '**Tempo Cherry Butterfly**' and '**Tempo Strawberry Butterfly**' (single flower – pink shades/tints class); '**Raspberry Swirl**' and '**Tempo Lavender Butterfly**'* (single flower – purple, red – violet shades/tints class). The **Fair** cultivar (4.0-4.9) was '**Circus Orange White**'* (double flower – orange/white shades/tints class).

PEST EVALUATIONS IN THE UNSPRAYED FIELD

Plant pests – arthropods. Symptoms were relatively minor, and the foliage and flower quality affected by these pests remained generally good to excellent all season. Symptoms of chewing insects (no pest observed), garden fleahoppers [*Halticus bractatus* (Say) (Insecta: Hemiptera: Miridae)], flower thrips [*Frankliniella bispinosa* (Morgan)] and twospotted spider mite [*Tetranychus urticae* Koch (Arachnida: Acari: Tetranychidae)] and broad mite [*Polyphagotarsonemus latus* (Banks) (Arachnida: Acarina: Tarsonemidae)] were detected on foliage. Thrips did not seem to play a major role, since flower condition remained very good; however, the foliar symptoms fit garden fleahopper damage.

Plant pests – disease. Disease symptoms on foliage were minor for all but a few cultivars. An *Alternaria* sp. was detected by a plant pathologist on marginal lesions.

'Circus Orange White' and 'Fanciful Orchid Rose' had small lesions on the leaf surface that were similar for both cultivars. These lowered foliage quality greatly for 'Circus Orange White' in late May, but symptoms were minor for 'Fanciful Orchid Rose'. Pathologists were unable to isolate the pathogen.

Plant pests – nematodes. After the second rating was completed, a general plant decline occurred. These affected plants were dug, and a severe rootknot nematode (*Meloidogyne* sp.) infestation observed. The trial was terminated. Flooding earlier in the season may have contributed to this condition in fumigated beds.

NOTE

The information in this report is a summary of experimental results and does not provide recommendations for crop production. Where trade names are used, no discrimination is intended or endorsement implied.

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