

Evaluation of Assorted Cultivars as Bedding Plants – Spring 2001

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Summary. We evaluated 67 cultivars from 24 genera 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 two subjective ratings (early April to mid June) 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 ratings in this assorted trial ranged from poor to outstanding, with differences being related to genus, species or individual cultivar performance within a species or interspecific hybrid. In general, cultivars with an adjusted overall performance rating ≥ 5.6 being considered outstanding, 5.0-5.5 as good, 4.0-4.9 as fair, and < 4.0 as poor. Cultivars were grouped into classes within each species or interspecific hybrid group based on growth habit, plant height, flower type, foliage, flower or fruit color, and are listed here by performance within class. **Outstanding** cultivars (≥ 5.6) were: [begonia, fibrous rooted] **‘Olympia Sprint Rose’** (red w/green leaf class); [celosia] **‘Prestige Scarlet’** (red shades/tints w/bronze leaf class); [dianthus – interspecific hybrids] **‘Melody Pink’**; [gazania] **‘Kiss Bronze’** (bronze class), **‘Kiss Bronze Star’** (bronze to yellow class) and **‘Kiss Yellow’** (yellow class); [marigold, French] **‘Bonanza Gold’** (dwarf – double gold class), **‘Bonanza Orange’** (dwarf – double orange class), **‘Safari Tangerine’** (dwarf – double orange shades/tints class), **‘Safari Red’** (dwarf – double red/gold class), and **‘Safari Yellow’** (dwarf – double yellow class); [ornamental pepper] **‘Chilly Chili’** (yellow to orange to red w/green leaf class); [phlox] **‘Patriot Mix’** (mixes class); [portulaca] **‘Sundial Peach’** (orange shades/tints class); [verbena] **‘Serenity Mix’** (mixes class); [zinnia – interspecific hybrids] **‘Profusion Orange’** (orange class) and **‘Profusion White’** (white class).

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Introduction

The United States wholesale value (1.01256 Euros = 1 US dollar) of floricultural crops was \$4.7 billion (€4.8 billion) in 2001, estimated from growers with sales \geq (\$10,000; €10,126). Bedding and garden plants comprise 46% of the floriculture value at \$2.18 billion (€2.21 billion), (United States Department of Agriculture, 2002). Florida (\$101.6 million; €102.9 million) ranks fifth behind California (\$303.5 million; €307.3 million), Michigan (\$189.4 million; €191.8 million), Texas (\$187.2 million; €189.6 million), and Ohio (\$131.8 million; €133.5 million), who together generate 42% of the bedding/garden plant wholesale value. Begonia had the highest wholesale value of the assorted crops. The wholesale value in the United States (in millions) of this crop and many of the assorted crops in this trial (flat/pot) were: ageratum (\$5.9; €6.0/\$1.02; €1.03), alyssum (\$11.2; €11.3/\$0.82; €0.83), begonia (\$35.0; €35.4/\$13.3; €13.5), gazania (\$1.80; €1.82/\$0.67; €0.68), marigold (\$32.6; €33.0/\$4.5; €4.6), portulaca (\$7.3; €7.4/\$0.99; €1.00), salvia (annual) (\$11.5; €11.6/\$2.90; €2.94); verbena (\$5.4; €5.5/\$1.60; €1.62); zinnia (\$3.10; €3.13/\$1.63; €1.65). (United States Department of Agriculture, 1998).

Materials and Methods

Seeds of 67 cultivars of assorted crops were sown between 6 and 20 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 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ 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 (3.1 cm x 3.1 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.

Between 8 Mar.-8 May (Table 2), depending on species development, plugs were transplanted in full sun into raised ground beds with 5 or 6 plants per plot spaced 6 to 24 inches (15.2-61.0 cm) apart in a staggered or straight-line layout. These beds were 32 inches wide x 8 inches high (81.3 cm x 20.3 cm), spaced 5 ft apart from center. Subsurface seepage irrigation water was supplied from lateral ditches spaced 12.8 m (42 ft) apart (Howe, 1998). Begonias were grown under a shaded, fiberglass covered

sawtooth structure with saran-covered sides. Beds for this crop were 32 inches (81.3 cm) wide x 6 inches (20.3 cm) high, spaced 6.5 ft (2 m) apart from center. All beds were fumigated ≥ 14 d prior to planting with a mixture of 66% methyl bromide and 33% chloropicrin at $392 \text{ kg}\cdot\text{ha}^{-1}$ (350 lb/acre) and covered with white-on-black polyethylene film. 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 $262 \text{ lb}/\text{row acre}$ ($294 \text{ kg}\cdot\text{ha}^{-1}$) of nitrogen.

Integrated pest management was employed to determine when pesticide applications were needed to control arthropod pests and plant pathogens in the sprayed lands. Temperature @ 2 ft (61.0 cm) during the remainder of the experiment ranged from a low of $3.8 \text{ }^\circ\text{C}$ ($39 \text{ }^\circ\text{F}$) to a high of $34.2 \text{ }^\circ\text{C}$ ($94 \text{ }^\circ\text{F}$) for the ratings period. Total rainfall of 35.2 cm (13.9 inches) occurred through 13 June. Only 0.02 cm (0.01 inches) fell in April. (Florida Automated Weather Network).

Three plants per plot were selected 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. These measurements were conducted on the following dates: 27 June (begonia); 8-9 May (sunflower); 22 May (tithonia); 16 April (marigold, ornamental basil, melampodium, and zinnia); 20 April (alyssum); 30 April (celosia, nierembergia, portulaca, salvia, torenia, and verbena); 1 May (abutilon, ageratum, dianthus, gazania, and phlox); 9 May (lobelia, osteospermum, platycodon, and rudbeckia); and 1 Aug. (ornamental peppers). 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 as follows: **first rating** dates for foliage and flower were: 13 Apr. (marigold, melampodium, ornamental basil, and zinnia), 20-27 April (alyssum, ageratum, celosia, dianthus, gazania, lobelia, nierembergia, ornamental pepper, portulaca, phlox, salvia, torenia, verbena, and torenia), 5 May (tithonia), 11-12 May (abutilon and platycodon.), 27 May (osteospermum and rudbeckia); **second rating** dates: 5 May (marigold, melampodium, ornamental basil, sunflower, zinnia), 11-12 May (alyssum, ageratum, celosia, dianthus, gazania, lobelia, nierembergia, ornamental pepper, portulaca, phlox, salvia, torenia, and verbena), 26 May (tithonia), 2-6 June (osteospermum, platycodon, and rudbeckia); 12 June (begonia); **third rating** dates: 26-27 May (marigold, melampodium, ornamental basil, sunflower, zinnia), 6-7 June (alyssum, ageratum, celosia, dianthus, gazania, lobelia, nierembergia, ornamental pepper, portulaca, phlox, salvia, torenia, and verbena), 13 June (tithonia). 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 as follows in an unsprayed field (simulating a homeowner environment): **rating 1** dates: 13-20 April (alyssum, marigold, melampodium, ornamental basil, and zinnia), 27 April (ageratum, celosia, dianthus, gazania, lobelia, nierembergia, ornamental pepper, phlox, salvia, torenia, and verbena), 24 May (abutilon, begonia, ornamental pepper, platycodon, rudbeckia, and osteospermum), 26 May (tithonia); **rating 2** dates: 8 May (alyssum, marigold,

melampodium, ornamental basil, and zinnia), 19-27 May (all other crops, except tithonia), 13 June (tithonia); **rating 3** dates: 26 May (all crops, except abutilon, begonia, ornamental pepper and platycodon, which bloomed later for two ratings). Where necessary and when possible, 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 plant growth habit, flower form, and flower fruit or foliage color. 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. It was necessary to use OP_{adj} , as opposed to OP , to account for plant loss due to soilborne pests. This value was arrived at using an adjustment to the formula $OP = (Q + P)/2$, where OP equals overall performance, Q equals “overall foliage/flower ratings” (Table 2), and P equals “overall foliage/flower pest ratings” (Table 4). $OP_{adj} = Q + P_{adj}/2$, where OP_{adj} equals the adjusted OP , and $P_{adj} = P - (dp \times dpf)$. The value for dp is the number of dead plants/plot and dpf is the dead plant factor. The value for dpf is the number of plants per plot divided by the highest rating possible (7). The assorted crop dpf was 6 plants/7, or 0.86 for a 6-plant plot. 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. Best-of-class performance may not represent good or outstanding performance. Some classes may have entries that do not perform well. Nevertheless, the cultivar with the highest rating in that class becomes best-of-class, and awaits new competition from breeders. The choice for use in this climatic zone should be based on performance rating.

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

Abstracts of performance for this wide assortment of cultivars are discussed below. Detailed information is found in Tables 1-4.

Abutilon (*A. x hybridum* Hort.); flowering maple or Chinese bell flower. Overall foliage/flower ratings were poor for this crop, primarily a result of poor flower display (flowers were hidden when viewed from above). Chlorotic and distorted foliage, and unevenness within plots, resembling symptoms of plant virus, also affected ratings. Pest infestation came from *Frankliniella bispinosa* Morgan, (Florida flower thrips) (North Carolina State University, 2002) and *Bemisa tabaci* (Gennadius) [sweetpotato whitefly]. Whitefly-vectored viruses on abutilon are: *abutilon mosaic virus* [(AbMV) *Geminiviridae*] and *abutilon yellows virus* [(AbYV) *Closteroviridae*]. (Brown, Wyatt and Associates, 1997). A number of plant deaths occurred, but cause was not determined; however, *Fusarium* crown rot had been detected in a number of other species in the same field. Flower data was not taken later in the season, because it was difficult to observe hidden flowers or determine cause of condition. Based on adjusted overall performance ratings, best-of-class was ‘Bella Deep Coral’ (3.5) for red shades/tints class, and ‘Bella Apricot’ (4.0) for orange shades/tints class.

Ageratum (*A. houstonianum* Mill.); Mexican ageratum; floss flower. Ageratum was going to seed by late May, when flower ratings were ended. ‘Leilani Blue’ (tall – blue class) experienced some uneven plant height and lodging. Some minor foliage feeding (pest undetermined) was observed, however, aphids caused severe foliage distortion in one plot. Leafminers (Li) were very minor, as were disease lesions. ‘Hawaii Shell Pink’ (dwarf – pink shades/tints class) displayed flowers unevenly. This dwarf compact cultivar had similar insect problems, but foliage was free of disease symptoms; however, mealybugs (instead of aphids) appeared in half the plots of ‘Hawaii Shell Pink’, which is a compact, dense cultivar, though the affect was minor. Plant death was more severe for ‘Hawaii Shell Pink’. Best-of-class was uncontested for both ‘Leilani Blue’ for tall – blue class, and ‘Hawaii Shell Pink’ for dwarf – pink shades/tints class, with both classes rated 5.3 for adjusted overall performance.

Alyssum [*Lobularia maritima* (L.) Desv.]; sweet alyssum. Foliage and flower performance peaked in mid May for ‘Wonderland Deep Purple’ (purple – dark blue violet shades/tints class) and ‘Wonderland Lavender’ (purple – light blue violet shades/tints class). While pest problems on foliage and flower did not occur, plant death was extensive. Based on adjusted overall performance, ‘Wonderland Deep Purple’ (4.6) for purple – dark blue violet shades/tints class and ‘Wonderland Lavender’ (5.5) for purple – light blue violet shades/tints class were uncontested best-of-class.

Basil, ornamental (*Ocimum basilicum* L.). ‘Magical Michael’ peaked with foliage and flower display in early May, but fell in late May to a general leaf blight (diagnosed as *Alternaria* spp., the primary pathogen), lodging, and lack of flower bract color early in the season, and bract color fading late in the season, the latter beginning in early May.

Fading was only noticeable upon closer inspection. Despite some faults, ‘Magical Michael’, uncontested best-of-class, had an adjusted overall performance rating of 5.2.

Begonia, angel-wing leaf (*B. × hybrida* Hort.). During the rating period, this crop was slow to develop flowers, and the display was uneven. Other begonias grown in the same time frame did develop a good floral display. Foliage lesions developed that were diagnosed as *Alternaria* spp. A longer rating period might be needed to allow this crop to reach the same performance level as other members of this genus. Overall adjusted performance for this uncontested best-of-class was 4.6.

Begonia, fibrous rooted (*B. × semperflorens-cultorum* Hort.). This crop was infested with *Myrothecium roridum* before planting, but the disease was successfully controlled, and was not a major problem in the field. Some insect foliage feeding was detected, but the source was not determined. A minor infestation of aphids was detected on flowers in one plot, and some scattered plant loss occurred (diagnosed as *Rhizoctonia* sp.). Cultivar performance peaked in early June. Based on adjusted overall performance, uncontested best-of-class were: ‘Olympia Sprint Red’ (5.2) for red w/green leaf class; ‘Olympia Sprint Rose’ (5.6) for rose w/green leaf class; ‘Olympia Sprint White’ (4.7) for white w/green leaf class.

Celosia (*C. argentea* L. var. *cristata* (L.) Kuntze Childsii Group); braincoral cockscomb. Performance was good all season for ‘Prestige Scarlet’. Pests did not have a significant affect on this crop, however, a heavy infestation of false chinch bug [*Nysius raphanus* Howard; (Heteroptera: Lygaeidae)] occurred, but no feeding was observed. In early June, the flower heads began to flop over, possibly the result of heavy rain showers or because of unobserved heavy feeding by the aforementioned bug. This condition in early June did not detract from the overall appearance of the plots. ‘Prestige Scarlet’ had an adjusted overall performance rating of 6.0, and was uncontested best-of-class for red shades/tints w/bronze leaf class.

Dianthus – interspecific hybrids. Performance peaked in mid May for these tall classes. Foliage and flower pest problems were not a major factor, however, ‘Melody Pink’ was the only dianthus class that did not experience plant death for this crop. ‘First Love’ and ‘Melody White’ had better flower ratings during mid May. Adjusted overall performance was 4.3 for ‘First Love’ (tall – white to pink color shift class), 5.8 for ‘Melody Pink’ (tall – pink class), and 4.7 for ‘Melody White’ (tall – white class). These cultivars were uncontested best-of-class.

Gazania [*G. rigens* (L.) Gaertn. (syn. *G. splendens* Hort.)]; treasure flower. Performance for the “Kiss” series peaked in mid May, then flowering declined for this crop. Pests/symptoms observed were garden fleahopper [*Halticus bractatus* (Say)], flower thrips, leafminer [(*Liriomyza trifolii* (Burgess))] (University of Florida Dept. of Entomology and Nematology. 1999), aphids (unidentified sp.), and suspected virus. ‘Kiss’ series had good to outstanding overall performance (5.0-5.9), each being uncontested best-of-class.

Lobelia interspecific hybrids (*L. speciosa* Sweet; hybrids of *L. fulgens* Willd., *L. cardinalis* Linn., and *L. siphilitica* Linn.). One floret opened (after the rating period was over) 30 June for ‘Fan Burgundy’ (purple – dark red violet class). Foliage quality was good to outstanding all season, but some plant death occurred. Without flowering, an overall performance rating could not be generated for ‘Fan Burgundy’, the uncontested best-of-class.

Lobelia (*L. erinus* Linn.); trailing/edging lobelia. ‘Palace Lilac’ (purple – blue violet shades/tints class) and ‘Palace Sky Blue’ (blue shades/tints class) performance peaked in mid May, when the foliage rating was outstanding for ‘Palace Sky Blue’ (6.0), and the flower ratings were outstanding for ‘Palace Lilac’ (5.8) and ‘Palace Sky Blue’ (7.0). Plant death occurred between late May and early June, resulting in average adjusted overall performance ratings between 4.1 and 4.2. ‘Palace Lilac’ and ‘Palace Sky Blue’ were uncontested best-of-class.

Marigold (*Tagetes erecta* Linn.); African marigold. Lack of plant uniformity and flower color fading affected the overall foliage/flower ratings for ‘Atlantis Mixture’ (4.3) and ‘Inca II Mix’ (3.9) (mixes class). These cultivars were relatively free from pest problems. This resulted in fairly good adjusted overall performance ratings (5.0-5.3). ‘Atlantis Mixture’ was best-of-class.

Marigold (*Tagetes patula* Linn.); French marigold. ‘Bonanza Gold’ (dwarf – double gold class), ‘Bonanza Orange’ (dwarf – double orange class), ‘Safari Tangerine’ (dwarf – double orange shades/tints class), ‘Safari Red’ (dwarf – double red/gold class), and ‘Safari Yellow’ (dwarf – double yellow class) all had outstanding adjusted overall performance ranging from 5.9-6.2. Lack of early flowering, some color fading, and off-type leggy plants had minor affects on performance. Pests were not a factor. Each cultivar was best-of-class, uncontested.

Melampodium (*M. paludosum* H.B. & K.). ‘Million Gold’ (gold class) had an outstanding overall foliage/flower rating (5.9) and overall foliage/flower pest rating (7.0) but plant death lowered the adjusted overall performance rating to 4.6 for this uncontested best-of-class.

Nierembergia (*N. caerulea* Gillies ex Miers); cupflower. The overall performance of ‘Mont Blanc’ was good. Flowering of ‘Mont Blanc’ (white class) was outstanding in mid May and still good in early June. Powdery mildew was diagnosed on foliage during this period, but dysfunction was not continuous over time. The overall foliage/flower rating was 5.3. The overall foliage/flower pest rating was 6.0. Some plant death occurred. The adjusted overall performance rating for this uncontested best-of-class was 5.2.

Ornamental Pepper (*Capsicum annuum* Linn.). No foliage pests were detected. Pepper weevil did infest the fruits of all these cultivars, however, the effect on the appearance of the ornamental display during the rating period was minimal. ‘Chilly Chili’ (yellow to orange to red w/green leaf class) had an adjusted overall performance of 5.8. ‘Explosive Blast’, ‘Explosive Ignite’ (dwarf – yellow to orange to red fruit w/green

leaf class) and ‘Explosive Ember’ (purple to red fruit w/purple leaf class) had identical adjusted overall performance ratings (5.4). Uncontested best-of-class were ‘Chilly Chili’, and ‘Explosive Ember’. ‘Explosive Ignite’ was best-of-class, based on average fruit rating.

Osteospermum (*O. ecklonis* (DC.) Norlindh); African daisy. Variability between cultivars within this mix and poor flowering late in the season contributed to the overall foliage/flower rating for ‘Passion Mix’ (mixes class) of 4.0. Foliage and flower pests were not a factor; some plant death occurred with this uncontested best-of-class. Adjusted overall performance was 5.2.

Phlox (*P. drummondii* Hook.); annual phlox. ‘Patriot Mix’ (mixes class) had an overall foliage/flower rating of 5.7, and was free from any significant pest problems with an overall foliage/flower pest rating 6.6. Some plant death occurred, but the adjusted overall performance rating was 5.8. ‘Patriot Mix’ was an outstanding uncontested best-of-class.

Platycodon (*Platycodon grandiflorum* A.DC.); balloonflower. Platycodon did not perform well this season. ‘Astra Semi-double Blue’ (double – blue class), ‘Astra Pink’ (pink class), ‘Astra White’ (white class) had adjusted overall performance ratings that ranged from 2.4 to 3.7. Plant death occurred early in the evaluation and was severe, limiting the number of ratings possible. Flower performance was poor all season. These cultivars are uncontested best-of-class.

Portulaca (*P. grandiflora* Hook.); moss rose. ‘Sundial Peach’ (sown 20 Feb.) performance gradually increased over the evaluation period. Plant variability and flowering contributed to lower ratings. Overall foliage/flower performance was 4.7. Lack of pest problems elevated the adjusted overall performance to 5.6. No plant death occurred for this uncontested best-of-class.

Rudbeckia (*R. hirta* Linn.); black-eyed Susan. Foliage (5.0) and flower ratings (5.3) for ‘Becky Mix’ were good in early June, however, plant variability in mix and plant death resulted in an adjusted overall performance rating of 4.2 for this uncontested best-of-class.

Salvia (*S. splendens* Ker-Gawl.); scarlet sage. Plant variability, lack of fullness and flowers, as well as unattractive brown calyxes and plant death resulted in a poor adjusted overall performance rating of 3.7 for ‘Sangria’ (dwarf – red/green class), uncontested best of class.

Sunflower (*Helianthus annuus* Linn.). Sunflower quality was rated once during the peak flowering in early May. Pests were rated twice between early and late May. Severe virus and leaf spots were the major symptoms affecting performance. ‘Lemon Éclair’ (medium – double; yellow/brown class) had an overall foliage/flower rating of 5.2, and an adjusted overall performance rating of 5.3. ‘Starburst Aura’ (medium – double; yellow/green class) had an overall foliage/flower rating of 2.6 and an adjusted overall

performance rating of 3.2; the result of plant variability, poor flowering, leaf spots and excessive plant death. ‘Chianti’ (medium – dark red class) had an overall foliage/flower rating of 3.6 and an overall adjusted rating of 4.9. ‘Chianti’ had foliage that was very open and loose, and flowers were on long stalks lacking foliage. ‘Dorado’ (medium – orange class) had an overall foliage/flower rating of 2.4 and an adjusted overall performance rating of 3.2. ‘Dorado’ appeared to be severely affected by plant virus. The plant height averaged 77 cm (2.5 ft) [average height normally 122-152 cm (4-5 ft)]. The stems had a diameter > 2.5 cm (> 1 inch) and the largest flowers of any class 21.8 cm (8.6 inches). The flower heads pointed downward, hiding their features. ‘Sundown’ (tall – red/gold class) had an overall foliage/flower rating of 4.0; lack of significant pest problems and lack plant death contributed to a good adjusted overall performance rating of 5.3. All cultivars were uncontested best-of-class.

Tithonia (*T. rotundifolia* S.F.Blake); Mexican sunflower. ‘Fiesta Del Sol’ (dwarf – orange class) had an overall foliage/flower rating of 2.8. Foliage condition suffered from a marginal necrosis that was minimal (6.0) in early May, but became serious over time. This condition was not due to a detected plant pathogen. Flowers did not develop until mid May and their numbers were variable. Pest damage was minor on foliage and flower; some plant death occurred. The adjusted overall performance rating was 4.5 for this uncontested best-of-class.

Torenia (*T. fournieri* Linden ex Fourn.); bluewings or wishbone flower. ‘Duchess Burgundy’ (purple – dark blue violet/white class) had an overall foliage/flower rating of 5.2. Foliage quality remained good all season, and flower performance peaked in mid May. This crop was very mildly infested with whitefly, garden fleahopper (symptoms), leafminer, mealybug and powdery mildew, but plant quality remained good all season. The adjusted overall performance rating was 5.5.

Verbena (*Verbena x hybrida* Groenl. & Ruempl.); garden verbena. The mixes class had an overall foliage/flower rating of 4.4 for ‘Crystal Ball Mix’, 4.6 for ‘Quartz Waterfall Mix’, and 5.9 for ‘Serenity Mix’. ‘Quartz Red Eye’ (red/white class) had an overall foliage/flower rating of 4.4. Flower performance remained outstanding for ‘Serenity Mix’ all season, but was poor for all other cultivars late in the season. Leafminer, garden fleahopper and powdery mildew symptoms affected all cultivars with the exception of ‘Serenity Mix’, which was free of pest symptoms. Powdery mildew was only serious on ‘Crystal Ball Mix’. Adjusted overall performance ratings for the mixes class ranged from 4.6 for Crystal Ball Mix’ to 6.5 for ‘Serenity Mix’. The adjusted overall performance rating for ‘Quartz Red Eye’ was 5.1. ‘Serenity Mix’ was best-of-class for the mixes class, and ‘Quartz Red Eye’ was uncontested best-of-class for the red/white class class.

Zinnia (*Z. angustifolia* H.B. & K.); narrow leaved zinnia. ‘Crystal White’ (white class) had an overall foliage/flower rating of 4.7. Foliage and flower ratings progressively improved to become outstanding (7.0) in late May, however, plant death in early May and flower lesions reduced the adjusted overall performance rating to 3.8 for this uncontested best-of-class.

Zinnia (*Z. elegans* Sesse & Moc.); garden zinnia. ‘Sun Gold’ (gold class) had an overall foliage/flower rating of 4.4, performance peaking in late May. Powder mildew reduced foliage quality in late May. The adjusted overall performance rating for ‘Sun Gold’ was 6.1. Plant variability and poorer flower quality among white and purple cultivars for ‘Sun Mix’ (mixes class) resulted in an overall foliage/flower rating of 3.9. Mildew severely affected foliage condition in late May. The adjusted overall performance rating for ‘Sun Mix’ was 4.9. ‘Sun Red’ (red class) had an overall foliage/flower rating of 4.7, performance peaking in early May. Mildew severely affected the foliage condition in late May. The adjusted overall performance rating for ‘Sun Red’ was 5.3. Each cultivar is an uncontested best-of-class.

Zinnia – interspecific hybrids (*Z. hybrida* Hort.Par.ex Poir.); narrow leaf zinnia x garden zinnia. Lepidopterous larvae, leafminers and disease lesions were observed on this crop, but did not hurt the performance of any of these cultivars. ‘Profusion Cherry’ (red shades/tints class) had an overall foliage/flower rating of 4.8. Performance peaked in early May; by late May open gaps developed and flowers faded. The adjusted overall performance rating for ‘Profusion Cherry’ was 4.9. ‘Profusion Orange’ (orange class) had an overall foliage/flower rating of 5.4. Foliage quality remained outstanding all season, some variability observed. Flowering peaked in early May and fading was very slight. The adjusted overall performance rating for ‘Profusion Orange’ was 5.4. ‘Profusion White’ (white class) had an overall foliage/flower rating of 5.4. Foliage quality was outstanding all season. Early flowering was lacking, but progressed over time, ending the season in outstanding condition, with an adjusted overall performance rating for ‘Profusion White’ of 5.8. Each of these cultivars was an uncontested 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 ≥ 5.6 as outstanding, 5.0-5.5 as good performers, 4.0-4.9 as fair and < 4.0 as poor. This is a summary of cultivar selections listed by performance and class order, with best-of-class indicated with an asterisk (*): **Outstanding** cultivars (≥ 5.6) were: [begonia, fibrous rooted] ‘**Olympia Sprint Rose**’* (red w/green leaf class); [celosia] ‘**Prestige Scarlet**’* (red shades/tints w/bronze leaf class); [dianthus – interspecific hybrids] ‘**Melody Pink**’*; [gazania] ‘**Kiss Bronze**’* (bronze class), ‘**Kiss Bronze Star**’* (bronze to yellow class) and ‘**Kiss Yellow**’* (yellow class); [marigold, French] ‘**Bonanza Gold**’* (dwarf – double gold class), ‘**Bonanza Orange**’* (dwarf – double orange class), ‘**Safari Tangerine**’* (dwarf – double orange shades/tints class), ‘**Safari Red**’* (dwarf – double red/gold class), and ‘**Safari Yellow**’* (dwarf – double yellow class); [Ornamental Pepper] ‘**Chilly Chili**’* (yellow to orange to red w/green leaf class); [Phlox] ‘**Patriot Mix**’* (mixes class); [portulaca] ‘**Sundial Peach**’* (orange shades/tints class); [verbena] ‘**Serenity**

Mix* (mixes class); [zinnia – interspecific hybrids] **‘Profusion Orange*** (orange class) and **‘Profusion White*** (white class). **Good** cultivars (5.0-5.5) were: [ageratum] **‘Hawaii Shell Pink*** (dwarf – pink shades/tints class) and **‘Leilani Blue*** (tall – blue class); [alyssum] **‘Wonderland Lavender*** (purple – light blue violet shades/tints class); [basil, ornamental] **‘Magical Michael** (purple/cream w/green leaf class); [begonia, fibrous rooted] **‘Olympia Sprint Red*** (red w/green leaf class); [gazania] **‘Kiss Mixture*** (mixes class), **‘Kiss Orange*** (orange class), **‘Kiss Rose*** (rose to white class), **‘Kiss White*** (white class), and **‘Kiss Golden Yellow*** (yellow shades/tints class); [marigold, African] **‘Atlantis Mixture*** and **‘Inca II Mix** (mixes class); [nierembergia] **‘Mont Blanc*** (white class); [ornamental pepper] **‘Explosive Blast** and **‘Explosive Ignite*** (dwarf – yellow to orange to red fruit w/green leaf class), and **‘Explosive Ember*** (purple to red fruit w/purple leaf class); [osteospermum] **‘Passion Mix*** (mixes class); [sunflower] **‘Lemon Éclair*** (medium – double; yellow/brown class), **‘Sundown*** (tall – red/gold class); [torenia] **‘Duchess Burgundy*** (purple – dark blue violet/white class); [verbena] **‘Quartz Waterfall Mix** (mixes class) and **‘Quartz Red Eye*** (red/white class); [zinnia, garden] **‘Sun Gold*** (gold class) and **‘Sun Red*** (red class); [zinnia – interspecific hybrids] **‘Profusion Cherry*** (red shades/tints class). **Fair** cultivars (4.0-4.9) were: [Abutilon] **‘Bella Apricot*** (orange shades/tints class); [alyssum] **‘Wonderland Deep Purple*** (purple – dark blue violet shades/tints class); [begonia, angel-wing leaf] **‘Dragon Wing Pink*** (pink class); [begonia, fibrous rooted] **‘Olympia Sprint White*** (white class); [dianthus – interspecific hybrids] **‘First Love*** [tall – white to pink color shift (*D. chinensis* X *D. barbatus*)], **‘Melody White*** [tall – white class (*D. interspecific*)]; [lobelia – interspecific hybrids] **‘Fan Burgundy*** (purple – dark red violet class); [lobelia, trailing/edging] **‘Palace Lilac*** (purple – blue violet shades/tints class) and **‘Palace Sky Blue*** (blue shades/tints class); [melampodium]; **‘Million Gold*** (*gold class*); [rudbeckia] **‘Becky Mix*** (mixes class); [sunflower] **‘Chianti*** (medium – dark red class); [tithonia] **‘Fiesta Del Sol*** (dwarf – orange class); [verbena] **‘Crystal Ball Mix** (mixes class); [zinnia, garden] **‘Sun Mix*** (gold class). **Poor** cultivar (< 4.0) were: [abutilon] **‘Bella Red** and **‘Bella Deep Coral*** (red shades/tints class) **‘Bella Salmon** and (orange shades/tints class); [platycodon] **‘Astra Semi-double Blue*** (double – blue class), **‘Astra Pink*** (pink class) and **‘Astra White*** (white class); [salvia, scarlet sage] **‘Sangria*** (dwarf – red/green class); [sunflower] **‘Starburst Aura*** (medium – double; yellow/green class), [sunflower] **‘Dorado*** (medium – orange class); [zinnia, narrow leaved] **‘Crystal White*** (white class).

Uncontested Best-of-Class

By their nature, these assorted trials are comprised of a variety of seed-propagated annual bedding plants of varying economic importance. Regardless of their place in the market, they are an important contribution to the bedding plant industry as a whole, providing greater diversity of plant form, habit, color and climate tolerance. Often the number of cultivars offered for trialing in a particular class at the Gulf Coast Research & Education Center has been limited to only one. Budgets or oversight may prevent companies from including certain selections in this research. Establishing uncontested best-of-class with

these solitary cultivars gives us our benchmark for comparison. The uncontested best-of-class may not have good performance ratings, and would not be recommended to the public. This performance may be a reflection of the species or the individual cultivar, and offers a challenge to the breeder and the seed companies to provide new selections to trial against it in our efforts to offer the best cultivars to growers, landscapers and gardeners in Central Florida.

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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