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Evaluation of Petunia Cultivars as Bedding Plants for Florida[1]

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The state of Florida has been an important region for the growing and testing of bedding plants. The USDA Floriculture Crops 2005 summary reports that bedding and garden plants accounted for 51 percent of the wholesale value ($2.61 billion) of all the floricultural crops reported in the United States, while Florida was ranked fifth among all the bedding plant producers in this country. Thirty-seven percent of all bedding and garden flat sales came from pansy/viola, impatiens and petunias. Petunia (*Petunia* x*hybrida*) ranked third in value after pansy (*Viola* x*wittrockiana*)/viola [*Viola cornuta* and *V.* x*williamsiana* (name used by some seed companies)] and impatiens (*Impatiens walleriana*). Florida ranked second in the United States for the value of potted petunia flats in the United States in 2005 ($4.5 million). Parts of the southeastern United States, Asia, Europe, and Australia share a similar climate with central Florida. Thus, Florida has also been an important testing ground for new petunia cultivars and other bedding plants to be grown and marketed in those regions.

Figure 1. Petunia axillaris (large white petunia). By permission of Mr. Juan Carlos M. Papa, Ing. Agr. M.Sc., Instituto Nacional de Tecnología Agropecuaria, Argentina.

Petunia is considered to be the first cultivated bedding plant. Breeding began in the 1800s using

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two South American species with white (*P. axillaris*) and purple flowers (*P. integrifolia*).

Figure 2. Petunia integrifolia var. integrifolia (violet-flower petunia). Photo Courtesy of White Flower Farm (original seed source: Longwood Gardens).

Five major class divisions resulted from petunia breeding: grandiflora, floribunda, milliflora, multiflora and spreading. The first consistently double flowers became available, and more flower colors were added, in the 1930s from open-pollinated plants. Flowers became larger with better growth habit and disease and weather resistance after World War II. Award-winning F1 hybrids, designated as floribundas, appeared in the 1950s by crossing the larger flowered but heat-sensitive grandifloras with the adverse weather-resistant multifloras (smaller, but more numerous flowers than grandiflora). The hybridization resulted in costly seed, but plants were superior to open-pollinated cultivars. New flower colors (red and yellow) and growth habits [spreading (covers a 3-4 foot area) and miniature (millifloras)] expanded the available choices. Economical production of F1 seed resulted from the use of petunia as a model for plant physiology research that produced important changes in plant breeding through the understanding of pollen sterility. These changes resulted in significant contributions to the further development of the bedding plant industry in the last half of the twentieth century.

There are over 360 cultivars of petunia available on the market today. Florida's climate has great appeal to visitors from colder regions; however, for many bedding plants such as petunia, the climate here, at times, can be harsh for the plants and ideal for their pests, if cultivars have not been selected for this climatic zone. Since many petunia cultivars are developed and tested in more temperate climates, will these cultivars perform well in Florida? We answered this question by evaluating and selecting the best performing petunias in Florida from eight trials conducted between Sept. 2000 and June 2006. In the early trials, we created classes based upon growth habit (spreading vs. normal), flower form (double vs. single), and flower color and color pattern (solid color vs. multicolored flower types such as star or picotee), and then selected the best performing cultivar (standard) from each class. In each subsequent trial, we compared these class "standards" with new, untested entries from the major seed companies in Europe, Japan, and the United States. Some new entries outperformed the standards and replaced them, while some standards continued to outperform the new entries. On occasion, an entire class would perform poorly, while another class might contain all good performers. Nevertheless, we chose one cultivar to represent each class for subsequent comparisons. This system of standards allowed us to continually upgrade performance without having to reevaluate large numbers of previously evaluated cultivars; however, if a cultivar was not selected for the standard, but was later improved through further breeding, it could be reevaluated. Some cultivars represented unique classes without comparison.

Field Trials and Evaluations

Each cultivar was planted in two fields. Each field had multiple plots (three or four) planted for each cultivar in different parts of the field to compensate for variations in soil pH and moisture and pest infestations that might occur within different parts of the field and cause differences in plant condition between plots. Each plot contained five or six plants

One field was sprayed (if necessary, after scouting for pests) to simulate a commercial setting

and to produce plants in the best possible condition for measuring plant height, width and flower diameter, recording earliness of flowering, and comparing cultivar foliage and flower quality. The other field was not sprayed to observe the effects of plant pests on foliage and flowers as they would appear in a homeowner's setting. Ratings were on a scale from 1 to 7 for both fields, with 7 being free from any flaw, such as lack of plant or flowering uniformity, color fading or variability, open gaps in the plants, stem splitting, or pest symptoms such as insect feeding scars, leaf spots or plant blights, as well as distortions, discolorations and stunting due to virus infestation; 4 was average, but still acceptable; 1 was poor and unacceptable. The ratings in both fields were taken three to four times during the season to show performance over the entire season, and then the ratings from both fields were combined and averaged to yield an overall performance rating, which was used to select each class standard.

Seed was sown in seeder trays (model P-Seed20; Landmark Plastic Corp., Akron, Ohio), covered with a light layer of course vermiculite to retain moisture, and germinated at 72-75°F in a growth room illuminated 24 hours a day with cool-white fluorescent tubes. Exposure to light (10 to 100 foot candles) improves petunia germination greatly. The soil mix (example: Vergro Container Mix A; Verlite Co. Inc., Tampa, Fla.) was kept saturated during germination (stage 1; water seen on surface). For pellet-seed, it is important to drench immediately after sowing to break down the hard coating. Immediately after germination, seedlings were transplanted into Todd planter flats (model 128; Speedling, Sun City, Fla.) and grown to mature, non-flowering plugs (production stage: 4). Soluble liquid fertilizers (example: 15-2-20 Ca-Mg Excel®; Scotts Co., Maryville, Ohio) were applied at 50 to 250 ppm (0.7 to 3.3 oz./100 gal) twice weekly. The soil mix was kept wet (not saturated, feels wet) during cotyledons expansion (stem present; production stage: 2). From the time true leaves were visible to the transplant stage (production stage: 3 and 4), we alternated wet/moist (dark black to medium brown;). Petunia roots (length: 1/2 inch or more) develop best when oxygen levels remain high. When seedlings were ready for field planting, roots had formed a firm plug.

To provide optimal conditions for growth, raised ground beds 32 inches wide x 8 inches high of EauGallie fine sand (pH range = 6.2 to 6.8) were fumigated with a mixture of methyl bromide and chloropicrin and covered with white-on-black polyethylene film. Two weeks later, plugs were transplanted into these beds; one week after transplanting, slow-release fertilizers [example: Osmocote Plus® 15-9-12 (5-6 mo.) with micronutrients; The Scotts Co., Maryville, Ohio] were applied by hand to each plant on the soil surface approximately one inch from the plant stem under the plastic mulch.

Summary

From 2000 to 2006, we evaluated 125 cultivars from 10 seed companies. The following cultivars included those that were selected as class standards, unique cultivars without comparison (to date), and cultivars that belonged to the same class, but could not be evaluated together in the same trial. All these cultivars had an overall performance rating 5.5.

Floribundas: 'Celebrity Chiffon Morn', 'Celebrity Mid-Blue', 'Celebrity White', 'Madness Magenta', and 'Madness Waterfall Mix'.

Grandifloras: 'Double Cascade Blue', 'Dreams Sky Blue', 'Dreams Burgundy Picotee', 'Dreams Wild Rose Mix', 'Eagle[1] Blue Improved', 'Eagle White', 'Limbo Blue', 'Storm Blue[1]', 'Storm Lavender', 'Storm Violet', 'Ultra Pastel Pink', and 'Ultra Salmon'.

Millifloras: 'Fantasy Light Lavender' and 'Fantasy Mix'.

Multifloras: 'Hurrah Pink Chiffon', 'Primetime Violet Star', 'Symphony Rose Star', 'Symphony Blue', 'Symphony Light Blue', 'Symphony Pink', 'Symphony Red Picotee', 'Symphony Rose', 'Symphony Salmon', and 'Symphony White'.

Spreading, normal: 'Avalanche Pink', 'Avalanche Lavender', 'Avalanche Rose', 'Easy Wave Shell Pink', 'Explorer Blue', 'Explorer Purple', 'Opera Light Purple', 'Plush White', 'Ramblin' Lavender', 'Ramblin' Peach Glo', 'Ramblin' Pink', and 'Ramblin' Salmon Capri'.

Spreading, tall: 'Kahuna Violet', 'Kahuna White', 'Ramblin' Burgundy Chrome', 'Ramblin' Lilac Glo', 'Tidal Wave Cherry', 'Tidal Wave Hot Pink', 'Tidal Wave Purple', 'Wave Blue'.

[1]The Eagle series has been dropped for future distribution in the United States market; however, remaining seed stock will be sold in the United States. Europe and Asia will continue to sell and order new production of this seed. 'Storm Blue' will replace 'Eagle Blue Improved'.

Detailed performance data for these cultivars is presented in Table 1, and flower pictures for each selected cultivar within its class are provided (Table 2). These cultivars can provide Florida growers and gardeners a wide selection of petunias from which to choose for their landscaping needs. Florida-selected petunias, with their great diversity of color and form, as well as their relative freedom from pests, provide Florida growers and gardeners a wide selection of hardier plants for our climate.

Additional information

Visit the seed-propagated bedding plant variety trials at http://vtgcrec.ifas.ufl.edu

for detailed information on petunias and other bedding plants.

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.

Table 1. Plant and flowering characteristics and performance ratings for outstanding petunia cultivars with the highest ratings values for their class in spring/early summer (Bradenton (2000-04) and Wimauma (2005-06) and winter/spring (Wimauma (2005/06)) Florida trials.

Cultivar	Seed Company	Trial year evaluated	Measurements (inches)			Days to First Flower[1]	Cultivar Quality		Pest symptoms		Overall performance
			Plant height	Plant width	Flower dia.		Foliage	Flower	Arthro	Disease	
Floribundas											
Celebrity Chiffon Morn	Bodger	2002	9	21	2.5	55	5.0	5.0	6.8	5.9	5.6
Celebrity Mid-Blue	Bodger	2002	11	20	2.0	63	5.0	5.5	6.3	6.0	5.7
Celebrity White	Bodger	2002	10	20	2.4	68	4.8	4.7	6.8	5.9	5.6
Madness Magenta	Ball	2002	8	20	2.2	61	5.2	5.0	6.3	5.8	5.5
Madness Waterfall Mix	Ball	2002	9	20	2.2	61	5.3	5.5	6.7	5.2	5.7
Grandifloras											
Double Cascade Blue	PanAmerican	2004	11	21	2.9	61	5.5	4.6	6.3	6.4	5.7
Dreams Sky Blue	PanAmerican	2004	12	20	2.8	54	4.4	5.7	6.4	6.2	5.7
Dreams Burgundy Picotee	PanAmerican	2004	9	18	2.8	54	6.1	5.4	6.5	6.5	6.2
Dreams Wild Rose Mix	PanAmerican	2001	6	15	2.3	44	5.1	4.7	6.5	5.7	5.5
Eagle[2] Blue Improved	Sakata	2004	8	19	3.0	53	5.7	5.9	6.5	7.0	6.2
Eagle White	Sakata	2000	10	22	2.6	36	50.0	6.0	xxx[3]	xxx[3]	5.5
Limbo Blue	Hem Genetics	2005–06	8	14	3.2	51	5.4	5.4	6.1	5.3	5.6
Storm Blue	Goldsmith	2004	9	21	2.8	57	5.0	5.0	6.5	6.7	5.7
Storm Lavender	Goldsmith	2002	12	21	2.4	61	4.8	5.3	6.4	5.6	5.5
Storm Violet	Goldsmith	2003	7	16	3.0	68	4.8	6.3	6.9	6.4	6.1
Ultra Pastel Pink	Goldsmith	2003	7	14	2.8	71	5.0	5.2	7.0	6.8	6.0
Ultra Salmon	Goldsmith	2002	8	20	2.9	64	5.7	4.5	6.2	6.3	5.7
Millifloras											
Fantasy Light Lavender	Goldsmith	2001	6	14	1.5	47	5.8	4.6	6.9	5.6	5.7
Fantasy Mix	Goldsmith	2002	6	13	1.5	55	5.0	4.7	6.7	6.4	5.7
Multifloras											
Hurrah Pink Chiffon	Syngenta	2002	7	17	2.2	55	5.5	4.5	6.7	6.4	5.7
Primetime Violet Star	Goldsmith	2002	9	23	2.2	59	5.5	4.0	6.9	6.2	5.6
Symphony Rose Star	Takii	2003	6	17	2.1	72	5.7	5.7	6.9	6.9	6.3
Symphony Blue	Takii	2001	8	13	2.1	45	3.9	5.3	6.8	5.9	5.5

Table 1. Plant and flowering characteristics and performance ratings for outstanding petunia cultivars with the highest ratings values for their class in spring/early summer (Bradenton (2000-04) and Wimauma (2005-06) and winter/spring (Wimauma (2005/06)) Florida trials.

Symphony Light Blue	Takii	2003	4	8	1.7	73	4.5	4.8	7.0	7.0	5.8
Symphony Pink	Takii	2001	6	16	2.4	44	5.1	5.0	6.8	6.2	5.8
Symphony Red Picotee	Takii	2002	6	12	2.1	53	4.8	3.7	6.9	6.2	5.6
Symphony Rose	Takii	2001	7	13	2.4	48	4.8	5.7	6.4	5.9	5.7
Symphony Salmon	Takii	2001	6	13	2.0	41	5.2	4.6	6.9	5.8	5.7
Symphony White	Takii	2001	8	15	2.6	46	5.4	4.9	6.8	5.6	5.7
Spreading, normal											
Avalanche Pink	Bodger	2001	5	23	2.3	49	5.4	4.2	6.8	5.8	5.5
Avalanche Lavender	Bodger	2002	4	17	2.2	65	6.0	5.2	6.8	6.0	5.9
Avalanche Rose	Bodger	2006	9	36	2.2	63	5.3	5.5	6.3	5.9	5.8
Easy Wave Shell Pink	PanAmerican	2002	5	21	2.2	54	6.7	5.5	6.9	6.4	6.3
Explorer Blue	Sakata	2002	4	20	2.1	68	4.3	5.5	6.5	6.2	5.5
Explorer Purple	Sakata	2002	4	23	2.2	64	6.3	5.2	6.6	5.9	6.0
Opera Light Purple	Takii	2002	4	24	2.1	71	6.5	5.0	6.6	6.3	6.1
Plush White	Syngenta	2006	8	27	2.3	56	5.3	5.8	6.8	5.8	5.9
Ramblin' Lavender	Goldsmith	2003	4	20	2.1	72	5.7	5.0	6.9	6.9	6.7
Ramblin' Peach Glo	Goldsmith	2002	4	17	2.1	58	6.0	5.0	7.0	5.8	6.0
Ramblin' Pink	Goldsmith	2006	9	30	1.9	68	6.2	6.0	6.2	6.0	6.1
Ramblin' Salmon Capri	Goldsmith	2005	6	19	2.1	45	5.2	5.3	6.4	5.3	5.5
Spreading, tall											
Kahuna Violet	Syngenta	2002	11	25	1.8	53	6.0	7.0	6.7	5.7	6.3
Kahuna White	Syngenta	2001	11	30	2.7	54	6.5	5.9	6.8	6.4	6.4
Ramblin' Burgundy Chrome	Goldsmith	2002	5	21	2.0	6.5	6.0	5.2	6.2	5.5	5.6
Ramblin' Lilac Glo	Goldsmith	2002	7	21	2.4	57	5.5	5.3	6.7	6.1	5.9
Tidal Wave Cherry	Ball	2000	20	38	2.0	44	6.7	6.4	xxx[3]	xxx[3]	6.6
Tidal Wave Hot Pink	Ball	2000	20	39	2.0	40	6.2	6.1	xxx[3]	xxx[3]	6.1
Tidal Wave Purple	Ball	2003	12	27	2.0	71	5.8	6.0	7.0	6.5	6.4
Wave Blue	PanAmerican	2006	9	41	1.9	67	4.3	5.3	6.2	6.1	5.5

[1]First flower unfurled in the transplant flat before planting in the field (2000 trial): one observation/cultivar (64 plants/cultivar/flat)
[2]The eagle series has been dropped for future distribution in the United States Market; however, remaining seed stock will be sold in the Unisted States. Europe and Asia will continue to sell and order new production of this seed. 'Storm Blue' will replace 'Eagel Blue IImproved.
[3]No pest symptom data was collected for cultivars (2000 trial), because an unsprayed field was not planted.

Table 2. Digital images of petunia cultivars (organized by class[1]) with the highest overall performance rating values for their class in spring/early summer [Bradenton (2000-04) and Wimauma (2005-06)] and winter/spring [Wimauma (2005/06)] Florida trials.

Class: Floribunda, single mix	**Class:** Floribunda, single blue	**Class:** Floribunda, single pink	**Class:** Floribunda, single purple (dark); red-violet
 'Madness Waterfall Mix' **Seed:** Ball	 'Celebrity Mid-Blue' **Seed:** Bodger	 'Celebrity Chiffon Morn' **Seed:** Bodger	 'Madness Magenta' **Seed:** Ball
Class: Floribunda, single white	**Class:** Grandiflora, single mix	**Class:** Grandiflora, double blue (dark)	**Class:** Grandiflora, dwarf; single blue
 'Celebrity White' **Seed:** Bodger	 'Dreams Wild Rose Mix' **Seed:** PanAmerican	 'Double Cascade Blue' **Seed:** PanAmerican	 'Limbo Blue' **Seed:** Hem Genetics
Class: Grandiflora, single blue	**Class:** Grandiflora, single blue (dark)	**Class:** Grandiflora, single blue (dark)	**Class:** Grandiflora, single orange shades/tints
 'Dreams Sky Blue' **Seed:** PanAmerican	 'Eagle' Blue' **Seed:** Sakata	 'Storm Blue' **Seed:** Goldsmith	 'Ultra Salmon' **Seed:** Goldsmith

Class: Grandiflora, single pink (light)	**Class:** Grandiflora, single purple (light); blue-violet	**Class:** Grandiflora, single purple (dark); red-violet	**Class:** Grandiflora, single purple; red-violet/white
 'Ultra Pastel Pink' **Seed:** Goldsmith	 'Storm Lavender' **Seed:** Goldsmith	 'Storm Violet' **Seed:** Goldsmith	 'Dreams Burgundy Picotee' **Seed:** PanAmerican
Class: Grandiflora, single white	**Class:** Milliflora mix	**Class:** Milliflora purple (light); blue-violet	**Class:** Multiflora, single orange shades/tints class
 'Eagle White' **Seed:** Sakata	 'Fantacy Mix' **Seed:** Goldsmith	 'Fantasy Light Lavender' **Seed:** Goldsmith	 'Symphony Salmon' **Seed:** Takii
Class: Multiflora, single pink	**Class:** Multiflora, single pink	**Class:** Multiflora, single purple (dark); blue violet	**Class:** Multiflora, single purple (dark), red-violet/white
 'Symphony Pink' **Seed:** Takii	 'Hurrah Pink Chiffon' **Seed:** Syngenta	 'Symphony Blue' **Seed:** Takii	 'Primetime Violet Star' **Seed:** Goldsmith

Class: Multiflora, single purple (light); blue-violet	**Class:** Multiflora, single red/white picotee	**Class:** Multiflora, single rose	**Class:** Multiflora, single rose/white star
 'Symphony Light Blue' **Seed:** Takii	 'Symphony Red Picotee' **Seed:** Takii	 'Symphony Rose' **Seed:** Takii	 'Syimphony Rose Star' **Seed:** Takii
Class: Multiflora, single white	**Class:** Spreading, normal; blue (dark)	**Class:** Spreading, normal; orange (dark) shades/tints	**Class:** Spreading, normal; orange (light) shades/tints
 'Symphony White' **Seed:** Takii	 'Explorer Blue' **Seed:** Sakata	 'Ramblin' Salmon Capri' **Seed:** Goldsmith	 'Ramblin' Peach Glo' **Seed:** Goldsmith
Class: Spreading, normal; pink (dark)	**Class:** Spreading, normal; pink (light)	**Class:** Spreading, normal; pink (light)	**Class:** Spreading, normal; purple (light), blue-violet
 'Ramblin' Pink' **Seed:** Goldsmith	 'Avalanche Pink' **Seed:** Bodger	 'Easy Wave Shell Pink' **Seed:** PanAmerican	 'Ramblin' Lavender' **Seed:** Goldsmith

Class: Spreading, normal; purple (dark), blue-violet	**Class:** Spreading, normal; purple (light) red-violet	**Class:** Spreading, normal; purple (dark), red-violet	**Class:** Spreading, normal; rose
 'Avelanche Lavender' **Seed:** Bodger	 'Opera Light Purple' **Seed:** Takii	 'Explorer Purple' **Seed:** Sakata	 'Avelanche Rose' **Seed:** Bodger
Class: Spreading, normal; white	**Class:** Spreading, tall; blue (dark)	**Class:** Spreading, tall; pink (dark)	**Class:** Spreading, tall; purple (light), blue-violet
 'Plush White' **Seed:** Syngenta	 'Wave Blue' **Seed:** PanAmerican	 'Tidal Wave Hot Pink' **Seed:** Ball	 'Ramblin' Lilac Glo' **Seed:** Goldsmith
Class: Spreading, tall; purple, red-violet	**Class:** Spreading, tall; purple (light) red-violet	**Class:** Spreading, tall; purple (light) red-violet	**Class:** Spreading, tall; red shades/tints
 'Tidal Wave Purple' **Seed:** Ball	 'Kahuna Violet' **Seed:** Syngenta	 'Ramblin' Burgundy Chrome' **Seed:** Goldsmith	 'Tidal Wave Cherry' **Seed:** Ball

Class: Spreading, tall; white

'Kahuna White'
Seed: Syngenta