Variety Trials

Evaluation of 125 Petunia Cultivars as Bedding Plants and Establishment of Class Standards

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SUMMARY. Central Florida has a climate similar to many locations in the southeastern United States and parts of Asia, Europe, and Australia. Thus, Florida is an important testing ground for new bedding plant cultivars not only in the United States, but around the world. The authors evaluated 125 petunia (*Petunia ×hybrida*) cultivars in replicated class tests at Bradenton, Fla. (lat. 27°4'N, long. 82°5'W) in 2000–04 and at Balm, Fla. (lat. 27°8'N, long. 82°2'W) in 2005–06. In this report they establish petunia classes and cultivar standards for each class, and provide objective plant measurements of vegetative and floral characteristics, and subjective performance ratings. Petunia cultivars were grouped into 73 classes based on the distinguishing characteristics for petunia, which are plant type and height, and flower type, color, and color pattern. Comparisons were made within each class to determine performance and to select a cultivar as the standard for the class—a plant with the highest overall performance rating that can represent the class in future trials against new cultivars. During the initial trials, larger numbers of cultivars were evaluated and eliminated from future comparisons when each class standard was selected. Many flower colors and color combinations, as well as plant types and other distinctive characteristics have been developed for bedding plants. By creating class standards for each distinctive characteristic, better choices over a wider range of classes are available to growers and landscapers in this climate. Cultivars with an outstanding overall performance rating (combined foliage, flower, arthropod feeding symptom, and disease symptom ratings ≥ 5.5 points on a 1 to 7-point scale) for class standard selections were (floribunda, single mix class) 'Madness Waterfall Mix' and [single purple (dark), red-violet class] 'Madness Magenta'; [grandiflora, single blue (dark) class] 'Eagle Blue', (single orange shades/tints class) 'Ultra Salmon', and [single purple (dark), red-violet class] 'Storm Violet'; and [spreading, normal, orange (dark) shades/tints class] 'Ramblin' Salmon Capri', [orange (light) shades/tints class] 'Ramblin' Peach Glo', [pink (dark) class] 'Wave Pink', [purple (dark), blue-violet class] 'Avalanche Lavender', [purple (light) blue-violet class] 'Ramblin' Lavender', (red class) 'Avalanche Red Improved', (rose class) 'Avalanche Rose Improved', (white class) 'Plush White', and [spreading, tall; blue (dark) class] 'Wave Blue'. These cultivars would likely perform well in the southern United States or areas of the world with similar heat and cold hardiness zones.

Petunia is considered to be the first cultivated bedding plant. It is the product of complex breeding begun in the 19th century that used two South American species with white (*Petunia axillaris*) and purple flowers (*Petunia integrifolia*) (Liberty Bailey Hortorium, 1976). Subsequent petunia breeding resulted in five petunia class divisions: grandiflora, floribunda, milliflora, multiflora, and spreading. In the 1930s, the first consistently double flowers became available from Japan, whereas more flower colors were introduced in Germany from open-pollinated plants. After World War II, breeders began working on larger flowers, better growth habit, and disease and weather resistance. In the 1950s, breeders produced award-winning F₁ hybrids, designated as floribundas, 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, such as true red and the first yellow, and plants with spreading and miniature growth habits (millifloras) expanded the available choices in color and form (Lewis, 1997; Trinklein, 2001). The range of colors, color patterns, and availability of double-flower cultivars is greatest in the grandifloras, floribundas, and multiflora classes. Use of the petunia as a model for plant physiology research resulted in important changes in plant breeding through the understanding of pollen sterility, resulting in economical production of F₁ seed. These changes resulted in significant contributions to the further development of the bedding plant industry in the last half of the 20th century (Craig, 2003).

In 2005, the wholesale value of petunias was \$94 million, and ranked third in value behind pansy (*Viola ×wittrockiana*)/viola (*V. cornuta*)

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Units

To convert U.S. to SI, multiply by	U.S. unit	SI unit	To convert SI to U.S., multiply by
0.3048	ft	m	3.2808
2.5400	inch(es)	cm	0.3937
0.4536	lb	kg	2.2046
1.1209	lb/acre	kg·ha ⁻¹	0.8922
28.3495	oz	g	0.0353
(°F – 32) ÷ 1.8	°F	°C	(1.8 × °C) + 32

and impatiens (*Impatiens walleriana*). Florida is one of the top wholesale producers of bedding plants, and in 2005 was ranked fourth in the United States in annual bedding plant production. The wholesale value of petunia flats in Florida in 2005 was \$2.0 million, whereas potted petunia sales in Florida (\$4.5 million) ranked second in the United States. (U.S. Department of Agriculture, 2006).

Major seed companies from Europe, Asia, and North America produce new petunia cultivars and submit them for testing in Florida. These plants may not have been bred to survive in our climate (Nordlie, 2002). Plant breeders and seed companies use Florida trial information and apply it to similar climatic regions, such as Australia, Japan, China, and southern France (T.K. Howe, pers. comm., Dec. 2001). Therefore, evaluation of petunia cultivars in Florida is vital for continued growth of the industry.

Standards have not been fully developed for petunias that identify the great diversity of color and form found in the bedding plant industry today, nor do they recognize a cultivar as a standard for each unique class that can be used for comparison. New cultivars are often compared with a random number of cultivars, and often many of these cultivars that failed to outperform a new entry in a recent trial are used repeatedly in future trials. We estimated there are more than 360 petunia cultivars currently available in the United States from a survey of eight major companies (R.O. Kelly, unpublished data). The establishment of plant and color classes, a system of class standards for each class used for comparison with new cultivars in future trials, and the effective elimination of previously evaluated cultivars was accomplished for marigolds (*Tagetes erecta* and *T. patula*), pansies, and violas in our initial evaluations. Detailed information for each cultivar about growth, flowering, performance, and pest damage was collected in seasonal replicated trials that could be used by the scientific community as well as growers, landscapers, consumers, and seed companies (Kelly and Harbaugh, 2002, Kelly et al., 2005, 2006). This petunia study was conducted to establish classes and class standards specific to this crop (such as plant and

flower forms/types, and flower colors, and color patterns) and to evaluate petunia cultivar performance.

Materials and methods

For each class, the cultivar with the highest overall performance rating was selected as the class standard. If the overall performance rating was a tie, another rating was chosen (such as the average of foliage and flower ratings, until a numerical difference was found) to determine the class standard (Kelly et al., 2005). After choosing the class standard cultivars, they were then used in subsequent trials as the "standard" for comparison of new cultivars in their class. Cultivars were placed into classes based on plant type (floribunda, grandiflora, milliflora, multiflora, and spreading), plant height, flower color, and flower color pattern, and all trial evaluations for each cultivar were grouped within that class by trial year (Table 1). In seven of the trials there were multiple cultivar comparisons within some classes; however, many cultivars evaluated were stand-alones (the sole entry for a class). If two cultivars from the same class were not evaluated in the same trial, they were reevaluated together in a future trial to determine a class standard. The number of cultivars evaluated in each trial was dependent upon economic decisions by a seed company, the development of new cultivars, and by the elimination of previously evaluated cultivars with lower overall performance ratings by the more highly rated class standards.

Eight trials were conducted between Sept. 2000 and June 2006. In the initial 2000 trial, the first set of classes was established, but no class standards were selected from the 16 cultivars entered because only one cultivar per class was submitted for evaluation. In June 2001, 35 cultivars were evaluated comparing multiple cultivars per class and established the first class standard cultivars. In spring/early summer trials, 64 (2002), 17 (2003), seven (2004), five (2005), and six (2006) new cultivars were evaluated; six in Winter/Early Spring 2005–06.

Seeds were sown in seeder trays (model P-Seed20; Landmark Plastic Corp., Akron, Ohio) 21.5 × 11 × 2.4 inches on 6 and 14 Feb. 2001; 8 and 14 Feb. 2002; 11 Feb. 2003;

11, 13, and 16 Feb. 2004; 17 and 18 Feb. 2005; 19 Oct. 2005; and 1 Mar. 2006. Immediately after germination, seedlings were transplanted into Todd planter flats (model 128; Speedling, Sun City, Fla.) 1.5 × 1.5 × 2.5 inches and were grown to mature, nonflowering plugs in a greenhouse. Before transplanting into the field, flats were placed outside in full sun for 1 to 2 weeks for hardening plants. Plugs were transplanted on 20 Mar. 2001, 1 and 2 Apr. 2002, 9 and 16 Apr. 2003, 24 Mar. 2004, 6 Apr. 2005, 23 Nov. 2005, and 13 Apr. 2006 into raised ground beds 32 inches wide × 8 inches high of Eau-Gallie fine sand (pH, 6.2–6.8). In most tests, five plants were planted along the midline at 12 to 24 inches apart, based on the space requirements of the petunia type. When space was limited in a trial, one plant was planted on the midline of the bed with four corner plants equidistantly spaced from this plant, forming a rectangle; or a sixth plant was added on the midline, equidistant from the first midline plant and two of the four corner plants, forming two chevron patterns. Cultivars within the same class were both sown and transplanted on the same date when multiple sowing or transplanting dates were indicated in the same year. Two duplicate fields were planted for each trial. One field was sprayed with pesticides on demand, whereas the other was not sprayed at all. Objective data were collected, and subjective foliage and flower quality ratings were taken from the former, whereas pest symptom ratings on plants unexposed to pesticides were taken in the latter.

Solid Nutricote 13N–5.7P–10.8K (13–13–13, 100-d slow-release type; Florikan, Sarasota, Fla.) fertilizer was applied by hand to each plant on the soil surface ≈1 inch from the plant stem under the plastic mulch in 2000–01 at 14 g/plant. Osmocote Plus 15N–3.9P–10K fertilizer slow-release type with micro-nutrients (15–9–12, 5–6 month; The Scotts Co., Marysville, Ohio) was used at the same rate in 2002–06. Beds were fumigated at or more than 14 d before planting with a mixture of 66% methyl bromide and 33% chloropicrin at 350 lb/acre (175 lb/acre in 2005 and 2006) and covered with white-on-black polyethylene film. Seepage irrigation water was supplied

Table 1. Plant and flowering characteristics and performance ratings for petunia cultivars grown in central Florida trials at Bradenton (Spring/Summer 2001–04) and Balm (Spring/Summer 2005 and 2006, and Winter/Early Spring 2005–06) and grouped within classes according to plant type and height, and flower type and color, arranged within a class by trial year.

Cultivar	Seed source ^z	Trial y	Measurements (cm) ^y				Flowering, d to first flower ^x	Cultivar quality (1–7-pt scale) ^w			Pest symptoms (1–7-pt scale) ^v			Overall performance rating ⁿ
			Plant ht	Plant width	Flower diameter	Flower		Foliage rating	Flower rating	Arthropod rating	Disease rating			
Double Madness Pink	Ball	2001	19 ± 3.2 ^s	35 ± 4.0	6.1 ± 0.5	47 ± 1.3	4.0 ± 0.5	4.7 ± 0.0	6.3 ± 0.3	5.9 ± 0.1	5.2 ± 0.2			
	Ball	2001	18 ± 1.0	32 ± 3.0	6.4 ± 0.4	59 ± 2.1	4.5 ± 0.4	3.5 ± 0.2	6.5 ± 0.2	5.9 ± 0.2	5.1 ± 0.2			
Double Madness Satin Pink	Ball	2001	16 ± 2.1	32 ± 3.3	6.1 ± 0.4	49 ± 2.2	0.4 ± 0.2	4.1 ± 0.5	6.7 ± 0.2	6.1 ± 0.3	5.3 ± 0.1			
Double Madness Rose & White	Ball	2000	35 ± 1.5	56 ± 4.9	6.2 ± 0.1	47 ± — ^r	3.6 ± 0.6	3.9 ± 0.3	— ^q	— ^q	3.7 ± 0.4			
Madness Clear Mix	Ball	2002	25	44	5.5	53	5.0	5.2	6.5	5.7 a ^p	5.6			
	Ball	2002	23 ⁿ	51 ⁿ	5.7 ⁿ	61 ⁿ	5.3 ⁿ	5.5 ⁿ	6.7 ⁿ	5.2 b	5.7 ⁿ			
Celebrity Mid Blue	Bodger	2002	29 ± 4.5	51 ± 8.3	5.2 ± 0.2	63 ± 0.6	5.0 ± 0.5	5.5 ± 0.0	6.3 ± 0.3	6.0 ± 0.1	5.7 ± 0.2			
Celebrity Chiffon Morn	Bodger	2002	22 ± 3.1	53 ± 0.6	6.3 ± 0.2	55 ± 1.2	5.0 ± 0.5	5.0 ± 0.0	6.8 ± 0.3	5.9 ± 0.3	5.6 ± 0.2			
Madness Lavender Glow	Ball	2005	25 ± 2.0	43 ± 3.5	6.6 ± 0.5	44 ± 0.6	4.8 ± 0.2	5.2 ± 0.2	6.3 ± 0.1	5.3 ± 0.1	5.4 ± 0.1			
Celebrity Burgundy	Bodger	2002	23 a	50	5.5	55	5.3	5.0	6.5	5.5	5.4 b			
	Ball	2002	20 b	51 ⁿ	5.5 ⁿ	61 ⁿ	5.2 ⁿ	5.0 ⁿ	6.3 ⁿ	5.8 ⁿ	5.5 a			
Celebrity Burgundy Frost	Bodger	2001	15 ± 1.3	38 ± 5.0	6.2 ± 0.2	50 ± 1.0	5.3 ± 0.7	3.3 ± 0.3	6.7 ± 0.1	5.7 ± 0.3	5.2 ± 0.1			
Celebrity Rose	Bodger	2005	15 ± 1.2	35 ± 4.0	6.2 ± 0.3	42 ± 0.6	4.5 ± 0.4	4.2 ± 0.2	6.6 ± 0.1	5.1 ± 0.1	5.1 ± 0.1			
Madness Rose Morn	Ball	2005	17 ± 3.5	28 ± 3.5	6.1 ± 0.2	42 ± 0.6	4.3 ± 0.0	5.1 ± 0.2	6.7 ± 0.0	5.4 ± 0.2	5.3 ± 0.1			
Celebrity White	Bodger	2002	25 ± 3.2	51 ± 6.0	6.0 ± 0.4	68 ± 1.2	4.8 ± 0.3	4.7 ± 0.3	6.8 ± 0.3	5.9 ± 0.3	5.6 ± 0.2			
Dreams Wild Rose Mix	PanAmerican	2001	14 ± 1.8	37 ± 2.0	5.9 ± 1.1	44 ± 1.7	5.1 ± 0.5	4.7 ± 0.3	6.5 ± 0.4	5.7 ± 0.1	5.5 ± 0.2			
	Ball	2005	23 a	41 a	8.2	44	4.3	4.3 b	6.3	4.7	4.9			
	Grimes	2005	14 b	28 b	8.6 ⁿ	42 ⁿ	4.2 ⁿ	4.6 a	6.3 ⁿ	4.7 ⁿ	4.8 ⁿ			

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Table 1. (Continued) Plant and flowering characteristics and performance ratings for petunia cultivars grown in central Florida trials at Bradenton (Spring/Summer 2001–04) and Balm (Spring/Summer 2005 and 2006, and Winter/Early Spring 2005–06) and grouped within classes according to plant type and height, and flower type and color, arranged within a class by trial year.

Cultivar	Seed source ^z	Trial y	Measurements (cm) ^y			Flowering, d to first flower ^x	Cultivar quality (1–7-pt scale) ^w		Pest symptoms (1–7-pt scale) ^v		Overall performance rating ⁿ
			Plant ht	Plant width	Flower diameter		Foliage rating	Flower rating	Arthropod rating	Disease rating	
Double Cascade Blue	PanAmerican	2004	28 ± 1.2	53 ± 4.5	7.4 ± 0.2	61 ± 2.9	5.5 ± 0.4	4.6 ± 0.2	6.3 ± 0.1	6.4 ± 0.1	5.7 ± 0.2
Limbo Blue	Hem Gen.	2005–06	21 ± 1.5	36 ± 2.5	8.2 ± 0.3	51 ± 1.0	5.4 ± 0.5	5.4 ± 0.2	6.1 ± 0.1	5.3 ± 0.4	5.6 ± 0.2
Limbo Rose	Hem Gen.	2005–06	16 ± 1.0	31 ± 0.6	7.4 ± 0.3	52 ± 2.5	4.4 ± 0.2	5.2 ± 0.3	6.0 ± 0.6	5.0 ± 0.3	5.2 ± 0.2
Dreams Sky Blue	PanAmerican	2004	31 ± 1.5	52 ± 1.0	7.1 ± 0.2	54 ± 0.0	4.4 ± 0.8	5.7 ± 0.4	6.4 ± 0.3	6.2 ± 0.2	5.7 ± 0.3
Storm Blue ^l	Goldsmith	2003	21 b	41	6.4	71	6.0 a	5.0	6.7	6.1	5.9 a
Ultra Blue	Goldsmith	2003	16 a	37 ⁿ	6.5 ⁿ	71 ⁿ	4.7 b	5.0 ⁿ	6.5 ⁿ	5.4 ⁿ	5.0 b
Eagle Blue ^m	Sakata	2004	21	48	7.6	53	5.7	5.9 a	6.5	7.0	6.2
Storm Blue	Goldsmith	2004	22 ⁿ	53 ⁿ	7.1 ⁿ	57 ⁿ	5.0 ⁿ	5.0 b	6.5 ⁿ	6.7 ⁿ	5.7 ⁿ
Eagle Salmon	Sakata	2000	32 ± 3.0	49 ± 16.4	6.9 ± 6.3	38 ± —	3.6 ± 0.8	4.7 ± 0.3	—	—	4.1 ± 0.5
Bravo Salmon Veined	Syngenta	2002	19	47 a	7.6 a	60 ab	5.0 b	4.5	6.2	5.8 b	5.3 b
Storm Salmon	Goldsmith	2002	18	36 b	6.0 b	58 b	3.5 c	4.5	6.3	6.5 a	5.1 c
Ultra Salmon	Goldsmith	2002	21 ⁿ	51 a	7.4 a	64 a	5.7 a	4.5 ⁿ	6.2 ⁿ	6.3 a	5.7 a
Eagle Pastel Pink	Sakata	2000	29 ± 3.9	46 ± 10.7	6.6 ± 0.8	37 ± —	4.8 ± 0.8	5.8 ± 1.1	—	—	5.3 ± 0.4
Ultra Pastel Pink	Goldsmith	2003	17 ± 0.4	36 ± 0.4	7.2 ± 0.1	71 ± 1.2	5.0 ± 0.0	5.2 ± 0.3	7.0 ± 0.0	6.8 ± 0.0	6.0 ± 0.1
Aladdin Pink Morn	Bodger	2002	28 a	58 a	6.7 a	58	4.0	5.0	6.2	5.8	5.1
Storm Pink	Goldsmith	2002	20 b	40 b	6.0 b	59	4.0	4.4	5.7	5.4	4.9
Storm Pink Morn	Goldsmith	2002	27 a	50 a	6.2 b	58 ⁿ	4.0 ⁿ	5.0 ⁿ	6.0 ⁿ	6.2 ⁿ	5.3 ⁿ
Storm Lavender	Goldsmith	2002	30 ± 2.9	53 ± 6.1	6.1 ± 0.2	61 ± 2.5	4.8 ± 0.3	5.3 ± 0.3	6.4 ± 0.1	5.6 ± 0.0	5.5 ± 0.1
Aladdin Strawberry Ice	Bodger	2002	19 ± 2.6	45 ± 4.2	7.0 ± 0.5	65 ± 2.1	4.5 ± 0.5	4.3 ± 0.3	6.5 ± 0.3	5.2 ± 0.3	5.1 ± 0.1
Aladdin Burgundy	Bodger	2002	24	47 b	6.7	64 a	4.7	3.3 b	6.5	6.5 b	5.1 b
Storm Violet	Goldsmith	2002	25 ⁿ	54 a	6.9 ⁿ	60 b	5.0 ⁿ	5.0 a	6.5 ⁿ	6.8 a	5.6 a

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Table 1. (Continued) Plant and flowering characteristics and performance ratings for petunia cultivars grown in central Florida trials at Bradenton (Spring/Summer 2001–04) and Balm (Spring/Summer 2005 and 2006, and Winter/Early Spring 2005–06) and grouped within classes according to plant type and height, and flower type and color, arranged within a class by trial year.

Cultivar	Seed source ^z	Trial y	Measurements (cm) ^y			Flowering, d to first flower ^x	Cultivar quality (1–7-pt scale) ^w		Pest symptoms (1–7-pt scale) ^v		Overall performance rating ^u
			Plant ht	Plant width	Flower diameter		Foliage rating	Flower rating	Arthropod rating	Disease rating	
Storm Violet	Goldsmith	2003	18 b	41 b	7.6 b	68 b	4.8 b	6.3 a	6.9	6.4	6.1
Ultra Violet	Goldsmith	2003	20 a	52 a	8.1 a	69 a	5.0 a	5.3 b	6.5 ⁿ	6.0 ⁿ	5.9 ⁿ
Dreams Burgundy Picotee	PanAmerican	2004	23 ± 1.2	45 ± 1.2	7.1 ± 0.2	54 ± 8.1	6.1 ± 0.5	5.4 ± 0.5	6.5 ± 0.3	6.5 ± 0.3	6.2 ± 0.3
Eagle Red	Sakata	2000	21 ± 0.5	40 ± 1.7	6.8 ± 0.3	38 ± —	4.3 ± 0.5	4.3 ± 0.5	—	—	4.3 ± 0.5
Storm Red	Goldsmith	2002	20	38 b	6.6 b	59 b	3.7	3.5	5.2	6.0	4.6
Ultra Red	Goldsmith	2002	23 ⁿ	44 a	7.7 a	62 a	4.2 ⁿ	3.5 ⁿ	5.5 ⁿ	5.8 ⁿ	4.7 ⁿ
Aladdin Cherry	Bodger	2002	16	51 a	6.5 b	60	5.0 a	4.0 a	6.5	6.0	5.1
Aladdin Orange	Bodger	2002	21 ⁿ	40 b	6.7 b	62 ⁿ	4.2 b	4.2 a	5.3 ⁿ	5.7 ⁿ	4.9 ⁿ
Eagle Red Star	Sakata	2000	30 ± 3.6	51 ± 10.7	6.8 ± 1.1	43 ± —	5.4 ± 0.6	4.3 ± 0.0	—	—	4.9 ± 0.5
Aladdin White	Bodger	2002	21 b	47	7.5	65 a	4.3	3.3	5.5	5.0 b	4.6
Storm White	Goldsmith	2002	35 a	57	7.5	63 ab	5.2	3.7	5.7	5.5 ab	5.0
Ultra White	Goldsmith	2002	24 b	45 ⁿ	7.4 ⁿ	60 b	4.3 ⁿ	3.2 ⁿ	6.5 ⁿ	5.7 a	4.8 ⁿ
Dreams Rose Picotee	PanAmerican	2004	22 ± 1.2	49 ± 2.5	7.5 ± 0.2	61 ± 2.0	5.3 ± 0.4	5.2 ± 0.2	6.2 ± 0.2	6.3 ± 0.4	5.8 ± 0.2
Eagle White	Sakata	2000	26 ± 3.5	55 ± 4.8	6.6 ± 0.5	36 ± —	5.0 ± 0.6	6.0 ± 0.7	—	—	5.5 ± 0.2
Aladdin Yellow	Bodger	2001	21 ± 1.0	35 ± 3.1	6.9 ± 0.3	52 ± 0.9	4.7 ± 0.4	4.9 ± 0.2	5.6 ± 0.6	6.2 ± 0.2	5.3 ± 0.1
Fantasy Mix	Goldsmith	2002	15 ± 1.0	33 ± 0.6	3.8 ± 0.2	55 ± 1.7	5.0 ± 0.5	4.7 ± 0.3	6.7 ± 0.2	6.4 ± 0.1	5.7 ± 0.1
Fantasy Light Lavender	Goldsmith	2001	16 ± 1.2	35 ± 3.2	3.8 ± 0.2	47 ± 0.5	5.8 ± 0.6	4.6 ± 0.2	6.9 ± 0.1	5.6 ± 0.4	5.7 ± 0.2
Fantasy Rose	Goldsmith	2001	14 ± 0.6	32 ± 1.3	4.3 ± 0.1	41 ± 1.2	4.9 ± 0.3	3.9 ± 0.2	7.0 ± 0.1	5.5 ± 0.3	5.3 ± 0.1
Mambo Blue	Hem Gen.	2005–06	21 ± 0.6	33 ± 2.1	6.2 ± 0.1	51 ± 1.2	5.0 ± 0.3	5.0 ± 0.9	6.0 ± 0.0	5.3 ± 0.2	5.3 ± 0.3

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Cultivar	Seed source ^z	Trial y	Measurements (cm) ^y			Flowering, d to first flower ^x	Cultivar quality (1–7-pt scale) ^w		Pest symptoms (1–7-pt scale) ^v		Overall performance rating ⁿ
			Plant ht	Plant width	Flower diameter		Foliage rating	Flower rating	Arthropod rating	Disease rating	
Mambo Rose	Hem Gen.	2005–06	16 ± 1.0	33 ± 1.0	6.0 ± 0.2	57 ± 4.3	4.8 ± 0.2	4.7 ± 0.0	5.9 ± 0.1	4.8 ± 0.3	5.0 ± 0.0
Ball Mixer: Old Glory	Ball	2002	27 ± 2.1	64 ± 3.1	5.7 ± 0.2	59 ± 2.0	4.0 ± 0.5	4.5 ± 0.0	6.4 ± 0.1	6.2 ± 0.1	5.3 ± 0.1
		2002	21 ± 0.6	36 ± 2.5	5.9 ± 0.1	56 ± 2.5	3.5 ± 0.5	3.5 ± 0.0	6.4 ± 0.2	6.0 ± 0.1	4.9 ± 0.1
Symphony Salmon	Takii	2001	14 ± 0.7	34 ± 1.9	5.1 ± 0.2	41 ± 1.2	5.2 ± 0.2	4.6 ± 0.4	6.9 ± 0.2	5.8 ± 0.0	5.7 ± 0.1
		2001	16 ± 0.7	40 ± 1.6	6.0 ± 0.2	44 ± 0.5	5.1 ± 0.3	5.0 ± 0.0	6.8 ± 0.1	6.2 ± 0.2	5.8 ± 0.1
Symphony Pink	Syngenta	2002	18 ± 0.0	42 ± 2.1	5.6 ± 0.1	55 ± 1.2	5.5 ± 0.0	4.5 ± 0.0	6.7 ± 0.2	6.4 ± 0.3	5.7 ± 0.1
		2001	20 ± 2.0	33 ± 3.7	5.4 ± 0.2	45 ± 1.7	3.9 ± 0.3	5.3 ± 0.3	6.8 ± 0.1	5.9 ± 0.1	5.5 ± 0.2
Primetime Violet Star	Goldsmith	2002	23 ± 2.3	58 ± 2.5	5.5 ± 0.2	59 ± 2.0	5.5 ± 0.5	4.0 ± 0.0	6.9 ± 0.1	6.2 ± 0.2	5.6 ± 0.1
		2003	10 ± 1.9	21 ± 2.7	4.4 ± 0.1	73 ± 1.2	4.5 ± 0.5	4.8 ± 0.3	7.0 ± 0.0	7.0 ± 0.0	5.8 ± 0.2
Symphony Light Blue	Takii	2001	13 ± 1.4	33 ± 0.7	6.0 ± 0.1	44 ± 1.3	3.9 ± 0.3	4.4 ± 0.3	6.8 ± 0.1	6.1 ± 0.2	5.3 ± 0.1
		2002	15 ± 1.0	31 ± 2.5	5.3 ± 0.2	53 ± 2.3	4.8 ± 0.3	3.7 ± 0.3	6.9 ± 0.1	6.2 ± 0.2	5.6 ± 0.1
Symphony Scarlet	Takii	2001	18 ± 2.1	33 ± 2.2	6.1 ± 0.2	48 ± 1.0	4.8 ± 0.4	5.7 ± 0.3	6.4 ± 0.2	5.9 ± 0.2	5.7 ± 0.2
		2001	20 ± 0.5	38 ± 1.6	5.9 ± 0.1	47 ± 0.8	4.2 ± 0.2	5.3 ± 0.3	6.4 ± 0.2	5.7 ± 0.1	5.4 ± 0.1
Symphony Red Picotee	Takii	2002	24 ± 1.5	52 ± 2.0	5.2 ± 0.2	52 ± 0.2	4.0 ± 0.0	3.3 ± 0.6	6.1 ± 0.2	6.0 ± 0.1	5.0 ± 0.1
		2003	15 ± 1.6	44 ± 1.9	5.4 ± 0.1	72 ± 0.0	5.7 ± 0.3	5.7 ± 0.3	6.9 ± 0.1	6.9 ± 0.1	6.3 ± 0.2

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Table 1. (Continued) Plant and flowering characteristics and performance ratings for petunia cultivars grown in central Florida trials at Bradenton (Spring/Summer 2001–04) and Balm (Spring/Summer 2005 and 2006, and Winter/Early Spring 2005–06) and grouped within classes according to plant type and height, and flower type and color, arranged within a class by trial year.

Cultivar	Seed source ^z	Trial y	Measurements (cm) ^y			Flowering, d to first flower ^x	Cultivar quality (1–7-pt scale) ^w		Pest symptoms (1–7-pt scale) ^v		Overall performance rating ⁿ
			Plant ht	Plant width	Flower diameter		Foliage rating	Flower rating	Arthropod rating	Disease rating	
Symphony White	Takii	2001	21 ± 2.2	39 ± 2.0	6.5 ± 0.2	46 ± 2.4	5.4 ± 0.6	4.9 ± 0.2	6.8 ± 0.3	5.6 ± 0.3	5.7 ± 0.2
	Explorer Blue Easy Wave Blue Plush Blue	2002	11 ± 1.0	52 ± 4.6	5.3 ± 0.6	68 ± 5.2	4.3 ± 0.3	5.5 ± 0.0	6.5 ± 0.3	6.2 ± 0.1	5.5 ± 0.1
		2006	21	104 a	5.3	67	4.7 a	4.7	5.9	5.9	5.3
		2006	20 ⁿ	61 b	5.1 ⁿ	61 ⁿ	3.3 b	6.3 ⁿ	6.0 ⁿ	5.3 ⁿ	5.2 ⁿ
Easy Wave Salmon Ramblin' Salmon Capri	PanAmerican	2005	9	59	5.7	44	5.0	4.3 b	6.6	4.9	5.3
	Goldsmith	2005	15 ⁿ	47 ⁿ	5.4 ⁿ	45 ⁿ	5.2 ⁿ	5.3 a	6.4	5.3	5.5
Avalanche Salmon Ramblin' Peach Glo	Bodger	2002	11	44	4.8	61	4.5 b	4.7	6.8	6.5	5.6
	Goldsmith	2002	9 ⁿ	44 ⁿ	5.4 ⁿ	58 ⁿ	6.0 a	5.0 ⁿ	7.0 ⁿ	5.8 ⁿ	6.0 ⁿ
Easy Wave Pink Explorer Pink Explorer Rose Pink Ramblin' Shades O' Pink Wave Pink	PanAmerican	2002	11	51 b	6.1 a	62 b	6.2 c	4.8	6.5 b	4.5 b	5.6 d
	Sakata	2002	12	50 b	5.6 b	56 c	6.2 c	4.7	7.0 a	6.5 a	6.0 b
	Sakata	2002	9	65 a	5.2 b	61 b	7.0 a	4.8	7.0 a	6.5 a	6.1 b
	Goldsmith	2002	11	43 b	5.6 b	61 b	6.0 c	4.7	6.8 ab	6.0 a	5.8 c
	PanAmerican	2002	9 ⁿ	54 b	5.1 b	75 a	6.7 b	5.0 ⁿ	7.0 a	6.3 a	6.3 a
Opera Supreme Pink Morn Ramblin' Pink ^k	PanAmerican	2006	16	93 a	4.7	68	5.2	5.5 b	6.5	6.0	5.8
	Goldsmith	2006	24 ⁿ	75 b	4.7 ⁿ	68 ⁿ	6.2 ⁿ	6.0 a	6.2 ⁿ	6.0 ⁿ	6.1 ⁿ
Avalanche Pink Easy Wave Shell Pink	Bodger	2001	12 ± 1.2	58 ± 5.1	5.8 ± 0.2	49 ± 0.8	5.4 ± 0.4	4.2 ± 0.1	6.8 ± 0.1	5.8 ± 0.7	5.5 ± 0.2
	PanAmerican	2002	13 ± 1.2	53 ± 3.6	5.6 ± 0.2	54 ± 2.5	6.7 ± 0.6	5.5 ± 0.0	6.9 ± 0.1	6.4 ± 0.1	6.3 ± 0.1
Avalanche Lilac Ramblin' Lavender	Bodger	2003	13	45	5.1	73	3.6 b	3.4 b	7.0	6.9	6.5
	Goldsmith	2003	10 ⁿ	52 ⁿ	5.3 ⁿ	72 ⁿ	5.7 a	5.0 a	6.9 ⁿ	6.9 ⁿ	6.7 ⁿ
Avalanche Lavender Explorer Lavender	Bodger	2002	11	43	5.6	65	6.0	5.2	6.8	6.0	5.9
	Sakata	2002	13 ⁿ	55 ⁿ	5.2 ⁿ	64 ⁿ	6.0 ⁿ	5.0 ⁿ	6.3 ⁿ	6.3 ⁿ	5.9 ⁿ
Opera Light Purple	Takii	2002	10 ± 0.6	60 ± 4.2	5.4 ± 0.4	71 ± 0.0	6.5 ± 0.0	5.0 ± 0.0	6.6 ± 0.2	6.3 ± 0.1	6.1 ± 0.1

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Table 1. (Continued) Plant and flowering characteristics and performance ratings for petunia cultivars grown in central Florida trials at Bradenton (Spring/Summer 2001–04) and Balm (Spring/Summer 2005 and 2006, and Winter/Early Spring 2005–06) and grouped within classes according to plant type and height, and flower type and color, arranged within a class by trial year.

Cultivar	Seed source ^z	Trial y	Measurements (cm) ^y			Flowering, d to first flower ^x	Cultivar quality (1–7-pt scale) ^w		Pest symptoms (1–7-pt scale) ^v		Overall performance rating ⁿ
			Plant ht	Plant width	Flower diameter		Foliage rating	Flower rating	Arthropod rating	Disease rating	
Explorer Purple	Sakata	2002	11 ± 0.0	58 ± 2.1	5.7 ± 0.3	64 ± 3.0	6.3 ± 0.3	5.2 ± 0.3	6.6 ± 0.3	5.9 ± 0.3	6.0 ± 0.3
Plush Purple	Syngenta	2006	19	74	5.4	58 b	4.5	6.0	5.7	5.3	5.4
Ramblin' Violet	Goldsmith	2006	23 ⁿ	83 ⁿ	5.3 ⁿ	67 a	4.8 ⁿ	5.0 ⁿ	6.0 ⁿ	5.3 ⁿ	5.3 ⁿ
Avalanche Red ^l	Bodger	2002	13	41	4.6	61	4.7	5.0	6.8	5.9	5.5
Avalanche Tropical Red	Bodger	2002	11 ⁿ	45 ⁿ	5.8 ⁿ	76 ⁿ	5.0 ⁿ	4.7 ⁿ	5.6 ⁿ	6.0 ⁿ	5.5 ⁿ
Easy Wave Red ^l	PanAmerican	2004	13	69 a	5.6 a	59 b	6.3 a	5.2	6.5	6.6	6.0
Ramblin' Red	Goldsmith	2004	14	76 a	5.8 a	71 a	5.0 b	5.5	6.3	6.4	5.7
Rapide Red	Floranova	2004	13 ⁿ	46 b	4.9 b	61 b	5.0 b	5.9 ⁿ	6.8 ⁿ	6.9 ⁿ	5.9 ⁿ
Avalanche Red Improved	Bodger	2005–06	20 a	73	6.0	70	5.3	5.0	5.4 a	5.3 a	5.4
Easy Wave Red	PanAmerican	2005–06	11 b	82 ⁿ	5.8 ⁿ	64 ⁿ	5.1 ⁿ	4.5 ⁿ	4.7 b	4.5 b	5.0 ⁿ
Plush Red	Syngenta	2006	29 ± 4.4	63 ± 12.7	5.2 ± 0.5	66 ± 1.7	4.0 ± 0.5	5.1 ± 0.3	6.2 ± 0.2	5.8 ± 0.3	5.3 ± 0.3
Avalanche Cherry	Bodger	2003	9 ± 1.0	45 ± 7.9	5.8 ± 0.3	73 ± 1.2	4.2 ± 0.3	4.3 ± 0.3	6.8 ± 0.3	5.8 ± 0.0	5.3 ± 0.1
Avalanche Rose	Bodger	2002	9 b	42 b	5.1 a	62 a	5.2 b	4.7 c	6.5	6.3	5.6 bc
Explorer Rose ^l	Sakata	2002	10 b	57 a	5.2 a	67 a	6.7 a	5.3 b	7.0	6.5	6.1 a
Opera Deep Rose	Takii	2002	14 a	47 b	5.1 a	52 c	5.7 ab	5.8 a	6.5	6.2	6.0 ab
Ramblin' Neon Rose	Goldsmith	2002	10 b	40 b	4.7 b	68 a	4.8 b	4.5 c	6.8 ⁿ	6.5 ⁿ	5.4 c
Easy Wave Rosy Dawn ^l	PanAmerican	2005	13	49 b	5.7 a	47 b	4.7	5.1 a	6.3	5.1	5.4
Explorer Rose	Sakata	2005	10 ⁿ	66 a	5.3 b	59 a	4.7 ⁿ	4.3 b	6.6 ⁿ	4.8 ⁿ	5.1 ⁿ
Avalanche Rose Improved	Bodger	2006	24 a	92 a	5.6	63 b	5.3 a	5.5	6.3	5.9	5.8
Easy Wave Rosy Dawn	PanAmerican	2006	16 b	70 b	5.5 ⁿ	71 a	4.8 b	5.5 ⁿ	6.3 ⁿ	5.5 ⁿ	5.5 ⁿ
Avalanche White ^l	Bodger	2002	10 b	42	5.5	68	5.8	5.0	6.8	5.2	5.7
Explorer White	Sakata	2002	20 a	40 ⁿ	6.0 ⁿ	70 ⁿ	5.5 ⁿ	4.7 ⁿ	6.8 ⁿ	6.2 ⁿ	5.7 ⁿ
Avalanche White	Bodger	2005	13 b	47	6.1 b	45	4.2 b	4.5 b	6.6	4.8 b	5.0
Ramblin' White ^l	Goldsmith	2005	21 a	59 ⁿ	6.4 a	45 ⁿ	4.8 a	5.0 a	6.3 ⁿ	5.0 a	5.3 ⁿ
Plush White	Syngenta	2006	21	68 b	5.8	56 b	5.3	5.8	6.8 a	5.8	5.9
Ramblin' White	Goldsmith	2006	26 ⁿ	89 a	6.3 ⁿ	64 a	5.0 ⁿ	5.2 ⁿ	6.4 b	6.2 ⁿ	5.7 ⁿ
Ramblin' Blue	Goldsmith	2006	28 a	83	5.1	66	4.8	5.5	5.7	5.7	5.4
Wave Blue	PanAmerican	2006	22 b	103 ⁿ	4.8 ⁿ	67 ⁿ	4.3 ⁿ	5.3 ⁿ	6.2 ⁿ	6.1 ⁿ	5.5 ⁿ

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Table 1. (Continued) Plant and flowering characteristics and performance ratings for petunia cultivars grown in central Florida trials at Bradenton (Spring/Summer 2001–04) and Balm (Spring/Summer 2005 and 2006, and Winter/Early Spring 2005–06) and grouped within classes according to plant type and height, and flower type and color, arranged within a class by trial year.

Cultivar	Seed source ^z	Trial y	Measurements (cm) ^y			Flowering, d to first flower ^x	Cultivar quality (1–7-pt scale) ^w		Pest symptoms (1–7-pt scale) ^v		Overall performance rating ^u
			Plant ht	Plant width	Flower diameter		Foliage rating	Flower rating	Arthropod rating	Disease rating	
Tidal Wave Hot Pink	PanAmerican	2000	50 ± 4.5	100 ± 4.1	5.0 ± 0.1	40 ± —	6.2 ± 0.6	6.1 ± 0.3	—	—	6.1 ± 0.4
Ramblin' Lilac Glo	Goldsmith	2002	17 ± 2.0	54 ± 7.5	6.0 ± 0.1	57 ± 1.5	Spreading, tall; purple (light), blue-violet class				
							5.5 ± 0.5	5.3 ± 0.3	6.7 ± 0.3	6.1 ± 0.1	5.9 ± 0.1
Tidal Wave Purple	PanAmerican	2003	30 ± 1.5	68 ± 4.8	5.2 ± 1.2	71 ± 1.2	Spreading, tall; purple, red-violet class				
							5.8 ± 0.3	6.0 ± 0.5	7.0 ± 0.0	6.5 ± 0.3	6.4 ± 0.2
Kahuna Violet	Syngenta	2002	28 ± 1.0	63 ± 11.1	4.5 ± 0.2	53 ± 1.2	Spreading, tall; purple (dark), red-violet class				
							6.0 ± 0.0	7.0 ± 0.0	6.7 ± 0.2	5.7 ± 0.3	6.3 ± 0.1
Ramblin' Burgundy Chrome	Goldsmith	2002	13 ± 2.1	54 ± 3.1	5.1 ± 0.1	65 ± 2.9	Spreading, tall; purple (light) red-violet class				
							6.0 ± 0.0	5.2 ± 0.3	6.2 ± 0.2	5.5 ± 0.0	5.6 ± 0.1
Tidal Wave Cherry	Ball	2000	50 ± 5.3	96 ± 4.4	5.2 ± 0.1	44 ± —	Spreading, tall; red shades/tints class				
							6.7 ± 0.3	6.4 ± 0.3	—	—	6.6 ± 0.1
Kahuna White	Syngenta	2001	29 ± 5.8	76 ± 1.7	6.9 ± 0.3	54 ± 0.8	Spreading, tall; white class				
							6.5 ± 0.2	5.9 ± 0.3	6.8 ± 0.2	6.4 ± 0.1	6.4 ± 0.1

^aBall = Ball Seed Co., West Chicago, Ill.; Bodger = Bodger Seeds, South El Monte, Calif.; Floranova = Floranova Services, Litchfield, Mich.; Goldsmith = Goldsmith Seeds, Gilroy, Calif.; Grimes = Grimes Seeds & Plants, Concord, Ohio; Hem Gen. = Hem Genetics, Hem, The Netherlands; PanAmerican = PanAmerican Seed Co., West Chicago, Ill.; Sakata = Sakata Seed America, Morgan Hill, Calif.; Syngenta = Syngenta Seeds, S&G Flowers, Downers Grove, Ill.; Takii = American Takii, Salinas, Calif.

^y1 cm = 0.3937 inch.

^zThe number of days from sowing seed to the unfurling of the first flower in a plot. For year 2000, no so. First flower data were one observation/cultivar (64 plants/cultivar/flat) in transplant flat before planting to field.

^wAverage of all foliage or flower quality ratings (two to four per trial) taken during the evaluation period on a scale from 1 to 7 points, where 7 points = all plants in a plot had full and uniform foliage, plants were free of pest symptoms and abnormalities or weaknesses such as lodging; 4 point = average foliage density, minimal lodging, or some insect damage, but foliage was still acceptable; 1 point = foliage sparse, stem lodging, or unacceptable pest damage making plants undesirable.

^vAverage of all arthropod or disease ratings (two to four per trial) for flowers taken during the evaluation period on a scale from 1 to 7 points, where 7 points = all foliage or flowers in a plot were free from arthropod feeding scars and diseased tissue in the form of spots, blights, or tissue distortion, symptomatic of plant dysfunction incited by a pathogen; 4 points = average condition, minimal pest damage to tissue, but still acceptable; 1 point = severely infested and damage unacceptable, making foliage or flower undesirable.

^uOverall performance rating is the average of the foliage, flower, arthropod, and disease ratings.

^tPlant classes are determined by factors that can vary with species. For petunia, classes are differentiated by plant type [floribunda (plant size intermediate between grandiflora and multiflora), grandiflora (larger but less numerous flowers than multiflora), multiflora (miniature plants), multiflora (more numerous but smaller flowers than grandiflora)] and spreading (plants cover a wider area than the other types and are further divided by plant height into normal and tall).

^sFlower class types are single and double. The final division for all classes is flower color.

^rMean of three randomized plots and their so.

^qFirst flower unfurled in the transplant flat before planting in the field (2000 trial); one observation/cultivar (64 plants/cultivar/flat).

^pNo pest symptom data were collected for cultivars (2000 trial), because an unsprayed field was not planted.

ⁿMean separation within classes by Duncan's multiple range test, $P < 0.05$.
^mThe class standard (bold type) is chosen from the overall performance rating with the highest numerical value or by another rating category, if overall performance values were equal. Stand-alone cultivars, because they were not evaluated against other cultivars, are not selected as class standards, but would be reevaluated against any new cultivars submitted for evaluation that are in the same class.

^lNon-significant.

^kThe Eagle series has been dropped for future distribution in the U.S. market; however, remaining seed stock will be sold in the United States. Europe and Asia will continue to sell and order new production of seed.

^jFormer standard that was replaced in a later trial by a new standard that had a higher overall performance rating.

ⁱRamblin' Pink' will be reevaluated in a future trial with 'Wave Pink' to resolve class standard.

from lateral ditches spaced 40.5 ft apart, whereas in 2005–06 the seepage irrigation water was supplied from lateral ditches spaced 25 ft apart in full-sun fields or by a subsurface drip irrigation system containing one drip line, supplying water to three beds between the lateral ditches (S.A. Davis, pers. comm.) (Kelly et al., 2006; Smajstrla et al., 1992).

Integrated pest management was used in the sprayed field to determine when pesticide applications were needed to control arthropod pests and plant pathogens. Weather information was recorded by an automated weather station located at the University of Florida's Gulf Coast Research and Education Center at Bradenton [lat. 27°4'N, long. 82°5'W; American Horticultural Society (AHS) heat zone 10 (American Horticultural Society, 1999); U.S. Department of Agriculture (USDA) cold hardiness zone 9b (U.S. National Arboretum, 1990)] and Balm (near Wimauma), Fla. [lat. 27°8'N, long. 82°2'W; AHS heat zone 10 (American Horticultural Society, 1999); USDA cold hardiness zone 9a (U.S. National Arboretum, 1990)] in 2005.

In the sprayed field, 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 on 30 Apr. 2001 (75–81 d from sowing), 8 to 14 Feb. 2002 (81–94 d from sowing), 6 May 2003 (84 d from sowing), 4 May 2004 (78–83 d from sowing), 23 May 2005 (94–95 d from sowing), 3 Mar. 2006 (135 d from sowing), and 14 June 2006 (106 d from sowing). In the sprayed and unsprayed fields, subjective ratings were made by the senior author two to four times between 24 Apr. and 2 June 2001, 1 May and 2 June 2002, 9 and 27 May 2003, 28 Apr. and 3 June 2004, 20 May and 20 June 2005, and 2 and 22–23 June 2006. Each time, an evaluation was made across all five or six plants in the plot, resulting in one value per plot. A scale of 1 to 7 points was used, with the highest rating being 7 points. In the sprayed field, floral characteristics were rated on the following scale: 7 points, flowers numerous, uniformly distributed overall plants, flowers were free from arthropod and disease symptoms; 4 points, average floral display, may have some pest damage

but not severe enough to cause flowers to be unacceptable; and 1 point, unacceptable flower number or display, or pest damage severe resulting in unattractive flowers. Foliage ratings were made as follows: 7 points, all plants in a plot had full and uniform foliage, plants were free of arthropod and disease symptoms and abnormalities or weaknesses such as lodging; 4 points, average foliage density, minimal lodging, or some insect damage but foliage was still acceptable; 1 point, foliage sparse, stem lodging, or unacceptable pest damage making plants undesirable. In the unsprayed field, arthropod and disease ratings on flowers were made as follows: 7 points, all flowers or foliage free from arthropod feeding scars and absence of diseased tissue in the form of spots, blights, or tissue distortion incited by a pathogen; 4 points, minimal pest damage to tissue, and flowers or foliage still acceptable; 1 point, flowers severely infested and damaged, resulting in undesirable flowers or foliage. For a measure of performance over time, each foliage and flower rating in the sprayed field, and each arthropod symptom and disease symptom rating for foliage and flower in the unsprayed field taken in a season was added individually and divided by the total number of ratings in the season (two to four per trial). For a measure of overall performance, averages for the flower and foliage ratings in the sprayed field, and arthropod and disease symptom ratings for foliage and flower in the unsprayed field were added together and divided by four.

Each class was analyzed as a separate experiment. A randomized complete block experimental design was used, with three or four blocks containing five or six plants per plot. The experimental unit for objective data was the average measurement from three plants, and for subjective data was one rating value that considered all six plants in the plot. All data were analyzed by analysis of variance 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

During the evaluation periods for the eight trials, weather

conditions resulted in a minimum temperature range from 2.1 °C (21 Dec. 2000) to 10.7 °C (13 Apr. 2003), and maximum temperatures that ranged from 33.9 °C (13 June 2003) to 35.2 °C (June 2001). Total rainfall ranged from 20.6 cm (2006) to 51.1 cm (2002) (Florida Automated Weather Network, 2004).

Although many disease organisms have been isolated from petunia over time from around the world (Alfieri et al., 1994; Brunt et al., 1996; Farr et al., n.d.), petunia is considered to be relatively free of diseases causing leaf spots (Alfieri and Schubert, 1986). In Florida, petunia performs well, but ratings may decline when the weather conditions are optimum for a particular disease. In our trials, three diseases predominated if petunias were left untreated by pesticides: alternaria leaf spot or blight (*Alternaria* sp. on foliage) (Alfieri et al., 1994; Chase, 1998a), graymold (*Botrytis cinerea*) on flowers in Florida's cool winter and early spring (Chase, 1998b), and choanephora flower blight (*Choanephora cucurbitarum*; may cause wet rot) (Holcomb, 2003) in warm and humid weather (Daughtrey et al., 1995; University of North Carolina, n.d.).

Insect damage symptoms were primarily from thrips (*Frankliniella* spp.) feeding on flowers, which was difficult to control, and from lepidopterist larvae (*Spodoptera* spp.), which were easily controlled.

Table 1 presents the class standard for each class, with the trial year it was selected and all the cultivars evaluated with the standards; the solitary cultivar entries without comparison are also listed. Plant width, flower size, flowering earliness, cultivar quality ratings for foliage and flowers, and pest symptom ratings for arthropod and disease damage to foliage and flowers are listed in Table 1. It is important to note that cultivars can be selected as class standards and vary in performance ratings from poor to outstanding. Class standards may be visually and statistically similar to other cultivars in their class, but were chosen for future comparisons based on the largest value for overall performance. By using this class standard system, we eliminated the need to reevaluate large numbers of cultivars previously evaluated when new

cultivars were released in the same class. Cultivars with an overall rating ≥ 5.5 points were considered outstanding, 5.0 to 5.4 points as good, 4.0 to 4.9 points as fair, and less than 4.0 points as poor.

Selecting outstanding cultivars

Ideally, class standard petunia selections would also have outstanding ratings (≥ 5.5 points, overall performance rating), but this was not the case in many instances. Cultivars with an outstanding overall performance rating and selected as class standard were (floribunda class) 'Madness Waterfall Mix' and 'Madness Magenta'; (grandiflora class) 'Eagle Blue', 'Storm Violet', and 'Ultra Salmon'; and (spreading class) 'Avalanche Lavender', 'Avalanche Rose Improved', 'Avalanche Red Improved', 'Plush White', 'Ramblin' Lavender', 'Ramblin' Salmon Capri', 'Ramblin' Peach Glo', 'Wave Blue', and 'Wave Pink'. Cultivars that were outstanding but not class standards, or were former class standards, were (floribunda class) 'Madness Clear Mix', (grandiflora class) 'Storm Blue' and 'ultraviolet', and (spreading class) 'Avalanche Salmon', 'Easy Wave Pink', 'Easy Wave Red', 'Explorer Pink', 'Explorer Rose Pink', 'Ramblin' Shades O' Pink', 'Explorer Lavender', 'Easy Wave Red', 'Avalanche Tropical Red', 'Ramblin' Red', 'Rapid Red', 'Explorer Rose', 'Opera Deep Rose', 'Easy Wave Rosy Dawn', 'Explorer White', and 'Ramblin White'.

Solitary cultivar entries with an outstanding overall performance rating were (floribunda class) 'Celebrity Chiffon Morn', 'Celebrity Mid Blue', 'Celebrity White', 'Double Cascade Blue', 'Dreams Burgundy Picotee', 'Dreams Rose Picotee', 'Dreams Sky Blue', 'Dreams Wild Rose Mix', 'Eagle White', 'Limbo Blue', 'Storm Lavender', and 'Ultra Pastel Pink'; (milliflora class) 'Fantasy Light Lavender' and 'Fantasy Mix'; (multiflora class) 'Hurrah Pink Chiffon', 'Primitime Violet Star', 'Symphony Blue', 'Symphony Light Blue', 'Symphony Pink', 'Symphony Violet', 'Symphony Red Picotee', 'Symphony Rose', 'Symphony Rose Star', 'Symphony Salmon', and 'Symphony White'; and (spreading class)

'Avalanche Lilac', 'Avalanche Pink', 'Easy Wave Shell Pink', 'Explorer Blue', 'Explorer Purple', 'Kahuna Violet', 'Kahuna White', 'Opera Light Purple', 'Ramblin' Burgundy Chrome', 'Ramblin' Lavender', 'Ramblin' Lilac Glo', 'Ramblin' Violet', 'Tidal Wave Cherry', 'Tidal Wave Hot Pink', and 'Tidal Wave Purple'.

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