

## Varietal diversity and selection of potential varieties of *Petunia hybrida* L. for commercial cultivation in Bangladesh

Uma Chouhan, Shamima Akter\* and Nazmul Alam

Department of Botany, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh

### Abstract

A study was conducted to compare the morpho-reproductive traits of twenty two genotype of *Petunia* in order to select superior and sustainable genotypes for commercial cultivation in Bangladesh during winter 2021-22. Thirteen qualitative and quantitative characters viz. stigma type, leaf shape, plant height (cm), number of branches, number of effective branches, days to flower initiation, number of flowers, duration of flowers, flowering duration, plant longevity, number of stamens, stamen length (cm) and petiole length (cm) were observed during the study period. The findings found that all morpho-reproductive traits differed significantly amongst the genotypes investigated, with the exception of the stamens, which were five in number. Highest quantitative variation was observed in days to flower initiation and longevity of the plants. Glow picotee blue showed the superior plant height (29.33 cm). Deep salmon had the shortest time to bloom initiation (52 days). Maximum number of flowers was recorded from ultra purple star (50) followed by ultra crimson star (49.67) while the duration of the flowers was maximum (6.67 days) in opera supreme white, prism pink, ultra burgundy star and ultra purple star. Opera supreme white had the longest flowering time (69.67 days). Whereas ultra purple star, ultra crimson star and ultra rose star had the longest lifespan (111 days). The genotypes deep salmon, ultra purple star, ultra red star, ultra rose star, opera supreme white, dreams midnight, and prism pink are recommended for commercial cultivation based on their overall morpho-reproductive performance.

**Key words:** Varietal diversity, selection, commercial cultivation, *Petunia*.

### INTRODUCTION

*Petunia hybrida* commonly known as garden petunia belongs to the family Solanaceae which is the prime family under Magnoliophyta division (Bremer *et al.*, 2003). *Petunia* genus consists of 35 species (Wizsman & Jong, 1985) and is an annual herbaceous plant rich with unique colors and was originated in South America which is regarded as the most economically important ornamental plant (Mol *et al.*, 1985).

The history of petunia development as a crop is discussed, with ramifications for many other floricultural crops (Griesbach, 2006). Hybrid seed production altered the crop, and subsequent domestication by flower breeders resulted in a diverse spectrum of flower hues and patterns (Ganga *et al.*, 2011). Several plants within the Solanaceae family have ornamental value, but the *Petunia* is the one that has the most significant economic value worldwide (Sink, 1984). *Petunia* comes in many different colors. However, white, purple, pink, red, and yellow are the most popular colors, and there are also some cultivars with multi-colored flowers. Petunias have a short life cycle having compact plant size (Gerats

---

\* Corresponding author. Email: sanupurbotju@juniv.edu

& Vandebussche, 2005). With its eye-catching and amazing colors, it is incredibly easy to grow in the yard, flower pot, or container.

*Petunia* has ornamental as well as aesthetic value because of their captivating appearance. It is not only used as decorative plant but also used in pharmaceuticals, cosmetic industry and phytoremediation (Watharkar *et al.*, 2013). It can also be used as insecticide and are currently used as natural insecticide in many countries (Thenmozhi & Sivaraj, 2011). *Petunias* are not only important as exquisite plants but also edible (Coyle, 1999; Deane 2007; Rogala & Pothour, 2013) which are used as a garnish in salads. In ancient period, it was used to make tea in South America. From ancient time to present days, it also used in making tea in China believing that it is good for skin.

*Petunias* are mainly propagated from seeds. The seeds are sown in soil enriched with nitrogen, potassium and magnesium. It does not need complex mixture of soil. It is best germinated in a well-drained, pit like medium with a growing optimum temperature which is at 24°C temperature (Ball, 2009). *Petunias* perform better in full sun all day (Brown, 2009), even though approximately five to six hours sunlight is enough for good production. Due to short life span, the flowers turn pale and droop gradually after a few days of flowering and flowers are pummeled out if there is raining during blooming season (Ando *et al.*, 2001).

*Petunia* is considered to be the first commercially important horticultural plant due to its ease bedding, caring, low expectations and mesmerizing colors (Booger *et al.*, 2014). Commercial *Petunia* production in the world has rapidly expanded over the years due to the increasing demand from the American market as one of the top five selling bedding plants for over 100 years (Hansen, 1972) which is used for mass planting, borders, containers, hanging baskets or ground cover. It enhances the beauty of places like government and non- government offices, school, colleges, universities, roadside areas, courts, bank of lakes, residential areas, restaurants etc. with their tempted colors like red, pink, violet, purple, white, yellow, fuchsia, lilac, mixed striped and so on.

Despite its origin in South America, Bangladesh is not lagged behind from its pleasing and eye-catching beauty. *Petunia* grows all over in Bangladesh and mainly propagated from seeds (Hossain, 2017). Due to the increasing demand in the local market along with wide variety of colours, *Petunia* is regarded as the latest sensation to commercial cultivation and for opening a new dimension in the field of horticulture in Bangladesh. Therefore, the present investigation was carried out to estimate the magnitude of morphological and reproductive characters and to select the potential varieties of high yielding and better quality of the flowers suitable for commercial cultivation in Bangladesh.

## **MATERIALS AND METHODS**

The study was conducted at the Botanical Garden of Jahangirnagar University, Savar, Dhaka, Bangladesh during November 2021 to March 2022. The experimental field was located inside the garden at 23° 52'44.61" north latitude, 90° 16'8.5" east longitudes above

sea level. The area is under the sub-tropical climatic zone signaled by scant rainfall, moderate humidity and moderate temperature during the month of November to March and relatively high humidity, high temperature, heavy rainfall during the other months of the year. The soil is sandy loam in texture with slight acidity. It belongs to the shallow red brown terrace under Madhupur tract with a pH about 6.2-6.8 (Anon, 1998 and Haider, 1991) and black terai soils of old Himalayan piedmont plain with pH of 6.3-6.9. Twenty two genotypes of *Petunia* were collected from different local nurseries of Savar Upazila under Dhaka district of Bangladesh. The genotypes under study are listed in the Table 1.

**Table 1. List of twenty two genotypes of *Petunia* used in the present study**

Genotypes	Name of the genotypes	Place of collection	Important characters
G <sub>1</sub>	Deep salmon	Barisal nursery	Early hybrid, red trumpet shape with slightly yellowish in center
G <sub>2</sub>	Tritunia sky blue	Barisal nursery	Bluish in color with white touch
G <sub>3</sub>	Dreams midnight	Barisal nursery	Royal violet with velvety texture
G <sub>4</sub>	Fantasy violet	Al-Amin nursery	Purplish violet with slightly ruffled edges
G <sub>5</sub>	Opera supreme white	Barisal nursery	Early hybrid, large pure white variety
G <sub>6</sub>	Success white	Barisal nursery	White flower with prominent single vein along with large yellowish in center
G <sub>7</sub>	Daddy orchid	Al-Amin nursery	Orchid-pink color
G <sub>8</sub>	Easy wave pink	Faisal nursery	Baby pink color with yellowish center
G <sub>9</sub>	Headliner white rose vein	Faisal nursery	Whitish pink color with dark pink vein
G <sub>10</sub>	Mainstage pink vein	Barisal nursery	Rose pink color with dark pink centered along with prominent pink vein
G <sub>11</sub>	Prism pink	Faisal nursery	Royal pink with yellowish center
G <sub>12</sub>	Royal magenta	Barisal nursery	Magenta color with yellowish center
G <sub>13</sub>	Surfinia pink vein	Barisal nursery	Baby pink color with red prominent vein
G <sub>14</sub>	Sun pleasure magenta vein	Barisal nursery	Magenta color with dark prominent vein along with dark center
G <sub>15</sub>	Super cascade burgundy	Faisal nursery	Burgundy color ruffled edges flower with maroon center
G <sub>16</sub>	Tidal wave hot pink	Al-Amin nursery	Early variety, yellowish centered hot pink
G <sub>17</sub>	Dreams red picotee	Al-Amin nursery	Red with picotee edges
G <sub>18</sub>	Glow picotee blue	Al-Amin nursery	Dark blue with white edges
G <sub>19</sub>	Ultra burgundy star	Barisal nursery	Burgundy colored flower with white stripe
G <sub>20</sub>	Ultra purple star	Barisal nursery	Purple colored with white stripe
G <sub>21</sub>	Ultra crimson star	Barisal nursery	Red color with white stripe
G <sub>22</sub>	Ultra rose star	Al Amin nursery	Rose pink color with white stripe

G = Genotype

The genotypes were evaluated through a field experiment conducted in a Randomized Complete Block Design (RCBD) with three replications at the Botanical garden of Jahangirnagar University. The experimental field was divided in three blocks. Each block was then subdivided into 22 plots. The unit plot size was 90×60×60 cm. Block to block distance was 30 cm. The fertilizer and manure were applied as per recommended dose for the commercial cultivation of *Petunia* and the intercultural practices were followed when

required. Seeds were sun-dried for two hours before sowing to facilitate germination. Subsequently, the seeds were sown in soil of earthen pots of 13 inches. Seed sowing was done by pressing down lightly on seeds to make sure that they were in contact with the prepared soil for easy emergence. Sowing was done on November 24, 2021. After the germination of the seeds, the earthen pots with the seedlings were transferred to sunlight as per recommendation of Brown (2009). All the fertilizers and manures were applied in the experimental field before transplantation. The seedlings were transplanted 7 days after germination.

The data were collected from three randomly selected plants from each genotype in each replication for recording various morho-reproductive traits viz. stigma type, leaf shape, plant height, number of branches, number of effective branches, days to flower initiation, number of flowers, duration of flowers, flowering duration, plant longevity, number of stamens, stamen length and petiole length. The significance of difference between pair of means was tested by the Duncan Multiple Range Test (DMRT) at 5% level of significance (Gomez & Gomez, 1984).

## RESULTS AND DISCUSSION

In the present study, two qualitative and eleven quantitative traits were recorded and evaluated to select the potential varieties. All of the flowers of the genotypes had lobed stigma that was slightly diffused. Leaf shape was observed as opposite to alternate; ovate-elliptic, lanceolate, pubescent, entire, and undulate; round, mucronate apex; cuniate base; prominent vein, slightly scented, obtuse and entire blade. Observed quantitative characters have been shown in Table 2 and 3. It was found that all the quantitative characters showed distinct variation among the genotypes except stamen number (5). Krahl & Randle (1993) analyzed the variability and correlation among 122 cultivars of *Petunia* for nine vegetative and floral traits in completely randomized block design. They found a significant variation among those genotypes for each of the characters.

In present investigation, glow picotee blue was superior in case of plant height (29.33 cm) followed by tritunia sky blue (26.33 cm) and dreams red picotee (23.83 cm) while headliner white rose vein exhibited the lowest (10.53 cm) (Table 2). According to Talang *et al.* (2019), the maximum plant height (13.76 cm) was recorded in hybrid super rose which was at par with hybrids sup-red (13.69 cm), sup-burgandy (13.31 cm), local variety (13.28 cm), sup-salmon (13.13 cm), sup-yellow (12.91 cm) and picotze-blue (12.85 cm) and minimum plant height (11.35 cm) was observed in hybrid sup-blush. On the other hand, highest number of branches per plant was observed in ultra purple star (10) followed by ultra crimson star and ultra rose star (8.67). Besides ultra burgundy star had the highest effective branches (8) followed by ultra purplestar and ultra crimsonstar (7.67). Moreover, the number of branches and effective branches had a strong positive correlation (Table 4). Cantor *et al.* (2015) worked on seven varieties of *Petunia* and reported the highest circumference with white petunia (280 cm) and the lowest with hot pink (156 cm). The length of the branches had different values within the examined varieties resulting a change of amplitude of 35 cm (hot pink) and 85 cm (hot red).

Depending on the length of floral stem remarked the varieties white, purple and hot red with very significant positive differences; to the opposite varieties famous blue, hot pink and lila white registered were differences very significant negative lowest branches of flowers.

The earliness of flowering, number of flowers and flowering duration ensures a vital role in commercial purpose that can benefit the growers. Days to flower initiation are one of the most important reproductive characters for floriculture. In present study, it was revealed that there were significant variations among the tested varieties in respect of days to blooming, number of flowers, individual flower duration, flowering duration and plant duration (Table 2 and 3). Correlations among the reproductive parameters are shown in Table 4. It was observed that there were considerable differences among them. Lowest days were taken for blooming was recorded in deep salmon (52 days) followed by ultra purple star (52.67 days), tidal wave hot pink (53.67 days) and ultra crimson star (54.33 days) while the longest period was taken by super cascade burgundy (61.33 days). Talang *et al.* (2019) recorded the earliness of flowering in crimson star (55.77 days) followed by sup-burgundy (60 days), sup-rose (61.11 days) and sup-red (63.66 days).

Statistical analysis showed significant differences in the number of flowers, longevity of the bloomed flowers, flowering duration and the plant longevity (Table 2 and 3). Strong correlation was observed among these four parameters (Table 4). Maximum number of flowers per plant was recorded in ultra purple star (50), followed by ultra crimson star (49.67) and ultra rose star (48.67). On the contrary, the minimum number of flowers was documented in tritunia sky blue (31.67). On the other hand, four genotypes viz. opera supreme white, prism pink, ultra burgundy star and ultra purple star had the average blossom lasting period (6.67 days) whereas the shortest period of blossom was recorded in mainstage pink vein and super cascade burgundy (4 days). Sareh *et al.* (2023) reported the flowers that have passed the anthesis phase can only last for an average of 1-2 days and the flowering period of petunias lasts an average of 37 days. Talang *et al.* (2019) recorded the maximum number of flowers (27.22) in hybrid sup-yellow followed by hybrid sup-red (19.29) while, the minimum number of flowers was observed in hybrid local variety (9.23). The maximum and minimum duration of flowering was recorded as 35.78 and 18.11 days in hybrid sup-red and hybrid blue vein blue, respectively.

The present study showed that the highest plant longevity was 111 days which was observed in ultra purple star, ultra crimson star and ultra rose star, followed by deep salmon (110.67 days), ultra burgundy star, opera supreme white and success white (109 days). The number of flowers has a strong correlation with plant longevity (Table 4). Highest stamen length was noted in deep salmon (2.73 cm) followed by success white (2.65 cm). Tritunia sky blue had the minimum stamen length (1.43 cm). Again, highest (0.41 cm) and lowest (0.23 cm) petiole length was observed in opera supreme white and prism pink respectively. Kondo *et al.* (2006) studied on white and violet varieties of *Petunia* and reported the maximum stamen length in five white varieties (three *Petunia axillaris*, subs p. *axillaris*, two *P. axillaris*, subsp. *parodii*) ranges from 42.8 to 63.6 mm whereas the violet *Petunia integrifolia* showed the minimum stamen length of 16.7 mm.

**Table 2. Quantitative characters of twenty two genotypes of *Petunia* during the study period**

Genotypes	Name of the genotypes	Plant height (cm)	No. of branches	No. of effective branches	Days to flower initiation	No. of flowers
G <sub>1</sub>	Deep salmon	20.37 ± 0.58 c	7.33 ± 1.20 bcd	4.67±0.88 efg	52±0.58 k	46±1.15 abc
G <sub>2</sub>	Tritunia sky blue	26.33 ± 0.88 b	6.33 ± 0.88 cd	5 defg	56.67±0.67 defg	31.67±0.88 g
G <sub>3</sub>	Dreams midnight	17.08 ± 0.72 defg	8.67 ± 0.33 ab	7±0.58 abc	54.33±0.88 hij	48±1.73 abc
G <sub>4</sub>	Fantasy violet	17.22 ± 0.05 cdef	8.0 ± 0.58 abcd	6.67±0.33 abcd	55±0.58 ghi	48±1.52 abc
G <sub>5</sub>	Opera supreme white	15.87 ± 0.24 efg	8.0 ± 0.58 abcd	6.67±0.33 abcd	56 efg	46±2.08 abc
G <sub>6</sub>	Success white	14.97 ± 0.09 fg	8.33 ± 0.33 abc	6.33±0.33 abcde	56 efg	45±0.58 bcd
G <sub>7</sub>	Daddy orchid	17.52 ± 1.28 cdef	6±0.57 d	4.67±0.33 efg	55.67±0.33 fgh	34±2.08 g
G <sub>8</sub>	Easy wave pink spreading	19 ± 3.79 cde	8.33±0.33 abc	5.33±0.33 cdefg	55.33±0.33 hi	35.37±1.86 fg
G <sub>9</sub>	Headliner white rose vein	10.53 ± 0.97 h	6.33±0.88 cd	4±0.58 g	57.33±0.33 cdef	33±2.08 g
G <sub>10</sub>	Mainstage pink vein	17.1 ± 1.27 defg	6.33±0.33 cd	4.33±0.33 fg	57.67±0.67 bcde	33.67±1.20 g
G <sub>11</sub>	Prism pink	16.63 ± 0.20 defg	7.67±0.33 bcd	6±0.58 bcdef	54.33±0.33 hij	44.67±1.76 cd
G <sub>12</sub>	Royal magenta	15.40 ± 0.30 fg	8±0.58 abcd	6±0.33 abcde	58.33±0.33 bcd	40.67±0.33 de
G <sub>13</sub>	Surfinia pink vein	19.33 ± 0.186 cd	7.67±0.88 bcd	5.67±0.67 cdefg	58.67±0.33 bc	35.67±1.86 fg
G <sub>14</sub>	Sun pleasure magenta vein	14.93 ± 0.18 fg	8±0.58 abcd	6.33±0.33 abcde	58±0.58 bcd	40.67±1.20 de
G <sub>15</sub>	Super cascade burgundy	15.77 ± 0.62 efg	7.33±0.67 bcd	4.67±0.67 efg	61.33±0.67 a	32±1.53 g
G <sub>16</sub>	Tidal wave hot pink	15.60 ± 0.23 fg	7.67±0.33 bcd	5.33±0.33 cdefg	53.67±0.67 ij	44.33±1.20 cd
G <sub>17</sub>	Dreams red picotee	23.83 ± 0.60 b	8 abcd	4.67±0.88 efg	59.33±0.67 b	39±0.58 ef
G <sub>18</sub>	Glow picotee blue	29.33 ± 0.88 a	7±0.58 bcd	6.33±0.88 abcde	56.67±0.33 defg	39.33±1.86 ef
G <sub>19</sub>	Ultra burgundy star	14.43 ± 0.35 fg	8.33±0.33 abc	8±0.58 a	56±1.15 efg	45±2.08 bcd
G <sub>20</sub>	Ultra purple star	13.77 ± 0.14 g	10±0.58 a	7.67±0.33 ab	52.67±0.33 jk	50±0.58 a
G <sub>21</sub>	Ultra crimson star	14.10 ± 0.21 fg	8.67±0.88 ab	7.67±0.33 ab	54.33±0.33 hij	49.67±0.88 ab
G <sub>22</sub>	Ultra rose star	14.13 ± 0.19 fg	8.67±0.33 ab	7±0.58 abc	56 efg	48.67±0.67 abc

In a column means followed by common letters are not significantly different from each other at 5% level of significance by DMRT

**Table 3. Quantitative characters of twenty two genotypes of *Petunia* during the study period**

Geno- types	Name of the variety	Duration of flowers (days)	Flowering duration (days)	Plant longevity (days)	Stamen length (cm)	Petiole length (cm)
G <sub>1</sub>	Deep salmon	6±0.58 ab	69±0.58 a	110±1.15 a	2.73±0.04 a	0.29±0.03 defgh
G <sub>2</sub>	Tritunia sky blue	5 cde	57 f	90.67±0.67 k	1.43±0.02 i	0.32±0.02 cdefg
G <sub>3</sub>	Dreams midnight	5.67±0.33 bc	69±0.58 a	107±1.53 bc	2±0.12 f	0.42±0.03 a
G <sub>4</sub>	Fantasy violet	5.67±0.33 bc	68.67±0.33 a	107bc	2.43±0.07 bcde	0.29±0.01 efgh
G <sub>5</sub>	Opera supreme white	6.67±0.33 a	69.67±0.33 a	109±0.67 ab	2.51±0.02 b	0.41±0.02 ab
G <sub>6</sub>	Success white	6 ab	69.33±0.33 a	109±0.67 ab	2.65±0.00 a	0.25±0.01 fgh
G <sub>7</sub>	Daddy orchid	4.33±0.33 ef	61.67±1.20 de	101±0.88 ghi	2.02±0.08 f	0.33±0.02 bcde
G <sub>8</sub>	Easy wave pink spreading	4.67±0.33 def	62.33±0.88 de	98.67±0.33 ij	2.34±0.01 de	0.38±0.02 abc
G <sub>9</sub>	Headliner white rose vein	4.33±0.33 ef	61.33±0.88 de	100E±0.58 ghij	2.46±0.03 bcd	0.24±0.01 h
G <sub>10</sub>	Mainstage pink vein	4 f	62.67±0.33 de	102±0.67 defg	2.46±0.03 bcd	0.25±0.01 gh
G <sub>11</sub>	Prism pink	6.67±0.33 a	54.33±0.33 g	105±1.15 cd	2.31±0.01 e	0.23±0.00 h
G <sub>12</sub>	Royal magenta	5 cde	62.67±0.67 d	104±0.67 def	1.62±0.03 h	0.29±0.01 efgh
G <sub>13</sub>	Surfinia pink vein	5.33±0.33 bcd	60±1.53 e	102±0.67 efgh	2.34±0.02 de	0.38±0.01 abcd
G <sub>14</sub>	Sun pleasure magenta vein	4.33±0.33 ef	61.33±0.88 de	104±0.67 cde	2.48±0.01 bc	0.35±0.02 abcde
G <sub>15</sub>	Super cascade burgundy	4 f	65.67±0.67 b	101±1.33 fghi	2.37±0.03 cde	0.33±0.01 bcdef
G <sub>16</sub>	Tidal wave hot pink	5.33±0.33 bcd	68.67±0.67 a	108±1.86 ab	2.43±0.01 bcde	0.39±0.01 abc
G <sub>17</sub>	Dreams red picotee	5 cde	61±1 de	97.67±1.33 j	2.42±0.02 bcde	0.33±0.02 bcde
G <sub>18</sub>	Glow picotee blue	4.33±0.33 ef	63.33±0.33 cd	99.33±0.33 hij	2.36±0.00 cde	0.35±0.02 abcde
G <sub>19</sub>	Ultra burgundy star	6.67±0.33 a	65.33±0.67 bc	109±0.67 ab	1.76±0.01 g	0.34±0.05 bcde
G <sub>20</sub>	Ultra purple star	6.67±0.33 a	69±0.58 a	111 ± 0.67 a	1.76±0.02 g	0.35±0.04 abcde
G <sub>21</sub>	Ultra crimson star	5.33±0.33 bcd	69±0.58 a	111±0.33 a	1.59±0.01 h	0.36±0.03 abcde
G <sub>22</sub>	Ultra rose star	6 ab	68±1 a	111±1.0 a	1.71±0.02 h	0.40±0.05 ab

In a column means followed by common letters are not significantly different from each other at 5% level of probability by DMRT

**Table 4. Correlation among the morpho-reproductive characters of twenty two genotypes of *Petunia***

	Plant height (cm)	No. of branches	No. of effective branches	Days to flower initiation	No. of flowers	Duration of flowers (days)	Flowering duration (days)	Plant longevity (days)	Stamen length (cm)	Petiole length (cm)
Plant height (cm)	1									
No. of branches	-.210	1								
No. of effective branches	-.170	.568**	1							
Days to flower initiation	.114	-.180	-.219	1						
No. of flowers	-.256*	.612**	.705**	-.531**	1					
Duration of flowers (days)	-.207	.444**	.590**	-.429**	.762**	1				
Flowering duration (days)	-.293*	.434**	.420**	-.326**	.659**	.366**	1			
Plant longevity (days)	-.555**	.481**	.570**	-.454**	.843**	.626**	.739**	1		
Stamen length(cm)	.038	-.176	-.399**	.080	.080	-.123	.076	.040	1	
Petiole length(cm)	.077	.203	.317**	-.070	-.070	.135	.313*	.133	-.212	1

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Evaluation of morpho-reproductive characters and their comparison is important for the execution of other plant breeding program for further improvement. *Petunia* flowers vary in color; it mesmerizes people with its fascinating beauty (Fig.1). In the present study, it was revealed that deep salmon, ultra purple star, ultra red star, ultra rose star, opera supreme white, dreams midnight, and prism pink genotypes were most suitable and sustainable that can be used for further breeding program in horticulture. Moreover, improvement in production may enrich the variety with more income. As the economy of Bangladesh largely depends on agriculture and horticulture, this flowering plant can have a great contribution to the economic growth of the country and for opening a new road in the field of horticulture in Bangladesh.





Fig. 1 (a-v). Flower diversity of *Petunia* genotypes. a) Deep salmon b) Tritunia sky blue c) Dreams midnight d) Fantasy violet e) Opera supreme white f) Success white g) Daddy orchid h) Easy wave pink i) Headliner white rose vein j) Mainstage pink vein k) Prism pink l) Royal magenta m) Surfinia pink vein n) Sun-pleasure magenta vein o) Super cascade burgundy p) Tidal wave hot pink q) Dreams red picotee r) Glow picotee blue s) Ultra burgundy star t) Ultra purple star u) Ultra crimson star v) Ultra rose star

## REFERENCES

- Ando, T., Nomura, M., Tsukahara, J., Watanabe, H., Kokubun, H., Tsukamoto, T., Hashimoto, G., Marchesi, E. and Kitching, I.J. 2001. Reproductive isolation in a native population of *Petunia sensu* Jussieu (Solanaceae), *Ann. Bot.* **88**: 403–413.
- Anonymous. 1998. **Year Book of Agricultural Statistics of Bangladesh**. Bangladesh Bureau of Statistics, Ministry of Planning, Govt. of the People's Republic of Bangladesh, Dhaka, Bangladesh, pp. 64-88.
- Ball. 2009. *Grower Facts, Petunia Pretty Flora (Petunia x hybrida)*. Ball Horticultural Company, West Chicago, USA.
- Booger, A.R., Shirmohammadi, E. and Geikloo, A. 2014. Effect of humic acid application on qualitative characteristic and micronutrient status in *Petunia hybrida* L, *Bull. Env. Pharmacol. Life Sci.* **3**(9): 15-19.
- Bremer, K., Bremer, B. and Thulin, M. 2003. Introduction to phylogeny and systematics of flowering plants. *Symb. Bot, Upsal.* **33**: 21-102.
- Brown, D. 2009. **Growing Petunias**, University of Minnesota Extension Office, University of Minnesota.
- Cantor, M., Krizbai, E. and Buta, E. 2015. The behavior of some *Petunia* varieties for improvement the Romanian assortment. *Bull UASVM Hortic.* **72**: 39-44.
- Coyle, G. 1999. **Edible flowers**. University of Minnesota Extension Service. p. 1.
- Deane, G. 2007. **Edible flowers: Part twelve**. p.1.
- Ganga, M., Jayalakshmi, S., Jegadeeswari, K., Padmadevi, K. and Jawaharlal, M. 2011. *Petunia*. In: Chittaranjan, K. (ed.). **Wild crop relatives: genomic and breeding resources plantation and ornamental crop**, p. 209. Springer, Berlin.
- Gerats, T. and Vandenbussche, M. 2005. A model system for comparative research: *Petunia*. *Trends Plant Sci.* **10**: 251-256.
- Gomez, K.A. and Gomez, A.A. 1984. Statistical procedures for agricultural research. 2<sup>nd</sup> Edn. A Wiley Inter Science Publication, John Wiley and Sons, New York. p.680
- Griesbach, R.J. 2006. *Petunia. Flower Breeding and Genetics* (Ed. Anderson, N.O.). Springer, The Netherlands. pp. 301-336.
- Haider, J., Marumoto, T. and Azad, A.K. 1991. Estimation of microbial biomass, carbon and nitrogen in Bangladesh soils, *Soil Sci. Tech.* **20**: 643-653.
- Hansen Jr., W.T. 1972. *Greenhouse Production and Marketing of Petunia*. All graduate theses and dissertations. 3802.
- Hossain, R. 2017. Genetic evaluation of *Petunia (Petunia hybrid Vilm.)* genotypes for agromorphological parametes. M.Sc Thesis (Unpublished)
- Kondo, M., Oyama-Okubo, N., Ando, T., Marchesi, E. and Nakayama, M. 2006. Floral scent diversity is differently expressed in emitted and endogenous components in *Petunia axillaris* lines, *Ann. Bot.* **98**(6): 1253-1259.
- Krahl, K.C. and Randle, W.M. 1993. Morphological variation in a *Petunia* germplasm collection, *Hort. Science.* **28**(5): 122.
- Mol, J.M.N., Koes, R., Van den Berg, E.A., Reif, H.J., Kreuzaler, F. and Veltkamp, E. 1985. The genetics of secondary metabolite production in higher plants: the flavonoid genes of *Petunia* as a model system, *Adv. Agri. Biotechnol.* **13**: 122-123.
- Rogala, C. and Pothour, G. 2013. Growing edible flowers in your garden. Cooperative Extension - Sacramento County, University of California. *Agriculture and Natural Resources*. pp. 1-4.
- Sareh, A.F., Murni, P. and W, P.J. 2023. Morphological and phenological characteristics of *Petunia (Petunia hybrida Vilm.)* flowering, *Jurnal Biolokus: Jurnal Penelitian Pendidikan Biologidan Biologi.* **6**(1): 75-87.

- Sink, K.C. 1984. *Petunia*. In: **Monographs on theoretical and applied genetics**, pp.185-202. Springer Verlag, Berlin.
- Talang, D., Fatmi, U., Sandeep, K. and Raquib, A. 2019. Evaluation of different hybrids of *petunia (Petunia hybrida)* under Allahabad agro-climatic conditions, *J. Pharmacogn. Phytochem.* **8**(3):66-68.
- Thenmozhi, M. and Sivaraj, R. 2011. *In vitro* evaluation of the antibacterial activity of *Petunia* leaf and callus extracts, *LIAT.* **7**(2): 321-330.
- Watharkar, A.D., Khandare, R.V., Kamble, A.A., Mulla, A.Y., Govindwar, S.P. and Jadhav, J.P. 2012. Phytoremediation potential of *Petunia grandiflora* Juss., an ornamental plant to degrade a disperse, disulfonated triphenylmethane textile dye Brilliant Blue G, *Environ. Sci. Pollut. Res.* **20**(2): 939-949.
- Wijsman, H.J.W. and de Jong, J.H. 1985. On the inter-relationships of certain species of *Petunia* IV: Hybridization between *P. linearis* and *P. calycina* and nomenclatorial consequences in the *Petunia* group, *Acta Bot. Neerl.* **34**(3): 337-349.