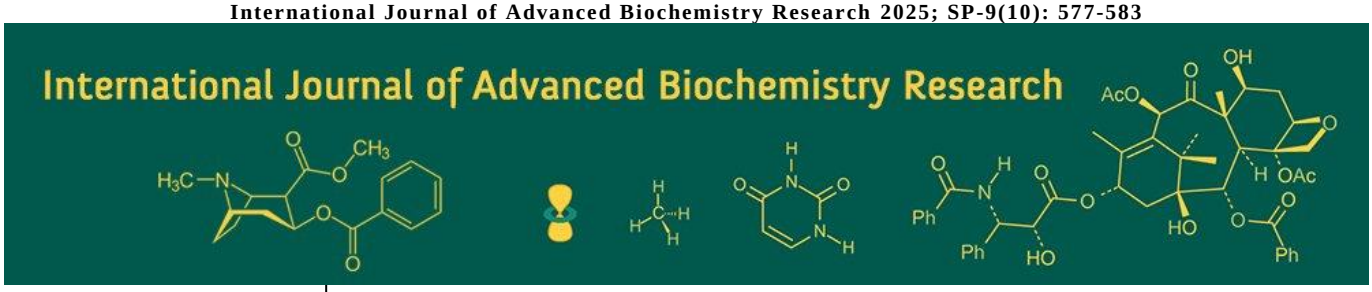

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(10): 577-583
www.biochemjournal.com
Received: 05-08-2025
Accepted: 08-09-2025

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Analysis of genetic diversity of petunia genotypes (*Petunia hybrida* Vilm.) for morpho-physiological parameters under hill zone of Karnataka

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DOI: https://www.doi.org/10.33545/26174693.2025.v9.i10Sg.5890

Abstract
An investigation entitled *"*Analysis of Genetic Diversity of Petunia (*Petunia hybrida* Vilm.) Genotypes for Morpho-Physiological and Seed Yield Attributes*"* was carried out during 2024-25 at the College of Horticulture, Mudigere (KSNUAHS, Shivamogga). The trial was arranged in a Randomized Complete Block Design (RCBD) with 20 genotypes, namely Petunia Debonair Black Cherry, Petunia Dreams, Petunia Daddy Peppermint, Petunia Dreams Picotee, Petunia Red Picotee, Petunia Rose Picotee, Petunia Daddy, Tritunia Star, Petunia Mirage Star, Supercascade Black Berry, Supercascade Burgundy, Petunia Lime Bicolor, Petunia Black, Supercascade Red, Supercascade Blue, Supercascade Pink, Supercascade Rose, Supercascade White, Petunia Debonair Lime Green, and Supercascade Green, each replicated three times. Seedlings at the fourth true-leaf stage were transplanted at a spacing of 30 × 30 cm. Data on morphological traits were recorded from five randomly tagged plants per plot. Considerable variability among genotypes was evident for all the traits studied. Among them, Supercascade Green registered the highest values for number of leaves per plant (158.78), number of branches per plant (19.80), leaf length (5.97 cm), leaf width (4.02 cm), leaf area (13.50 cm² per plant), leaf area index (2.38), trichome (108.80), chlorophyll a (3.53 mg/g), chlorophyll b (2.61 mg/g) and total chlorophyll (5.14 mg/g). Petunia Black showed maximum plant height (28.13 cm), plant spread in North- South direction (26.77 cm) and anthocyanin content (4.99 mg/g). Based on overall performance, Supercascade Green, Petunia Black and Supercascade Pink were identified as superior genotypes.

Keywords: Petunia, genotypes, morpho-physiological, anthocyanin and hill zone

Introduction
The flowers and flowering plants are a fascinating aspect of our lives. Today, the commercial importance of floriculture is recognized worldwide. With the implementation of World Trade Organization, it is the fastest emerging enterprise on a global scale. Flowers and their trade, which were once considered a gardener's profession, are now quickly emerging as a significant commercial venture. There are no religious ceremony and social gathering that begins without offering of flowers. Today floriculture has emerged as a lucrative profession with higher potential of returns than other horticultural crops.

Petunia hybrida is one of the most important annual ornamental plants not only for the modern world but since the early days of horticulture and its one of the important genera for developing new varieties. Petunia has the maximum turnover in the international market and rank first among the bedding plants and an important ornamental. The genus petunia belongs to the family Solanaceae and is essentially distributed in South America. (Talang *et al*., 2019) [15].

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*., 2012) [18]. It can also be used as insecticide and are currently used as natural insecticide in many countries (Thenmozhi and Sivaraj, 2011) [17]. Petunias and variable number of seeds are produced in each capsule depending up on species. Petunias are very popular, easy to grow and versatile annuals with spectacular flowers that bloom for the longest season among all the garden annual flowers. During the recent years, majority of hybrid cultivars of petunia having single and double type petals

with fringy and wavy margins have been developed. Flowers are attractive, funnel-shaped, tiny or large (up to 6-12 cm) and produced on a flower stalk that is approximately 4-5 cm long. The petunia flowers are available are not only important as exquisite plants but also edible 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 (Rogala and Pothour, 2013) [11].

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 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 with their tempted colours like red, pink, violet, purple, white, yellow, fuchsia, lilac, mixed striped and so on (Hansen, 1972) [4].

Material and Methods

The present investigation was conducted during the 2024-25 academic year at the Department of Floriculture and Landscaping, College of Horticulture, Mudigere, under Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga. The experimental site is located in the Malnad region of Karnataka, within the Southern Transitional Zone, at a latitude of 13°13′ N, longitude of 75°64′ E, and at an altitude of approximately 990 meters above mean sea level.

Twenty Petunia genotypes were used in this present study *viz.*, G_1-Petunia Debonair Black Cherry, G_2-Petunia Dreams, G_3-Petunia Daddy Peppermint, G_4-Petunia Dreams Picotee, G_5-Petunia Red Picotee, G_6-Petunia Rose Picotee, G_7-Petunia Daddy, G_8-Tritunia Star, G_9-Petunia Mirage Star, G_{10}-Supercascade Black Berry, G_{11}-Supercascade Burgundy, G_{12}-Petunia Lime Bicolor, G_{13}-Petunia Black, G_{14}-Supercascade Red, G_{15}-Supercascade Blue, G_{16}-Supercascade Pink, G_{17}-Supercascade Rose, G_{18}-Supercascade White, G_{19}-Petunia Debonair Lime Green and G_{20}-Supercascade Green. They were sourced from Indo-American Hybrid Seeds Pvt Ltd., Bengaluru, Karnataka, India.

The trial followed a Randomized Complete Block Design (RCBD) with three replications. The seedlings were transplanted onto flat beds with bed length of 1.8 m and bed width of 1.5 m at a spacing of 30 × 30 cm. The data on morphological traits were recorded from five tagged plants in each plot.

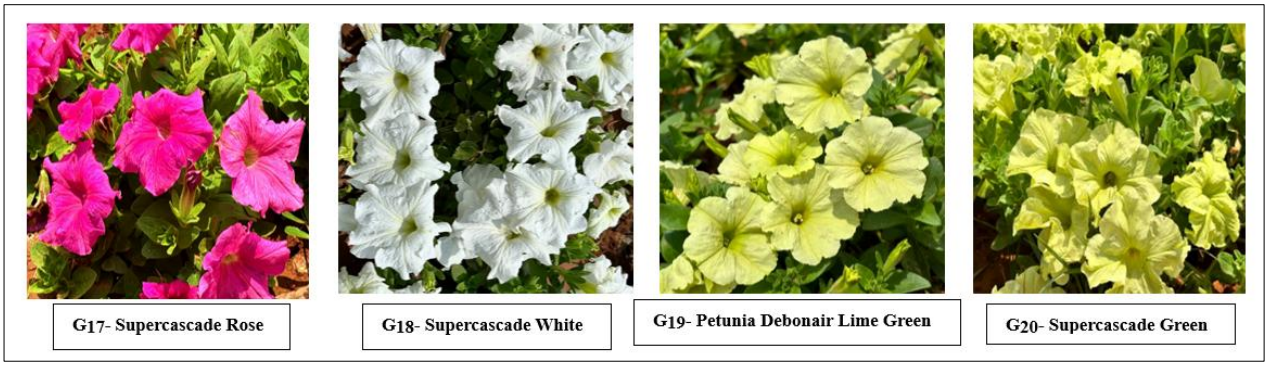

Plate 1: Close-up view of Petunia genotypes under study

Experimental results

A. Morphological parameters

Significant differences were observed among the petunia genotypes for all morphological traits after 90 days after transplanting (Table 1). The plant height was observed maximum in Petunia Black (28.13 cm), followed by Supercascade White (27.17 cm) and the minimum in Petunia Mirage Star (13.73 cm), The number of branches per plant was maximum in Supercascade Green (19.80), while minimum in Tritunia Star (10.20). The number of leaves per plant was highest in Supercascade Green (158.78), followed by Petunia Black (139.00), while minimum in Petunia Red Picotee (92.44). Leaf length was maximum in Supercascade Green (5.97 cm), which was on par with Supercascade Pink (5.89 cm), whereas minimum in Petunia Mirage Star (4.43 cm). The leaf width varied significantly among the different genotypes of Petunia at 90 days after transplanting. The maximum leaf width observed in Supercascade Green (4.02 cm), while the minimum leaf width recorded in Petunia Mirage Star (2.88 cm). The plant spread in North-South direction was maximum in Supercascade Green (26.77 cm), on par with Petunia Black (25.89 cm), while minimum in Petunia Dreams Picotee (24.07 cm).

Table 1: Performance of Petunia genotypes for plant height, number of leaves per plant, number of branches per plant, leaf length, leaf width and plant spread (N-S) under Hill Zone of Karnataka.

Genotype No.	Genotypes	Plant height (cm)	Number of branches per plant	Number of leaves per plant	Leaf length (cm)	Leaf width (cm)	Plant spread (N-S) (cm)
G_1	Petunia Debonair Black Cherry	20.19	12.20	101.44	4.98	3.31	24.53
G_2	Petunia Dreams	17.98	12.40	101.67	5.12	3.42	24.76
G_3	Petunia Daddy Peppermint	26.62	11.40	98.78	4.75	3.19	25.01
G_4	Petunia Dreams Picotee	18.39	10.60	94.89	4.68	3.12	24.07
G_5	Petunia Red Picotee	16.13	10.40	92.44	4.62	2.97	24.90
G_6	Petunia Rose Picotee	16.99	13.30	107.56	5.30	3.47	24.19
G_7	Petunia Daddy	16.27	13.70	114.00	5.52	3.76	24.43
G_8	Tritunia Star	16.13	10.20	93.67	4.58	2.94	23.89
G_9	Petunia Mirage Star	13.73	10.30	94.44	4.43	2.88	24.01
G_{10}	Supercascade Black Berry	19.26	13.40	108.44	5.42	3.60	24.67
G_{11}	Supercascade Burgundy	19.14	12.70	102.89	5.20	3.44	24.48
G_{12}	Petunia Lime Bicolor	17.48	14.60	118.22	5.70	3.80	25.13
G_{13}	Petunia Black	28.13	17.60	139.00	5.87	3.82	25.89
G_{14}	Supercascade Red	17.49	11.10	98.67	4.72	3.12	24.26
G_{15}	Supercascade Blue	16.13	11.90	99.33	4.80	3.19	24.18
G_{16}	Supercascade Pink	20.26	16.70	130.22	5.89	3.88	25.28
G_{17}	Supercascade Rose	16.42	12.10	100.33	4.94	3.23	25.31
G_{18}	Supercascade White	27.17	15.70	124.22	5.78	3.76	25.07
G_{19}	Petunia Debonair Lime Green	18.32	14.30	115.33	5.60	3.86	25.01
G_{20}	Supercascade Green	21.34	19.80	158.78	5.97	4.02	26.77
	S. Em ±	0.68	0.53	4.24	0.22	0.14	0.43
	CD @ 5%	1.94	2.03	12.23	0.63	0.40	1.23

The Petunia genotypes exhibited significant variation in leaf area, leaf area index and trichome count at grand growth stage (Table 2). The genotype Supercascade Green exhibited maximum leaf area (2143.53 cm^2/plant) followed by Petunia Black (1779.20 cm^2/plant), whereas the minimum leaf area was recorded in the genotype Petunia Mirage Star (793.29 cm^2/plant). Leaf area index had significantly maximum in Supercascade Green (2.38), followed by Petunia Black (1.97), whereas the minimum leaf area index was recorded in the genotype Petunia Mirage Star (0.82). The significant differences were obtained with respect to trichome count among the genotypes studied. The maximum trichome count was observed in the genotype Supercascade Pink (132.60) followed by Petunia Debonair Lime Green (115.60),

Supercascade Green (108.80) whereas, the minimum trichome count was recorded in the genotype Petunia Daddy Peppermint (41.60).

Table 2: Performance of Petunia genotypes for leaf area, leaf area index and trichome count at grand growth stage under Hill Zone of Karnataka

Genotype No	Genotypes	Leaf area (cm^2/plant)	Leaf Area Index (LAI)	Trichome count
G_1	Petunia Debonair Black Cherry	953.53	1.05	46.70
G_2	Petunia Dreams	965.86	1.07	48.00
G_3	Petunia Daddy Peppermint	889.02	0.98	41.60
G_4	Petunia Dreams Picotee	844.52	0.93	48.00
G_5	Petunia Red Picotee	813.47	0.90	53.60
G_6	Petunia Rose Picotee	1043.33	1.15	48.70
G_7	Petunia Daddy	1128.60	1.25	52.10
G_8	Tritunia Star	796.19	0.85	41.90
G_9	Petunia Mirage Star	793.29	0.82	47.70
G_{10}	Supercascade Black Berry	1062.71	1.18	48.70
G_{11}	Supercascade Burgundy	987.74	1.09	45.20
G_{12}	Petunia Lime Bicolor	1194.02	1.32	56.80
G_{13}	Petunia Black	1779.20	1.97	49.70
G_{14}	Supercascade Red	888.03	0.98	48.80
G_{15}	Supercascade Blue	923.76	1.02	43.80
G_{16}	Supercascade Pink	1575.66	1.75	132.60
G_{17}	Supercascade Rose	943.10	1.04	49.40
G_{18}	Supercascade White	1267.04	1.40	50.30
G_{19}	Petunia Debonair Lime Green	1153.30	1.28	115.60
G_{20}	Supercascade Green	2143.53	2.38	108.80
	S. Em ±	37.57	0.04	1.97
	CD @ 5%	108.82	0.12	5.65

Significant differences were observed among different genotypes of Petunia for chlorophyll content in the leaf and flower anthocyanin content (Table 3). The genotype Supercascade Green recorded maximum chlorophyll a content (3.53 mg/g), which was on par with Petunia Black (3.40 mg/g), whereas the minimum chlorophyll 'a' was recorded in Tritunia Star (2.51 mg/g). Chlorophyll 'b' content was significantly maximum in genotype Supercascade Green (2.61 mg/g) followed by Supercascade White (1.58 mg/g), whereas the minimum chlorophyll 'b' was recorded in Tritunia Star (1.25 mg/g). Total chlorophyll content was significantly maximum in genotype Supercascade Green (5.14 mg/g), which was on par with Petunia Black (4.98 mg/g), whereas it was minimum in Tritunia Star (3.87 mg/g). Flower anthocyanin content was significantly maximum in genotype Petunia Black (4.99 mg/g) which was on par with Supercascade Burgundy (4.52 mg/g), whereas it was minimum in Supercascade White (0.14 mg/g).

Table 3: Performance of Petunia genotypes for chlorophyll and flower anthocyanin content at grand growth stage under Hill Zone of Karnataka

		mg/g of fresh weight			
Genotype No	**Genotypes**	**Chlorophyll a**	**Chlorophyll b**	**Total Chlorophyll**	**Flower Anthocyanin**
G_1	Petunia Debonair Black Cherry	2.73	1.33	4.06	3.44
G_2	Petunia Dreams	2.74	1.34	4.09	3.89
G_3	Petunia Daddy Peppermint	2.69	1.31	4.00	0.48
G_4	Petunia Dreams Picotee	2.68	1.27	3.89	3.77
G_5	Petunia Red Picotee	2.61	1.28	3.89	2.43
G_6	Petunia Rose Picotee	2.75	1.37	4.11	3.03
G_7	Petunia Daddy	2.79	1.38	4.16	3.72
G_8	Tritunia Star	2.51	1.25	3.87	3.02
G_9	Petunia Mirage Star	2.66	1.30	3.95	2.51
G_{10}	Supercascade Black Berry	2.75	1.37	4.13	3.94
G_{11}	Supercascade Burgundy	2.74	1.36	4.10	4.52
G_{12}	Petunia Lime Bicolor	2.82	1.39	4.20	1.13
G_{13}	Petunia Black	3.40	1.42	4.98	4.99
G_{14}	Supercascade Red	2.66	1.30	3.96	4.03
G_{15}	Supercascade Blue	2.71	1.33	4.03	4.06
G_{16}	Supercascade Pink	2.88	1.54	4.68	4.12
G_{17}	Supercascade Rose	2.73	1.33	4.04	2.52
G_{18}	Supercascade White	3.14	1.58	4.30	0.14
G_{19}	Petunia Debonair Lime Green	2.80	1.38	4.19	0.19
G_{20}	Supercascade Green	3.53	2.61	5.14	0.36
	S. Em ±	0.11	0.06	0.17	0.11
	CD @ 5%	0.31	0.17	0.47	0.31

Discussion

The genotype Petunia Black recorded the maximum plant height (28.13 cm), while the minimum plant height was recorded in Petunia Mirage Star (13.73 cm). The variation in plant height among the Petunia genotypes may be attributed to underlying genetic differences evaluated in the present study and also physiological efficiency in terms of photosynthetic activity, nutrient assimilation, and growth regulator balance plays a crucial role in determining plant height. The number of branches per plant and number of leaves per plant was recorded maximum in Supercascade Green (19.80 and 158.78, respectively), while minimum number of branches recorded in Tritunia Star (10.20) and minimum number of leaves in Petunia Red Picotee (92.44), variation in branches and leaves may be attributed to genetic behaviour. The increase in branches leads to greater number of leaves in turn it will enhance the yield. The leaf length was significantly maximum throughout its growth period in the genotype Supercascade Green (5.97 cm), while the minimum leaf length recorded in Petunia Mirage Star (4.43 cm) and leaf width was significantly maximum throughout its growth period in the genotype Supercascade Green (4.02 cm), whereas the minimum leaf width was recorded in Petunia Mirage Star (2.88 cm). The leaf area and plant spread was maximum in Supercascade green (2143.53 cm^2/plant and 26.77, respectively), The variation in morphological traits might be attributed to varied growth rate due to their genetic makeup. Similar findings were recorded in Talang *et al.* (2019) [15] and Lalrintluangi *et al.* (2023) [8] in Petunia, Roopa *et al.* (2018a) [12] and Beerlingappa *et al.* (2016) in Chrysanthemum, Kolur *et al.* (2022) [5] in China Aster, Kumari *et al.* (2018) [7] in China Aster, Namratha (2021) [9] in Lisianthus, Arulmani *et al.* (2015) in Gaillardia, Guleria *et al.* (2023) [3] in Marigold and Prakash *et al*., in Chrysanthemum.

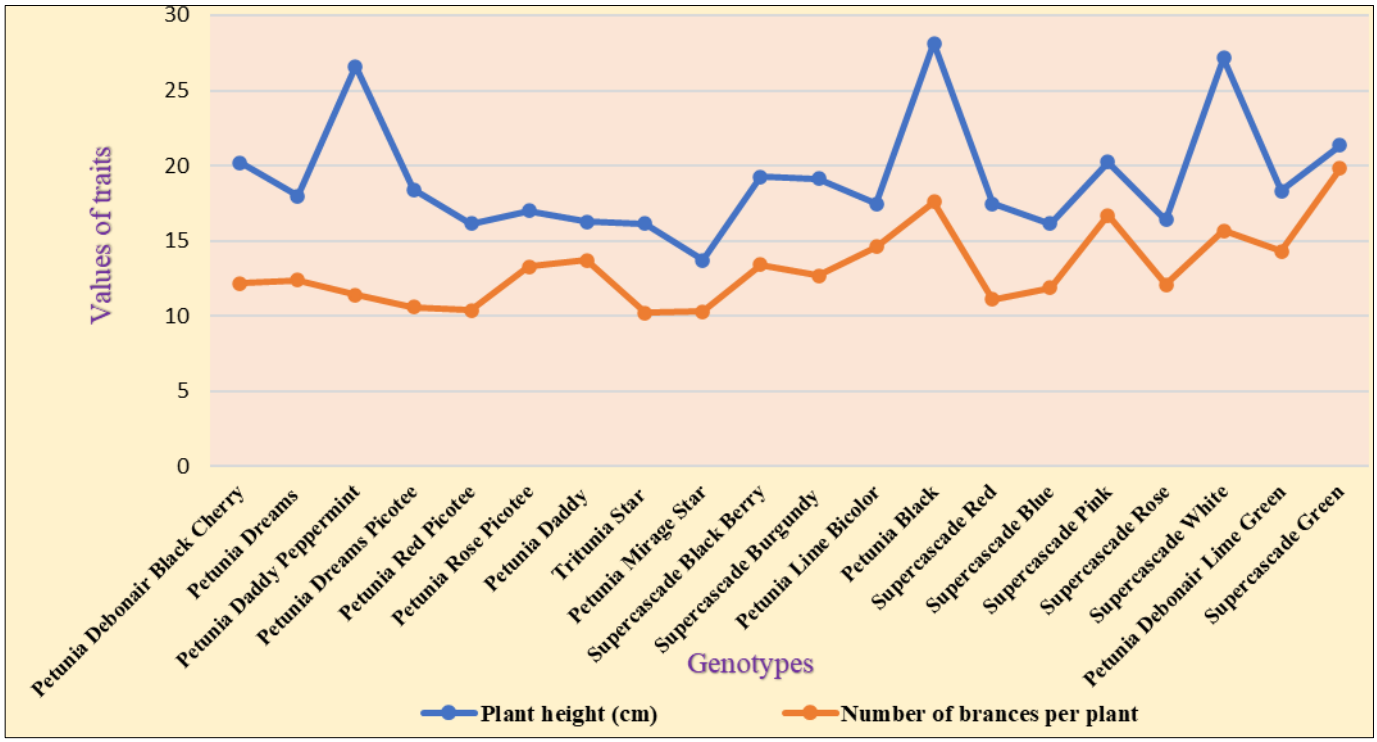

Fig 1: Performance of Petunia genotypes for plant height and number of branches per plant

The leaf area is one of the important factors which affect the photosynthesis of the plant and it helps to induce more flowering and yield. Supercascade Green had significantly recorded maximum leaf area (2143.53 cm^2/plant) at grand growth stage which could be due to more number of large sized leaves, whereas it was minimum in the genotype Petunia Mirage Star (793.29 cm^2/plant) which could be due to lesser number of leaves per plant and shorter leaf length. The genotype Supercascade Green (2.38) recorded the maximum leaf area index, while the minimum was observed in Petunia Mirage Star (0.82). This variation might be due to the tendency of genotypes to produce a higher number of branches and leaves per plant, which indirectly increases the total leaf area. Leaf morphology and photosynthetic efficiency also contribute significantly, as genotypes with broader leaves and higher chlorophyll content tend to develop a greater functional leaf area, thereby ensuring improved assimilate production. Trichome density is largely a genetically controlled trait. Certain genotypes, such as Supercascade Pink (132.60 trichomes/mm^2) and G19 (115.60 trichomes/mm^2), exhibited markedly higher trichome counts, suggesting inherent genetic potential for trichome proliferation. Differences among genotypes are consistent with prior reports indicating that *Petunia* genotypes differ in leaf surface characteristics due to allelic variation controlling epidermal cell differentiation. These results are in accordance with the findings of Savitha *et al.* (2016) in China Aster, Rashmi *et al.* (2015) in Gladiolus, Roopa *et al.* (2018a) [12] in Chrysanthemum and Arulmani *et al.* (2015) [1] in Gaillardia and Namratha (2021) [9] in Lisianthus.

Chlorophyll content in leaves plays a crucial role in enhancing photosynthetic efficiency, which in turn facilitates carbohydrate synthesis. These carbohydrates act as a vital energy source for bud development, flower opening, and extending flower longevity. Significant variation in chlorophyll content was observed among the

Petunia genotypes evaluated (Table 9). The highest chlorophyll 'a' content was recorded in the genotype Supercascade Green (3.53 mg/g), while the lowest was observed in Tritunia Star (2.51 mg/g). Similarly, Supercascade Green exhibited the highest chlorophyll 'b' content (2.61 mg/g), whereas Tritunia Star showed the lowest value (1.25 mg/g). The total chlorophyll content was also maximum in Supercascade Green (5.14 mg/g) and minimum in Tritunia Star (3.87 mg/g). Chlorophyll concentration in leaves is primarily governed by genetic factors and tends to vary with genotype. Anthocyanin content in leaves contributes significantly to pigmentation, stress tolerance, and acts as an indicator of physiological responses in plants. It plays a vital role in protecting tissues from oxidative stress, thereby indirectly supporting flower coloration and overall plant vigour. Significant variation in anthocyanin content was observed among the Petunia genotypes studied (Table 9). The highest anthocyanin content was recorded in the genotype Petunia Black (4.99 mg/g), while the lowest was found in Supercascade White (0.14 mg/g). Similar trends in chlorophyll variability have been reported by Tarannum and Naik (2012) in Carnation, Sandesh (2019) [13] in Liliums, Kumar *et al*. (2019) [6] in Dahlia and Talang *et al*. (2019) [15] in Petunia.

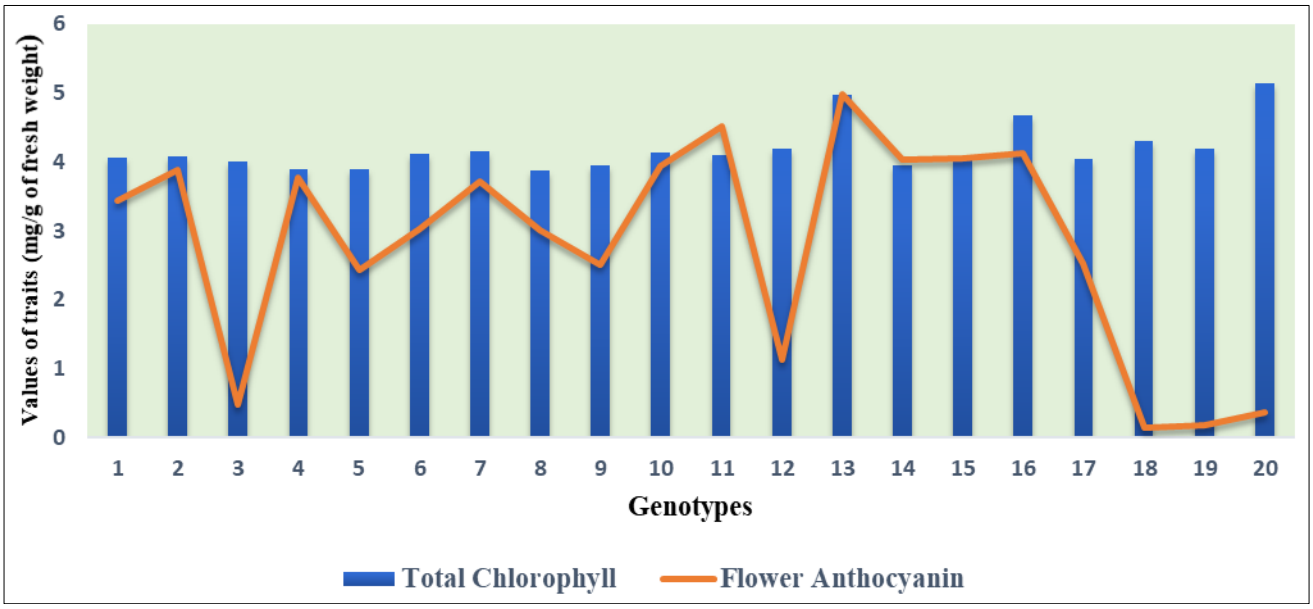

Fig 2: Performance of Petunia genotypes for total chlorophyll and flower anthocyanin contents in flowers

Conclusion

The present study revealed substantial variation among Petunia genotypes with respect to morpho-physiological traits, highlighting the significant influence of genetic factors on growth and vegetative performance. Among the twenty genotypes evaluated, Supercascade Green exhibited the most vigorous growth, including the highest number of leaves, branches, and largest leaf size, indicating superior morpho-physiological performance. Petunia Black and Supercascade Pink also showed notable performance, with well-developed vegetative structures and favourable growth characteristics. Conversely, Tritunia Star and Petunia Mirage Star demonstrated relatively lower values for most morpho-physiological traits. Overall, Supercascade Green emerged as the most promising genotype for selection in breeding programs targeting enhanced growth and vegetative vigour in Petunia.

Acknowledgement

Our deep appreciation goes to Indo-American Hybrid seeds Pvt Ltd., Bengaluru, Karnataka, India, for their generous contribution of Petunia genotypes used in this investigation.

References

1. Arulmani N, Chandrashekar SY, Geeta K, Rashmi R, Ravi CH, Praveen BY. Studies on genetic variability in *Gaillardia* (*Gaillardia pulchella* Foug.) genotypes. Res Environ Life Sci. 2016;9(4):466-469.
2. Beeralingappa. Morphological characterization of Chrysanthemum genotypes under Central Dry Zone of Karnataka [MSc thesis]. Shivamogga (India): Univ. Agric. Hortic. Sci.; 2016. p. 45-74.
3. Guleria N. Evaluation of marigold genotypes for growth and flowering [MSc thesis]. Nauni, Solan (India): Dr. Y.S. Parmar Univ. Hort. Forestry; 2023. p. 126.
4. Hansen JR. Greenhouse production and marketing of *Petunia* [thesis]. Utah, USA: All Graduate Theses and Dissertations, Utah State University; 1972. p. 3802.
5. Kolur SM, Hejjegar I, Patil SS. Evaluation of China aster (*Callistephus chinensis*) genotypes for cut flower production. Biol Forum Int J. 2022;14(3):975-978.
6. Kumar N, Prasad VM, Yadav NP. Evaluation of *Dahlia* (*Dahlia variabilis* L.) cultivars for seed yield attributes under subtropical conditions. J Pharmacogn Phytochem. 2019;8(4):2265-2267.
7. Kumari P, Kumar R, Rao TM, Bharathi TU, Dhananjaya MV, Bhargav V. Evaluation of China aster [*Callistephus chinensis* (L.) Nees] F1 hybrids and parents for growth, flower quality, yield and postharvest life. Int J Curr Microbiol Appl Sci. 2018;6(8):1543-1549.
8. Lalrintluangi J, Tamrakar SK, Shrivastava R. Study of genetic variability among *Petunia* hybrids at

Chhattisgarh plains. Int J Plant Soil Sci. 2023;35(18):1221-1229.
9. Namratha G, Chandrashekar SY, Hemla Naik B, Shivaprasad M, Hanumantharaya L. Varietal evaluation of Lisianthus (*Eustoma grandiflorum* Shinn.) for morphological parameters under protected cultivation. J Pharm Innov. 2021;10(12):2160-2162.
10. Rashmi R, Chandrashekar SY, Arulmani N. Performance of *Gladiolus* (*Gladiolus hybridus* L.) genotypes for growth, flowering and quality characters. Res Environ Life Sci. 2016;9(7):879-881.
11. Rogala C, Pothour G. Growing edible flowers in your garden. Coop Ext Sacramento County, Univ. California, J Agric Nat Resour. 2013;1-4.
12. Roopa S, Chandrashekar SY, Shivaprasad M, Hanumantharaya L, Kumar H. Evaluation of Chrysanthemum genotypes for floral quality traits under hill zone of Karnataka, India. Int J Curr Microbiol Appl Sci. 2018;7(8):1874-1879.
13. Sandesh P. Performance of *Lilium* under protected cultivation in transitional zone of Karnataka [MSc thesis]. Shivamogga (India): Univ. Agric. Hort. Sci.; 2019. p. 142.
14. Savitha KH, Srinivasa V, Ramesha JL, Shivayya Mathapati. Studies on the vegetative growth, flowering and yield characters of different cultivars of China aster (*Callistephus chinensis* L. Nees) under hill zone of Karnataka. Res Environ Life Sci. 2016;9(12):1508-1509.
15. Talang D, Fatmi U, Sandeep K, Raqeeb A. Evaluation of different hybrids of *Petunia hybrida* under Allahabad agro-climatic conditions. J Pharmacogn Phytochem. 2019;8(3):66-68.
16. Tarannum MS, Naik HB. Performance of carnation (*Dianthus caryophyllus* L.) genotypes for qualitative and quantitative parameters to assess genetic variability among genotypes. J Hort Sci. 2012;5(1):96-101.
17. Thenmozhi M, Sivaraj R. *In vitro* evaluation of the antibacterial activity of *Petunia* leaf and callus extracts. J Agric Tech. 2011;7(2):321-330.
18. Watharkar AD, Khandare RV, Kamble AA, Mulla AY, Govindwar SP, Jadhav JP. Phytoremediation potential of *Petunia grandiflora* Juss., an ornamental plant to degrade a disperse, disulfonated triphenylmethane textile dye Brilliant Blue G. Environ Sci Pollut Res. 2012;20(2):939-949.