Journal of Applied and Natural Science
16(3), 964 - 968 (2024)
ISSN : 0974-9411 (Print), 2231-5209 (Online)
journals.ansfoundation.org

Research Article

Evaluation of the agronomic performance of nerium genotypes (*Nerium oleander* L.) under the Eastern dry zone of Karnataka

Manjula Belagihalli Siddalingappa*
Division of Horticulture, School of Agricultural Sciences, Karunya Institute of Technology and Sciences, Coimbatore - 641114 (Tamil Nadu), India
Balaji Shreedhar Kulkarni
College of Horticulture, University of Horticultural Sciences, Bagalkot - 587104 (Karnataka), India
Sangappa Patil
College of Horticulture, Halladkeri Farm Hyderabad Road, Bidar - 585403 (Karnataka), India

*Corresponding author. E-mail: manju.flori@gmail.com

Article Info
https://doi.org/10.31018/jans.v16i3.5599
Received: April 03, 2024
Revised: June 28, 2024
Accepted: July 05, 2024

How to Cite
Manjula, B. S. *et al.* (2024). Evaluation of the agronomic performance of nerium genotypes (*Nerium oleander* L.) under the Eastern dry zone of Karnataka. *Journal of Applied and Natural Science*, 16(3), 964 - 968. https://doi.org/10.31018/jans.v16i3.5599

Abstract
Nerium oleander is a popular shrub because of its drought-tolerant capacity and least susceptibility to pests and diseases. Despite its widespread cultivation in tropical and subtropical regions, there has been a lack of information on the performance of different genotypes regarding growth and yield parameters. The present study aimed to assess the performance of ten different Nerium genotypes for growth and yield traits. Genotypes were procured from various nurseries in the suburbs of Bengaluru. The collection of genotypes was based on flower morphology, flower colour, the stature of plants, and leaf variegation. A randomised complete block design with three replications was used and 1.2 m × 1.2 m spacing was followed throughout January 2018 to April 2019. The observations were made every 60 days up to 300 DAP (Days After Planting), and there were notable variations in the growth and yield metrics of the genotypes. Five tagged plants in each replication were used to record all observations. Genotype BNC-1 (Bengaluru Nerium Collection- 1) recorded the highest value for plant height (107.33 cm), plant spread (1770.66 cm^2), chlorophyll (1.16 mg/g) as well as yield of flower per plant and per hectare (1.85 kg and 12.73 t respectively) while genotype BNC-6 (Bengaluru Nerium Collection- 6) recorded the highest number of branches (45.00). The lowest flower yield per plant and hectare was observed in BNC-6 (0.32 kg and 2.26 t, respectively). In conclusion, genotype BNC-1 exhibits characteristics warranting its consideration for cultivation and inclusion in breeding programs aimed at varietal development.

Keywords: Flowering shrub, Ornamental shrub, Plant Growth, Underutilized plant, Yield

INTRODUCTION

Flowers are eulogized as God's gift to mankind, while in India, it is rightly said that man is born with flowers, lives with flowers, and dies with flowers. Flowers symbolize purity, beauty, peace, love, and passion. In this country, no special function is complete without the use of flowers. Floral garlands, *gajras,* and *venis* are needed for marriage ceremonies. Floral bouquets or flower arrangements also find a pride of place in social gatherings, *viz*., birthday parties, welcoming guests, etc. Besides, various valuable by-products are manufactured, like attar, *gulkand*, rose water, essential oil, and perfume from various flowers. Flowers are also used for landscaping purposes as they have great aesthetic value (Vinayak *et al*., 2017).

The area under loose/traditional flowers in India has increased due to the lower investment required for production and marketing. About 309.26 ('000 ha) hectare area is under flowers with the production of 2246.40 ('000 MT) loose/traditional flowers (Anonymous, 2017). Hence, it has made a big impact at the domestic level apart from the international market. Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, and West Bengal are important states for traditional flower cultivation and commerce in India. Traditional flowers like jasmine, rose, chrysanthemum, marigold, tuberose, nerium and crossandra gaining popularity among growers as they fetch higher returns in the market (Gopalakrishnan and Renganathan, 2019).

Originally from the Mediterranean region, Nerium, botanically known as *Nerium oleander* L., is an evergreen shrub in the family Apocynaceae that has since spread widely across all tropical and subtropical nations. The commonly used names are oleander and rosebay. Nerium is a perennial shrub; plants are easily propagated by cuttings or layering. Plants can be kept attractive with regular proper pruning soon after the flowering season ends. Nerium is frequently utilised in median landscaping since it blooms throughout the year; however, summer is the peak season for flowering. The following types of flowers are frequently found in their single and double forms: pink single, pink double, deep rose, white single, intense yellow, light yellow, and deep rosy red blossoms (Preethi *et al*., 2019).

Various factors influence the crop to achieve a good yield, including region-specific genotypes. The selection of suitable genotypes depends on the purpose for which the crop has to be grown, i.e., as loose flowers, cut flowers, pot culture, and adaptability to specific growing places (Preethi *et al*., 2019; Rajiv *et al*., 2022). Currently, there is little to no information on varieties of Nerium for commercial production. Hence, it is necessary to identify region-specific genotypes for loose flower production. The present study aimed to bridge this gap by providing information on the agronomic performance of ten genotypes suitable for commercial cultivation of *Nerium oleander* L. in the eastern dry zone of Karnataka.

MATERIALS AND METHODS

The planting material was composed of 10 genotypes (rooted cuttings) *viz.,* BNC-1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 (BNC indicates 'Bengaluru Nerium Collection') of *Nerium oleander* L. These were collected from various nurseries in and around Bengaluru and planted at the College of Horticulture-Bengaluru, with a spacing of 1.2 m × 1.2 m. The experiment was started in January 2018 and carried up to April 2019 with a randomized complete block design. Different coloured genotypes of petals' single and double whorl were used (Table 1). In each replication, observations were recorded on five randomly selected plants for all the growth and yield traits such as plant height, plant spread, number of branches, chlorophyll estimation, flower yield per plant, and flower yield per hectare. For growth parameters, observations were recorded at intervals of two months up to 300 DAP (Days After Planting) . Chlorophyll estimation was conducted at the plants' grand growth stage, *i.e.,* 300 DAP (Days After Planting), and yield data was recorded from June 2018 to April 2019.

The soil of the experimental plot was loamy, with slight acidity. The experimental field was fairly leveled land with red sandy loam soil of uniform fertility status. Well-decomposed farm yard manure (FYM) of 5 kg per plant was applied at planting (Composition of FYM 0.5% N, 0.2% P2O5 and 0.5% K2O) for each plant. Nitrogen, phosphorous and potassium were applied as urea, Di Ammonium Phosphate and Muriate of Potash, respectively (Ananth and Rameshkumar, 2012). The data was collected on various parameters during vegetative, yield and quality from randomly tagged five plants in each plot after 300 DAP (Days After Planting).

Growth attributes

The plant height (cm) was measured from the base to the growing tip, and the average was calculated. The spread (cm^2) of the foliage both in East-West and North -South directions were measured and multiplied, and then the average was worked out. The number of branches per plant arising from the main stem up to the top portion of central stem in each plant was counted from five tagged plants. Flower yield per plant (kg), i.e. weight of flowers produced in each tagged plant, was recorded and the average weight produced per plant was worked out. The flower yield per hectare (t) was worked out by multiplying the total yield per plant by a number of plants per hectare.

Chlorophyll estimation

The total leaf chlorophyll was extracted by immersing 100 mg of leaf discs collected randomly from each treatment in DMSO (Di Methyl Sulphoxide) 10 ml overnight (Hiscox and Israelstam, 1979). The extract was used to measure optical density. The optical density of the extract was measured at three wavelengths of 645 and 663 nm using a Spectrophotometer (Arnon, 1949) and the observation was recorded after 300 DAP (Days after planting).

Statistical analysis

The Randomized Complete Block Design analysis was done by using Microsoft Excel® software.

RESULTS AND DISCUSSION

Several variables, including variety, season, environment, etc., determine any flower crop's performance in terms of growth and yield traits. Among these other considerations, genotypes play a significant role in growth and yield performance. The crop genotypes perform differently in different geographical areas. Hence, an effort was made to identify the best-performing nerium genotypes among 10 genotypes for higher flower yield under the eastern dry zone of Karnataka.

The different genotypes of *Nerium oleander* L. significantly affected plant height (300 DAP-Days after planting), plant spread (300 DAP- Days after planting), num-

Table 1. Details of the genotypes

Sl. No.	Genotype	Description	Colour group
1.	BNC-1	Double whorl genotype	Red purple group N 57 (Source, RHS colour chart)
2.	BNC-2	Double whorl genotype	White group NN 155 (Source, RHS colour chart)
3.	BNC-3	Double whorl genotype	Yellow group 2 (Source, RHS colour chart)
4.	BNC-4	Single whorl genotype with yellow as secondary colour at the center	Red purple group 58 Yellow group 11 (Source, RHS colour chart)
5.	BNC-5	Single whorl genotype	Red purple group N 57 (Source, RHS colour chart)
6.	BNC-6	Single whorl genotype	Red group 49 (Source, RHS colour chart)
7.	BNC-7	Single whorl, tall genotype	Red purple group N 57 (Source, RHS colour chart)
8.	BNC-8	Single whorl, dwarf genotype	Red purple group N 57 (Source, RHS colour chart)
9.	BNC-9	Single whorl genotype	Yellow group 4 (Source, RHS colour chart)
10.	BNC-10	Single whorl genotype	White group NN 155 (Source, RHS colour chart)

BNC: Bengaluru Nerium Collection

ber of branches (300 DAP- Days after planting), and chlorophyll estimation throughout the experimental period (Table 2).

The plant height of BNC-1 recorded the highest value (107.33 cm); however, genotypes BNC-7 and BNC-9 (100.66 cm and 98.00 cm) were found on par with genotype BNC-1, while genotype BNC-10 recorded the least (38.33 cm) plant height. Despite being a genetically determined trait, plant height changed between genotypes due to growing environment, production technology, and cultural practices. In addition, increasing leaf chloroplast content may have accelerated the synthesis of amino acids, carbohydrates, and other compounds that led to the production of phytohormones like auxins, gibberellins, and cytokinins, which resulted in increased plant height. Similar variation in plant height among the cultivars was also observed in rose (Singh *et al*., 2013; Soujanya *et al*., 2018; Philip *et al*., 2019**)**, crossandra (Ashwath *et al*., 2007; Ramachandrudu and Thangam, 2010; Rahuldas, 2017; Tejaswi *et al*., 2019), hibiscus (Seeruttun and Sanmukhiya, 2013; Falusi *et al*., 2014) and tuberose (Hasna and Manjusha, 2021).

Plant spread of BNC-1 recorded the highest value (1770.66 cm^2), followed by BNC-2 (1258.00 cm^2), while the genotype BNC-10 recorded the least (615.33 cm^2)

Table 2. Growth and yield traits in nerium (*Nerium oleander* L.) genotypes after 300 DAP

Genotypes	Plant height (cm)	Plant spread (cm^2)	Number of branches	Chlorophyll content (mg/g)	Flower yield per plant (kg)	Flower yield per hectare (t)
	300 DAP	300 DAP	300 DAP			
BNC-1	107.33	1770.66	29.33	1.16	1.85	12.73
BNC-2	70.00	1258.00	16.33	0.76	1.20	8.30
BNC-3	71.00	1046.66	13.33	0.71	1.15	8.03
BNC-4	53.66	615.33	9.00	0.25	0.56	4.01
BNC-5	78.33	1051.66	16.00	0.88	0.75	5.32
BNC-6	70.00	1006.66	45.00	0.13	0.32	2.26
BNC-7	100.66	988.66	16.33	0.54	0.36	2.60
BNC-8	40.33	926.00	32.00	0.66	0.44	3.11
BNC-9	98.00	912.00	19.33	1.22	0.51	3.54
BNC-10	38.33	879.33	16.66	0.37	0.57	4.01
Mean	72.76	1045.49	21.33	0.66	0.77	5.31
S.Em±	5.91	24.87	1.97	0.034	0.004	0.043
CD @ 5%	17.68	74.53	5.85	0.101	0.012	0.128

BNC: Bengaluru Nerium Collection; DAP: Days After Planting plant spread. The genetics of the cultivars and the prevailing environmental conditions may be responsible for the variation in plant spread. Yield is a dependent attribute; the plant's spread contributes much to a crop's final yield value. The more the plant spreads, the more photosynthates will be synthesised, which will lead to more production. Similar results were noticed in crossandra (Rahuldas, 2017) and nerium (Parashuram *et al*., 2018). The present study along with Parashuram *et al.* (2018) research on nerium illustrates significant genotype-dependent variation in plant spread. Notably, pink genotypes (referred to colour group as 'Red purple group N 57' in this study) exhibited superior performance in both investigations. However, Parashuram *et al.* (2018) research work was confined to 180 day utilizing four genotypes under Coimbatore conditions. Contrary to this, this study extends the evaluation to 300 days, utilizing 10 genotypes under Bengaluru conditions.

The number of branches of BNC-6 recorded the highest value (45.00), followed by BNC-8 (32.00), while genotype BNC-4 recorded the least (9.00) number of branches. The genetic makeup of the cultivars could be responsible for the variation in the number of branches. The compactness of a plant is ultimately decided by the number of branches it bears. Similar trends were noticed in rose (Zarina *et al*., 2001; Rabbi *et al*., 2004) and adenium (Mamilla *et al*., 2022).

The genotype BNC-9 recorded the highest chlorophyll content (1.22 mg/g). BNC-1 (1.16 mg/g) was on par with BNC-9. Genotype BNC-6 recorded the least chlorophyll content (0.13 mg/g). Leaves are the functioning units for photosynthesis; principally the chlorophyll content coupled with darker leaves influences the growth. However, the chlorophyll content of leaves is a genetic characteristic that differs between varieties. A similar trend was noticed in the chlorophyll content of crossandra (Priyanka *et al*., 2017) and rose (Soujanya *et al*., 2018).

Throughout the trial period, different genotypes significantly impacted yield parameters (Table 2). Genotype BNC-1 recorded the highest flower yield per plant (1.85 kg) followed by genotype BNC-2 (1.20 kg). Genotype BNC-6 recorded the minimum flower yield per plant (0.32 kg). Genotype BNC-1 recorded significantly higher flower yield per hectare (12.73 t) which was followed by genotype BNC-2 (8.30 t). Genotype BNC-6 recorded minimum flower yield per hectare (2.26 t). The increased growth parameters, such as plant height, spread, and branch count, which assisted in the production of more photosynthates and a greater accumulation of dry matter, which in turn led to the production of more flowers per plant, may be the cause of the higher yield. In addition, the genetic makeup of the varieties, seasonal climatic conditions, and the diversified origin of the cultivars may also affect the crop's final yield. The additive gene effect and the variation in photothermal units on different genotypes might influence the flower yield by altering genetic activity. Weather conditions play an important role in flower production. Hence, warm weather and sufficient sunshine can produce more yield and good quality flowers. The results obtained on the yield parameter in the present study are comparable to those observed in crossandra (Ashwath *et al.,* 2007, Ramachandrudu and Thangam, 2010); and Rahuldas, 2017), rose (Wasnik *et al*., 2015), marigold (Yuvraj and Dhatt, 2014 and Umesh *et al*., 2018) and nerium (Parashuram *et al*., 2018). However, the yield data presented in the present study reflects ten months, contrasting with the six-month data analyzed in the research conducted by Parashuram *et al*. (2018) on nerium.

Conclusion

Among different genotypes of *Nerium oleander* L., BNC -1 recorded the highest value for the growth parameters *viz*., plant height (107.33 cm), plant spread (1770.66 cm^2) and flower yield/hectare (12.73 t). The genotype BNC-9 recorded the highest chlorophyll content (1.22 mg/g). The recorded value for chlorophyll content of BNC-1 (1.16 mg/g) was on par with BNC-9. Therefore, the present findings offer valuable insights into genotype-specific performance, facilitating the selection and cultivation of appropriate nerium genotypes for maximizing growth and yield in the Eastern dry zone of Karnataka. Genotype BNC-1 emerged as a promising candidate for future endeavours in cultivation and breeding programs.

ACKNOWLEDGEMENTS

The authors extend their gratitude to the Department of Floriculture and Landscape Architecture, College of Horticulture, Bengaluru for providing the facilities.

Conflict of interest

The authors declare that they have no conflict of interest.

REFERENCES

1. Ananth, A. V. & Rameshkumar, S. (2012). Effect of different levels of pruning along with NPK on growth and yield of nerium (*Nerium oleander* L.). *International Journal of Current Agricultural Sciences,* 2(6), 13-16.
2. Anonymous (2017). The Indian Horticulture Database 2017. National Horticulture Board,Gurgaon.
3. Arnon, D. L. (1949). Copper enzymes in isolated chloroplasts. Polyphenol oxidases in *Beta vulgaris*. *Plant Physiology,* 24:1-15. https://doi.org/10.1104/pp.24.1.1
4. Ashwath, T., Rao, M. & Ramachandran, N. (2007). Promising crossandra (*Crossandra undulaefolia* Salisb.) F_1 hybrids IIHR 2004-09 and 2004-11. *Journal of Ornamental Horticulture,* 10(1), 64-66.

5. Falusi, O. A., Dangana, M. C., Daudu, O. A. Y., Oluwajobi, A. O., Abejide, D. R. & Abubakar, A. (2014). Evaluation of some rossele (*Hibiscus sabdariffa* L.) germplasm in Nigeria. *International Journal of Biotechnology and Food Science*, 2(1), 117-121.
6. Gopalakrishnan, A. & P. Renganathan (2019). Impact of Socio-Economic factors on flower cultivation area and production in Tamil Nadu. 22(14).
7. Hasna, P. M. & Manjusha, A. V. M. (2021). Varietal evaluation of tuberose (*Polianthes tuberosa* L.) for growth and yield characters. *Journal of Tropical Agriculture*. 59(2), 302-305.
8. Hiscox, J. D. & Israelstam, G. F. (1979). A method for the extraction of chlorophyll from leaf tissue without maceration. *Canadian Journal of Botany.* 57, 1332-1334. https://doi.org/10.1139/b79-163
9. Mamilla, S., Alka, S., Bhandari, A. J., Shah, H. P., Patel, A. I. & Parekh, V. B. (2022). Morphological characterization of different genotypes of adenium. *Indian Journal of Horticulture*. 79(3), 296-30. http://doi.org/10.5958/0974-0112.2022.00040.8
10. Parashuram, M., Rajadurai, K.R. & Haripriya, S. (2018). Evaluation of nerium cultivars for morphological, flowering and yield traits under Coimbatore conditions. *International Journal of Chemical Studies*. 6(3), 497-501.
11. Philip, P., Sankar, M., Sreelatha, U., Minimol, J. S. & Anupama, T. V. (2019). Evaluation of cut rose varieties for commercial cultivation under humid tropics of Kerala. *Journal of Tropical Agriculture*. 57(2), 180-185.
12. Preethi, T. L., Muthulakshmiand, S. & Juliet, H. (2019). A study on the evaluation and crop improvement of Nerium oleander L. Ecotypes for yield and quality. Innovative Farming, 4(2), 63-67.
13. Priyanka, T. K., Kamble, B. S., Subiya, R. K., Anuradha, R. W. & Kulkarni, B. S. (2017). Evaluation of different crossandra genotypes for vegetative shelf life and flower quality parameters. *Inernational Journal of Pure and Applied Bioscience*. 5(6), 443-447.
14. Rabbi, F. F., Hussain, K. & Rafiq, M. (2004). Evaluation of different rose cultivars under the agroclimatic conditions of Hattar, Haripur (NWFP) Pakistan. *Sarhad Journal of Agriculture.* 20(1), 43-45.
15. Rahuldas (2017). Evaluation of crossandra (*Crossandra undulaefolia* Salisb.) genotypes under Eastern dry zone of Karnataka. *M. Sc. (Hort.) Thesis, Univ. Hort. Sci.*, Bengaluru, Karnataka, India.
16. Rajiv, G., Jawaharlal, M., Allen J. J. & Ganesh S. (2022). Diversity assessment of Nerium accessions for growth and flower yield. *Journal of Horticultural Sciences*. 17(2) : 543-548. https://doi.org/10.24154/jhs.v17i2.996
17. Ramachandrudu, K. & Thangam, M. (2010). Characterization and evaluation of local germplasm of crossandra (*Crossandra undulaefolia* Salisb.). *Journal of Ornamental Horticulture*. 13,138-141.
18. Seeruttun, B. & Sanmukhiya, R. V. M. (2013). Molecular characterization of some *Hibiscus* species cultivated in Mauritius. *International Journal of Life Sciences Biotechnology and Pharma Research*. 2(3), 358-366.
19. Singh, P., Dubey, R. K., Singh, R. & Ramesh, K. (2013). Evaluation of floribunda rose (*Rosa hybrida* L.) cultivars for landscape use under Punjab condition. *Journal of Horticultural Sciences.* 8(2), 271-275. https://doi.org/10.24154/jhs.v8i2.318
20. Soujanya, P., Kulkarni, B. S., Kumar, R., Munikrishnappa, P. M., Shivapriya M, & Harshavardhan, M. (2018). Evaluation of rose (*Rosa hybrida* L.) varieties for growth, yield and quality under Eastern dry zone of Karnataka. *Journal of Pharmacognosy and Phytochemistry*, 7(5), 165-168.
21. Tejaswi, R., Salma, Z., Rao, A. V. D. D. & Naresh, S. (2019). Study on growth, floral and yield parameters of crossandra genotypes under coastal Andhra Pradesh conditions. *Bulletin of Environment*, *Pharmaco logy and Life Sciences.* 8(4), 100-104.
22. Umesh, C., Sreelatha, U., Kurian, P. & Narayanankutty, C. (2018). Evaluation of African marigold (*Tagetes erecta* L.) genotypes for yield and resistance to bacterial wilt pathogen, *Ralstonia solanacearum*. *Journal of Tropical Agri culture*, 56(1), 86-91.
23. Vinayak, K., Prasad, V. M., Sindhuja, M., Rajawade, V. B. & Singh, D. (2017). Response of spacing and nitrogen levels on growth and flowering of salvia (*Salvia splendens* L.). *Journal of Pharmacognosy and Phytochemistry*, 6(4), 2059-2062.
24. Wasnik, P., Raut, V. U., Bhande, M. H. & Shambhavkar, V. B. (2015). Evaluation of scented rose varieties for yield and quality of flowers. *Plant Archives*, 15(2), 895-897.
25. Yuvraj, Dhatt, K. K. (2014). Studies on genetic variability, heritability and genetic advance in marigold. *Indian Journal of Horticulture*. 71(4), 592-594.
26. Zarina, G., Ghaffer, A., Waseem, K. & Nadeem, M. A. (2001). Evaluation of six exotic rose cultivars by three different pruning intensities. *Sarhad Journal of Agriculture*. 17: 91-96.