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Evaluation of Different Nerium (*Nerium oleander* L.) Accessions for Vegetative Floral and Yield Attributes

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ABSTRACT

An experiment was conducted to evaluate the performance of 30 Nerium accessions for growth and flower yield. Wide variation was observed in vegetative and flowering related traits were observed by each accession. Out of the thirty Nerium accessions studied, ACC- 19 recorded the maximum plant height (236.84 cm) and flower yield per plant (333.09g). ACC- 2 recorded the maximum number of primary branches (6.80). Leaf area (33.61 cm^2), early flower bud initiation (90.47), flower bud length (3.40), number of inflorescence per plant (24.17), number of flowers per plant (10.67) was maximum in ACC- 12. Accessions 12 (Rasipuram pink single) was observed to flower profusely and exhibited prolonged blooming and hence ideal for the commercial cultivation and landscape.

Keywords Nerium, Evaluation, Diversity, Growth, Flower crops.

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INTRODUCTION

Nerium (*Nerium oleander* L.) is an evergreen shrub belongs to the Apocynaceae family native to Northern Africa and the Mediterranean region. Globally, it is well acclaimed as ornamental due to its abundant and long lasting flowering habit and for its heat, salinity and drought tolerance capacity (Sugadev *et al*. 2018). *Nerium oleander* L. is one of the important ornamental flowering shrubs which finds a place in all gardens. This ornamental shrub is suitable for commercial cultivation all over the tropical region. The Nerium is used as loose flowers for religious purposes, garland making and worship in home and temples. In addition, they are preferred for growing as shrubs in the garden along a boundary wall to mask some areas of lawn. In recent days, Nerium has great demand in landscape architecture for the beautification of home gardens,

industrial gardens, public gardens, road dividers in highways, railway stations, airport surroundings and historical monuments (Preethi *et al*. 2019).

The ornamental plant market is extremely dynamic and demands constant novelties. To meet such needs, advances in genetic improvement programs aligned with the consumers' demands are crucial. These flowering plants exhibit considerable diversity with respect to growth habits, flower colors, shape, size and color patterns. These flowers are relatively easy to grow, begin flowering as young plants, continue to produce flowers throughout the year. The proper selection of Nerium cultivars is indeed a secret of success and expected to increase yield by enhancing the number and size of flowers. Cultivars that respond well in local climatic conditions protect themselves from the depredation of insect, pest and diseases and as result, vigorous growth occurs to face the seasonal hazards. The selection of suitable cultivars depends on the purpose for which crop has to be grown i.e. ,used for loose flowers, ornamental shrubs and pot culture and also adaptability to specific growing places. Therefore, the present study was undertaken entitle "Diversity assessment of Nerium accessions for growth and flower yield".

MATERIALS AND METHODS

The present investigation was carried out in the experiments were conducted at the Department of Floriculture and Landscaping, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. The experiment was laid out in a randomized Block Design having two replications and thirty genotypes as treatment. Five plants from each genotype and from each replication were randomly selected for recording observation on growth, flowering and flower yield parameters. Data collected were analyzed using analysis of variance (ANOVA) using AGRES 3.01 and AGDATA software. The mean values of the treatments were compared using LSD at 5% level of significance. The lists of 30 Nerium accessions were listed in Table 1 and Fig. 1, were taken for the study.

RESULTS AND DISCUSSION

Growth parameters

The vegetative growth was measured in terms of plant height (cm), number of primary branches, leaf length (cm), plant spread and leaf area (cm^2) (Table 2).

Fig. 1. Diversity in flower color of different Nerium accessions.

Table 1. Collected Nerium accessions for this experiment.

Accession No.	Source of collection	Color of the flower	Flower type (single/ double)
Acc.No: 1	Panamarathan patty- SLM	Red	Single
Acc.No: 2	Panamarathan patty- SLM	White	Single
Acc.No: 3	Panamarathan patty- SLM	Pink	Single
Acc.No: 4	Beemanagari- KKM	Red	Single
Acc.No: 5	Mettupalayam - CBE	Red	Single
Acc.No: 6	Thazhakudy- KKM	Red	Single
Acc.No: 7	Periyakulam- THN	Red	Single
Acc.No: 8	Thirupathisaram- KKM	Red	Single
Acc.No: 9	Beemanagari- KKM	White	Single
Acc.No: 10	Kumarapuram- KKM	White	Single
Acc.No: 11	Nagarkovil -KKM	White	Single
Acc.No: 12	Rasipuram- NKL	Pink	Single
Acc.No: 13	Aralvaimozhi- KKM	Dull Pink	Single
Acc.No: 14	Bhavanisagar - ED	Pink	Single
Acc.No: 15	Trichy – TRY	Dull Pink	Single
Acc.No: 16	P N Pudur - CBE	Light yellow	Single
Acc.No: 17	Avarakulam- KKM	Ivory	Single
Acc.No: 18	Kadiyam- AP	Mauve	Single
Acc.No: 19	Rasipuram- NKL	Pink	Double
Acc.No: 20	Valliyur - KKM	Pink	Double
Acc.No: 21	Karunkulam- KKM	Red	Double
Acc.No: 22	Azhagapuram- KKM	Red	Single
Acc.No: 23	Paiyur – DMP	Red	Single
Acc.No: 24	Varigated leaves-Kadiyam	Pink	Double
Acc.No: 25	Palakkad –KL	White	Double
Acc.No: 26	Perur - CBE	White	Single
Acc.No: 27	Thudiyalur- CBE	White	Double
Acc.No: 28	Nilakottai - DGL	Pink	Single
Acc.No: 29	Mallanam patty- DGL	White	Double
Acc.No: 30	Bhavanisagar - ED	Pinkish orange	Single

Note: KKM-Kanyakumari, SLM-Salem, DMP-Dharmapuri, CBE- Coimbatore, TRY-Trichy, THN-Theni, NKL-Namakkal, DGL- Dindigul, ED- Erode, KL- Kerala, AP-Andhra Pradesh.

Significant differences were observed in plant height during crop growth of Nerium accessions at 12th month after planting. The plant height was ranged in between 74.63 to 236.84 cm. Acc.19 recorded the maximum plant height of about 236.84 cm and it was on par with Acc.20 (234.67 cm) and minimum plant height (74.63 cm) was recorded in Acc.18. The variation in plant height among the accessions

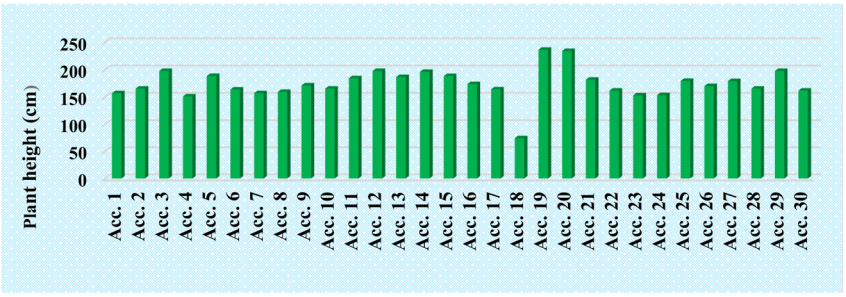

Fig. 2. Plant height (cm) at 12th month after planting in different Nerium accessions.

Table 2. Evaluation of Nerium accessions for growth parameters.

	Plant height (cm)	Number of primary branches	Leaf length (cm)	Leaf breath(cm)	Plant spread (cm) N-S	E-W	Leaf area (cm^2)
Acc. 1	157.33	5.77	16.14	2.37	131.22	129.14	26.59
Acc. 2	165.67	6.80	19.47	2.37	136.33	135.28	25.35
Acc. 3	198.00	6.58	16.00	2.34	152.18	156.77	27.15
Acc. 4	151.33	4.51	20.77	2.33	128.17	130.23	24.59
Acc. 5	188.84	5.50	20.64	2.37	121.83	127.29	28.37
Acc. 6	164.00	4.51	17.67	1.90	124.65	125.13	32.51
Acc. 7	157.33	3.83	20.83	2.00	130.49	133.42	32.51
Acc. 8	159.67	4.67	21.77	2.54	125.64	129.47	24.59
Acc. 9	171.50	5.50	27.80	2.77	131.06	131.89	23.19
Acc. 10	165.67	4.67	23.84	2.60	133.11	137.76	25.05
Acc. 11	184.67	4.50	24.79	2.74	121.72	130.26	27.03
Acc. 12	198.00	5.17	17.24	2.51	151.36	153.66	33.61
Acc. 13	186.84	3.84	14.74	1.87	138.13	136.52	22.66
Acc. 14	196.34	5.17	18.73	2.30	149.86	150.59	29.48
Acc. 15	188.67	5.00	16.98	1.90	132.63	131.68	27.71
Acc. 16	174.00	3.94	21.07	2.23	120.19	124.92	33.39
Acc. 17	164.34	3.90	20.97	2.40	118.27	121.77	31.51
Acc. 18	74.63	3.65	8.89	1.56	76.28	79.47	9.38
Acc. 19	236.84	5.33	16.47	3.37	127.20	132.99	24.89
Acc. 20	234.67	4.89	16.85	3.47	133.82	136.63	24.51
Acc. 21	182.00	5.17	16.25	2.32	123.75	129.44	22.22
Acc. 22	162.00	4.90	19.08	1.97	126.80	130.11	19.68
Acc. 23	153.33	4.67	19.30	2.14	132.17	135.71	23.27
Acc. 24	153.67	4.32	15.58	2.71	127.09	129.93	18.16
Acc. 25	179.84	5.12	17.65	2.37	124.14	127.26	24.47
Acc. 26	170.33	4.65	18.92	1.90	119.64	125.41	25.18
Acc. 27	179.44	4.81	17.38	2.26	126.10	131.11	21.61
Acc. 28	165.67	4.89	20.82	1.75	129.93	133.87	26.24
Acc. 29	198.00	5.29	16.26	3.47	127.07	129.56	27.63
Acc. 30	162.00	4.00	18.73	1.90	117.29	123.39	26.80
Mean	174.15	4.85	18.72	2.36	127.94	131.02	25.64
SE(D)	6.95	0.20	0.76	0.09	5.11	5.26	1.06
CD (p=0.05)	20.14	0.59	2.21	0.27	14.80	15.26	3.06
CV (%)	5.64	5.90	5.75	5.59	5.64	5.68	5.82

could be due to genetically controlled factors (Fig. 2), which varies among the genotypes as well as influenced by the growing environmental conditions. This result was in accordance with Parashuram *et al*. (2018) and further reported that the increased plant height in certain accessions might be associated with the higher chlorophyll content of leaves might have increased the synthesis of carbohydrates, amino acids, from which phytohormones such as auxins, gibberellins and cytokinins have been synthesized resulting in rapid meristematic activity and increased plant height. Similar variation in plant height among cultivars was also observed in Nerium (Rajiv *et al*. 2018), Crossandra (Prasanth *et al.* 2020, Bhosale *et al*. 2018, Priyanka *et al*. 2017) and Gladiolus (Chourasia *et al.* 2015).

With respect to the number of branches per plant, Acc.2 recorded a maximum number of primary branches (6.80) on par with Acc.3 (6.58) both are, whereas Acc.18 recorded the minimum number of primary branches (3.65). Increased number of branches leads to the production of more leaves which in turn enhances the yield of flowers by increasing the source and sink relationship. A similar trend was noticed by Chowdhuri *et al.* (2016) in different China aster genotypes, Gupta *et al*. (2015) in Dahlia and Ramachandrudu and Thangam (2010) in Crossandra.

Table 3. Evaluation of Nerium accessions for flowering parameters.

Accession No.	Days taken flower initation (days)	Single flower weight (g)	Flower diameter (cm)	Flower bud length (cm)	Number of inflorescence per plant	Number of flowers per inflorescence	Yield / g / Plant
Acc. 1	100.82	0.27	4.79	3.08	16.73	9.58	197.33
Acc. 2	96.17	0.24	4.86	3.08	18.12	8.89	183.75
Acc. 3	97.53	0.27	4.80	3.29	24.04	10.09	262.52
Acc. 4	109.89	0.30	4.89	3.20	11.17	9.51	151.57
Acc. 5	97.28	0.24	4.03	2.88	14.67	10.67	171.02
Acc. 6	94.37	0.27	4.97	3.38	10.83	8.83	140.63
Acc. 7	114.08	0.24	4.62	3.12	14.67	9.00	172.17
Acc. 8	107.83	0.21	4.86	3.26	11.83	8.50	120.89
Acc. 9	113.98	0.25	4.91	3.20	12.17	8.83	135.47
Acc. 10	104.73	0.27	4.46	3.12	14.67	9.35	136.05
Acc. 11	113.58	0.23	4.39	3.14	13.50	9.89	172.61
Acc. 12	90.47	0.29	4.80	3.40	24.17	10.67	265.37
Acc. 13	98.10	0.23	4.84	3.26	10.00	7.51	115.65
Acc. 14	93.87	0.27	4.74	3.34	23.00	10.00	258.33
Acc. 15	98.89	0.23	4.60	3.26	9.33	8.33	126.23
Acc. 16	109.09	0.24	4.13	3.26	12.00	8.00	127.87
Acc. 17	120.12	0.23	4.42	3.06	9.83	7.67	134.03
Acc. 18	91.14	0.15	2.49	2.62	8.13	6.30	98.87
Acc. 19	100.63	0.90	5.13	3.00	18.83	4.83	333.09
Acc. 20	101.41	0.94	5.15	2.96	17.98	4.67	329.49
Acc. 21	104.37	0.67	4.26	2.94	15.42	4.33	281.29
Acc. 22	103.65	0.24	4.84	3.18	12.51	9.67	148.01
Acc. 23	95.82	0.27	4.59	3.24	14.67	8.67	160.12
Acc. 24	115.75	0.67	4.56	2.92	9.17	4.33	191.02
Acc. 25	120.89	0.57	4.17	2.90	11.93	4.83	209.45
Acc. 26	104.13	0.24	4.79	3.14	12.00	9.33	136.81
Acc. 27	119.82	0.50	4.20	2.85	11.31	3.85	193.33
Acc. 28	92.00	0.29	4.99	3.30	14.67	9.17	216.18
Acc. 29	106.79	0.70	5.08	2.88	10.17	4.17	290.45
Acc. 30	98.37	0.25	4.87	3.00	9.35	8.90	156.78
Mean	103.85	0.36	4.61	3.11	13.90	7.95	187.21
SE(D)	4.37	0.02	0.18	0.13	0.60	0.35	7.83
CD (p=0.05)	12.66	0.05	0.52	0.36	1.74	1.02	22.71
CV (%)	5.95	6.74	5.54	5.71	6.12	6.24	5.92

Among the accessions highest leaf length was recorded in Acc.9 (27.80 cm) followed by Acc.11 (24.79 cm). The lowest leaf length was registered in Acc.18 (8.89 cm). The highest leaf area was observed in Acc.12 (33.61 cm^2) on par with Acc.16 (33.39 cm^2). The lowest leaf area was observed in Acc.18 (9.38 cm^2). The differences in the length and leaf area might be due to the genetic influences of the genotypes and this variability may be associated with adaptability to the climatic conditions (Mahantesh *et al.* 2018) in Marigold. Similar observations were made by Prashanta *et al.* (2016) in Tuberose, Malakar *et al.* (2015) in Heliconia, Pal *et al.* (2018) in Balsam, Priyanka *et al.* (2017) in Crossandra and by Seeruttun and Ranghoo-Sanmukhiya (2013) in Hibiscus.

Significant results were obtained for plant spread in different Nerium accessions. Acc.3 recorded maximum plant spread 152.18 cm (N-S) and 156.77 cm (E-W), respectively which was on par with the Acc.12 (151.36 cm and 153.66 cm) and the minimum plant spread was recorded with Acc.18 (76.28 cm and 79.47 cm). An increase in plant spread might be due to the production of more number of branches and peculiar branching and flowering habit. Also it has shown more internodal length and wider crotch angle between the branches genetic nature of the plant. Variation in plant spread is due varietal trait and is

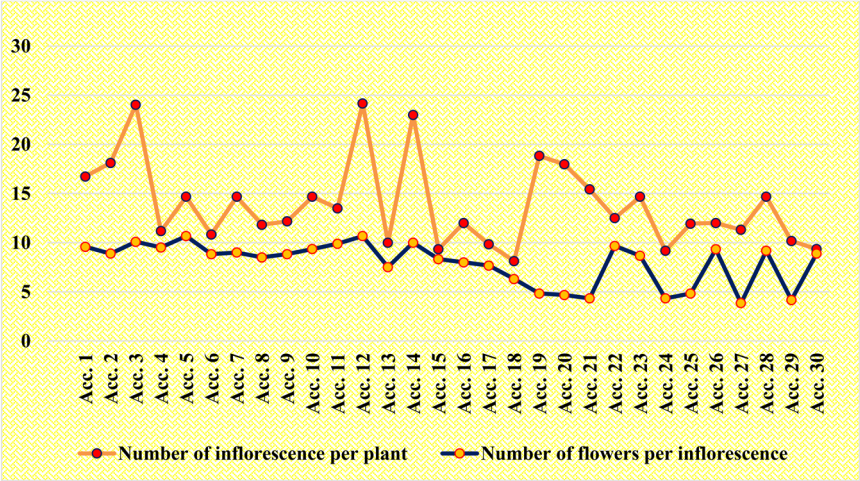

Fig. 3. Number of inflorescence per plant and number of flowers per inflorescence in different Nerium accessions.

probably governed by the genetic makeup (Tejaswi *et al.* 2020).

Flowering and flower yield characters

The data related to flowering and flower yield parameters of different Nerium accessions are presented in Table 3. Significant variation among the accessions was observed in days taken for flower bud emergence. The earliest flower bud appearance was registered in Acc.12 (90.47 days) for flower initiation, while, the Acc.24 recorded maximum number of 115.75 days. The difference in flower initiation indicated that supplementary dry matter accumulation during favorable climatic conditions might be the reason for earliness. Similar results were obtained by, Madhumathi *et al.* (2018) in Tuberose, Rai and Chaudhary (2016) in China aster, Srilatha *et al*. (2015) in Chrysanthemum and Shaukat *et al.* (2013) in Gladiolus, and also recorded variation among the varieties for flower bud initiation. Significant differences were observed in flower weight, the maximum flower weight (0.94 g) was recorded by Acc.20 on par with Acc.19 (0.90 g) and the minimum flower weight (0.15 g) was recorded in Acc.18. The variation in flower weight might be mainly dependent upon the size of the flower head and number of whorls in the varieties which inturn may be attributed to the inherent characters of the individual cultivars and environmental factors. Similar variation was also observed by Rai and Chaudhary (2016) in China aster and Thakur *et al.* (2018) in Chrysanthemum. Flower diameter, the Acc.20 recorded maximum flower diameter (5.15 cm) followed by Acc.19 (5.13 cm). The minimum flower diameter was recorded by Acc.18 (2.49 cm). With regard to flower bud length it was observed that Acc.12 (3.40 cm) recorded maximum flower bud length, which was on par with Acc.14 (3.34 cm) and Acc.28 (3.30 cm). Minimum flower bud length was recorded by Acc.18 (2.62 cm). Number of inflorescence per plant and number of flowers per inflorescence varied significantly among the accessions which directly influenced the yield of the plant. The number of inflorescence per plant ranged from 7.17 to 24.17. The highest number of inflorescence (24.17) was recorded in Acc.12 followed by Acc.3 (24.04) and Acc.14 (23.0), while the lowest number of inflorescence per plant was recorded in Acc.24 (5.34). Number of flowers per inflorescence ranged from 3.87 to 10.67. The highest number of flowers per inflorescence (10.67) was recorded in Acc.5 and Acc.12 followed by Acc.3 (10.09). Acc.27 (3.87) recorded the lowest number of flowers per inflorescence. Number of inflorescence per plant and number of flowers per inflorescence. This might be due to the transport of photosynthetic assimilates to the developing floral buds which might be triggered by the amount of endogenous growth regulators in the flower Philip *et al.* (2019). Variations in the number

of flowers per plant are related to recurrent blooming habit due to their genetic makeup (Preethi *et al.* 2019). The variation in the number of flowers may be due to the genetic nature of the cultivar and also the effect of agro-climatic conditions. The varietal differences for yield potential may also be due to attributed additive gene effect. This was in accordance with the findings of Prashanta *et al.* (2016) in Tuberose, Mahantesh *et al.* (2018) in Marigold and Ramachandrudu and Thangam, (2010) in Crossandra (Fig. 3). Flower yield per plant per year showed significant differences among the Nerium accessions. The highest flower yield was recorded by Acc.19 (333.09 g) followed by Acc. 20 (329.49g) and the lowest flower yield per plant year per year were recorded by Acc.18 (98.87 g). The variation among the accessions with respect to flower yield might be due to increased flower size with a number of whorls in Nerium. Further, being a genetic factor, variations were expected among the accessions of Nerium. The higher yield might be due to increased morphological parameters like plant height, more branches and leaf area which attributes in production of more photosynthates resulting in greater accumulation of dry matter which in turn leads to the production of more flowers per plant. Similar results were observed in Dahlia (Gupta *et al.* 2015), Chrysanthemum (Rajiv 2014), Crossandra (Ramachandrudu and Thangam 2010), Priyanka *et al.* (2017), Rose (Shahrin *et al.* 2015) and China aster (Tirakannanavar *et al.* 2015).

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