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Evaluation of nerium cultivars for morphological, flowering and yield traits under Coimbatore conditions

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Abstract

Nerium (Nerium oleander L.) is an evergreen shrub or small tree in the dogbane family Apocynaceae. The family has a widespread distribution throughout tropical and temperate regions. *Nerium* is an ornamental plant used in the urban landscaping due to its spectacular flowering which can have different colorations as the variety and its resistance to long drought periods. The objectives of this study were to evaluate four *nerium* cultivars for vegetative, flowering and yield traits. The cultivars under study showed significant variation for different characters. Among the four cultivars of *nerium*, Pink cultivar recorded maximum plant height, plant spread, number of branches, internodal length and leaf width and lowest plant height, plant spread, number of branches, internodal length and leaf width, was recorded in Yellow cultivar at six month after planting. Regarding leaf length, highest leaf length was recorded in White cultivar and lowest leaf length was recorded in Yellow cultivar at six month after planting. Similarly Pink cultivar recorded maximum number of inflorescences per plant, number of flowers per inflorescence, flower diameter, corolla tube length, hundred bud weight and yield per plant on other hand lowest number of inflorescence per plant in Yellow cultivar, number of flowers per plant, flower diameter and corolla tube length in white cultivar, hundred bud weight and yield per plant in Yellow cultivar. From the study it was found that Pink cultivar was found as superior for vegetative, flowering and yield traits. Hence, the Pink cultivar may be used in breeding programme for further varietal development.

Keywords: *Nerium oleander L.* cultivar, significant, flower diameter, inflorescence

Introduction

Nerium (Nerium oleander L.) is an evergreen shrub or small tree in the dogbane family Apocynaceae (Kiran and Prasad, 2014; Yadav *et al.*, 2013) [14, 20]. The Apocynaceae is a diverse and species rich family in the order Gentianales. The family has a widespread distribution throughout tropical and temperate regions (Barrios and Koptur, 2011) [3]. *Nerium oleander L.* is widely cultivated that no precise region of origin has been identified, though South West Asia has been suggested. It is either native or naturalized to a broad area from Mauritania, Morocco, and Portugal eastward through the Mediterranean region and the Sahara to the Arabian peninsula, Southern Asia, and as far East as Yunnan in Southern parts of China. It typically occurs around dry stream beds. In India *nerium* distributed throughout the country. *Nerium* grows to 2–6 m tall, with erect stems that spread outward as they mature. Leaves are 10 to 22 cm. long, narrow, acute and have a prominent mid rib, are "leathery" in texture and usually arise in groups of three from the stem. The plant produces terminal flower heads, usually pink or white (Kiran and Prasad, 2014) [14]. *Nerium* is an ornamental plant used in the urban landscaping due to its spectacular flowering which can have different colorations as the variety and its resistance to long drought periods (Albornoz *et al.*, 2014) [1]. In Tamil Nadu, *nerium* is used for various purposes like ornamental plants in garden, religious purpose and garlands. Now days in India *nerium* cultivation gaining more importance due to its wide utility but no systematic research has been carried out. Hence keeping all these in view, the research has been undertaken to evaluate the *nerium* cultivars for vegetative, flowering and yield traits. The best promising cultivar can be further utilize in crop improvement programme.

Material and methods

The study was conducted during 2016-2017 to study the evaluation of *nerium* cultivars for vegetative, flowering and yield traits at Department of Floriculture and Landscaping,

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Horticulture College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. The four cultivars of nerium was collected from different districts of Tamil Nadu. The well-established ground layered plants were used for plating. In a fortnight duration, all the plants were established well. Flower initiation occurred two months after planting and all the flowers were nipped off regularly until the plants were reaches four month old. The observations like plant height, plant spread, internodal length was recorded 2, 4, and 6 month after planting. Yield per plant was recorded from October 2016 to March 2017 with three pickings of flowers. The other vegetative and yield parameters like leaf length, leaf width, petiole length, flower diameter, corolla tube length, pedicel length, number of inflorescence per plant, number of flowers per inflorescence, hundred bud weight was recorded at six month after planting. In each replication five plants were selected in all the treatments and tagged for recording the observation on various vegetative and flowering characters. The statistical analysis was done by adopting the standard procedures of Panse and Sukhatme (1985) [14]. Randomized Block Design (RBD) design were followed with five replication in each treatment. The critical difference was worked out at five percent (0.05) probability. Analysis was carried out with AGRES software package and MS Excel® spreadsheet.

Result and discussion

The plant height varied significantly among the cultivars at two, four, and six month after planting table 1. Among the cultivars highest plant height (74.78, 89.97, 124.05 cm) was recorded in Pink cultivar at two, four and six month after planting respectively followed by Red cultivar (65.56, 80.24, 100.93 cm) at two, four and six month after planting respectively while the least plant height is recorded in Yellow cultivar (55.90, 73.90, 93.91cm) at two, four and six month after planting respectively. The variation in plant height among the cultivars could be due to influence of the genetical makeup of the cultivars. Higher value for plant height is associated with rapid meristematic activity, probably due to rapid cell division and elongation during the growth period (Sharova *et al.*, 1977) [18]. This is in line with observation made by (Herrera 1991; Mackay *et al.*, 2005; Mulas *et al.*, 2008; Kumar and Haripriya, 2010) [6, 10, 11, 9] in nerium. Similar findings were reported by Paliwal (2009) [13] that the nerium will attain height of six meter but is usually trimmed to contain it to a height of around 2 to 3m.

Data pertaining to the performance of different nerium cultivars for plant spread were presented in table 2. The plant spread varied significantly among the cultivars at two, four and six month after planting. Among the cultivars highest plant spread (59.96, 82.45, 117.87 cm) for East to West was recorded in Pink cultivar at two, four, and six month after planting respectively followed by White cultivar (58.03, 81.27, 107.54 cm) at two, four and six month after planting respectively and least in Yellow cultivar (52.42, 65.54, 77.22 cm) at two, four and six month after planting with respectively. For North South plant spread it is evident from the data that the highest plant spread (65.86, 82.97, 103.21 cm) was recorded in Pink cultivar at two, four and six month after planting respectively, followed by White cultivar (58.18, 74.67, 99.33 cm) at two, four and six month after planting respectively and least in Yellow cultivar (55.23, 70.72, 80.35 cm) at two, four and six month after planting respectively. The variation in plant spread was due to the additive gene effect. Similar observations were made by (Mackay *et al.*,

2005; Mulas *et al.*, 2008) [10, 11] on oleander ecotypes differed considerably regarding plant spread which varied between 1.4 and 5.0 m. The four month old nerium plants spread up to 78.56 cm East West direction and 75.54 cm North South direction (Kumar and Haripriya, 2010) [9]. Similar findings were made by Kobayashi *et al.* (2007) in bougainvillea is that with multi-trunked or with clumping stems. It has a spreading, round canopy with a height and spread of up to 20 feet. Similar observations were made (Choudhary *et al.*, 2014) [5] in marigold.

Number of branches plant⁻¹ is also an important criteria which determines important parameters including plant spread and flowering shoots. Data presented in table 3 reveals the performance of nerium cultivars for number of branches plant⁻¹. The number of branches plant⁻¹ among the cultivars at two, four and six month after planting. Among the cultivars more number of primary branches (2.93, 3.13, 3.13) was recorded in White cultivar at two, four and six month after planting respectively followed by the Red cultivar (2.19) at two month and Pink cultivar (2.53, 2.73) at four and six month after planting respectively while least number in Yellow cultivar (1.73, 2.13, 2.16) at two, four and six month after planting respectively. The difference in number of branches among the cultivars could be due to influence of the genetical makeup of the cultivars. This was in line with observation of (Mackay *et al.*, 2005) [10] in nerium. Similar observation made by Zosiamliana (2012) [21] in China aster and (Choudhary *et al.*, 2014) [5] in marigold.

As regards internodal length, it differed significantly among the cultivars at two, four and six month after plating. The perusal of data in fig 1 revealed that Pink cultivar have high internodal length (2.88, 5.67, 5.80 cm) at two, four and six month after planting respectively, followed by red cultivar (2.76, 4.83, 5.00 cm) at two, four and six month after planting respectively and the least observed in Yellow cultivar (2.03, 3.87, 4.60cm) at two, four and six month after planting respectively. This was agreement with observation of (Mackay *et al.*, 2005) [10] in nerium. Similar observations were reported by (Samanta *et al.*, 2014) [16] in *Tabernaemontana coronaria* on internodal length, which did not vary to a large extent except in dwarf variety.

Data on leaf length, leaf width petiole length are presented in table 5. Significant differences were found for leaf length and leaf width among the nerium cultivars. It is evident from the data that highest leaf length (20.27 cm) was recorded in White cultivar, followed by Pink cultivar (19.58 cm) and the least observed in Yellow cultivar (18.39 cm). The highest leaf width (2.59cm) was recorded in the Pink cultivar followed by the White cultivar (2.11) while the least leaf width was recorded in Yellow cultivar (1.86 cm). This is in accordance with observation made by Kiran and Prasad (2014) [14] in nerium, who reported that the length of leaf ranges between 5 to 21 cm and width of the leaves ranges 1 to 3.5 cm. The differences in the length and width of the leaves might be due to the genetic influences of the genotypes. This was agreement with observation of (Mackay *et al.*, 2005) [10] in nerium. Similar observations were made by Seeruttun and Sanmukhiya (2013) [17] in Hibiscus. An inquisition of data regard to petiole length are presented in table 5. Among the cultivars highest petiole length (0.93 cm) was recorded in Pink cultivar followed by White cultivar (0.92 cm) and the least petiole length (0.82 cm) was recorded in Yellow cultivar. But, petiole length showed the non significant results in this study.

The results pertaining to number of inflorescence plant⁻¹ presented in fig 2. It is evident from the data that number of inflorescence plant⁻¹ varied significantly among cultivars at six month after planting. It is evident from data that highest number of inflorescences plant⁻¹ (21.86) was observed in Pink cultivar at six month after planting followed by White cultivar (17.53) at six month after planting while least observed in Yellow cultivar (12.53) at six month after planting. The total number of flowers inflorescence⁻¹ varied significantly among the cultivars at six month after planting (fig 2). The highest number of flowers inflorescence⁻¹ (70.86) was recorded in Pink cultivar at six month after planting followed by in Red cultivar (68.93) and the least number of flowers inflorescence⁻¹ (64.03) was recorded in White cultivar at six month after planting. Similar observation made by Herrera (1991) [6] in nerium reported that a medium sized plant (about 2 m of diameter and 2 m height) may produce from eight to more than 100 inflorescences. These are corymbs that, when large have 3–5 lateral branches and may produce between 12 and 44 flowers. This finding is in accordance with observation made by Sihag and Wadhwa (2011) [19] in *Rauwolfia serpentina* reported that the number of inflorescences plant⁻¹ ranged from 17 to 63 and flowers in the inflorescences ranged from 36 to 54.

Data presented in table 7 revealed that the performance of nerium cultivars for flower diameter, corolla tube length and pedicel length varied significantly among the nerium cultivars. Among the cultivars the highest flower diameter of 5.04 cm was recorded in Pink cultivar followed by Red cultivar (4.84 cm) and the least flower diameter recorded in White cultivar (4.71 cm). This was in accordance with observation made by (Herrera, 1991; Mackay *et al.*, 2005; Mulas *et al.*, 2008; Kumar and Haripriya, 2010; Kiran and Prasad, 2014) [14, 6, 10, 11, 9, 7] in nerium. Among the cultivars highest corolla tube length of 2.15 cm was recorded in Pink cultivar followed by the Red cultivar (1.98 cm). The least corolla tube length of 1.76 cm was recorded in White cultivar. This was in confirmation with the observation of (Mackay *et al.*, 2005) [10] in nerium. It is observed from the data that pedicel length varied significantly among the nerium

cultivars. Among the cultivars maximum pedicel length of 0.75cm was recorded in Pink cultivar followed by the White cultivar (0.66 cm). The least pedicel length was recorded in Yellow cultivar (0.61cm). Similar observation in glory Lilly was made by Anandhi and Rajamani (2012) [2] flowers of glory Lilly were borne on the long pedicel (10.45 cm).

A perusal of data embodied in table 8 revealed that the cultivars differed significantly with respect to hundred bud weight. Among the cultivars the highest hundred bud weight (20.26 gm) was recorded in Pink cultivar followed by Red cultivar (16.06 gm). The least hundred bud weight was observed in Yellow cultivar with 15.22 gm.). This observation was in conformation with Kumar and Haripriya, 2010 [9] in nerium and Ranchana (2013) [15] in tuberose. Significant variations were found regarding yield plant⁻¹ among the different nerium cultivars fig 3. Among the cultivars the highest yield per plant⁻¹ (134.45 gm) was recorded in Pink cultivar followed by White cultivar (123.78 gm) while least Yield was recorded in Yellow cultivar (110.41gm). This was in line with the observation made by with Kumar and Haripriya, 2010 [9] in nerium and Bharathi *et al.*, 2014 [4] in marigold. Similar observations have also been recorded in chrysanthemum (Palai *et al.*, 1999) [12]. The variation in yield characters may be due to genetic nature of the cultivar and also the effect of agro climatic conditions. The varietal differences for yield potential may also be attributed to additive gene affect.

Table 1: Plant height (cm) at 2nd, 4th and 6th month after planting in nerium (*Nerium oleander* L.) cultivars

Cultivars	Plant height (cm)		
	Month after planting		
	2 nd	4 th	6 th
Red	65.56	80.24	100.93
White	64.21	77.13	99.28
Pink	74.78	89.97	124.05
Yellow	55.90	73.90	93.91
Mean	65.11	80.31	104.54
SEd	2.61	17.41	6.16
CD (p= 0.05)	5.69	37.93	13.43

Table 2: Plant spread (cm) at 2nd, 4th and 6th month after planting in nerium (*Nerium oleander* L.) cultivars

Cultivars	Plant spread (cm)					
	Month after planting					
	2 nd		4 th		6 th	
	East - West	North South	East - West	North South	East - West	North - South
Red	56.77	56.52	70.23	70.80	98.75	88.93
White	58.03	58.18	81.27	74.67	107.54	99.33
Pink	59.96	65.86	82.45	82.97	117.87	103.21
Yellow	52.42	55.23	65.54	70.72	77.22	80.35
Mean	56.80	58.95	74.87	74.79	100.35	92.96
SEd	2.19	2.28	19.21	18.44	3.95	3.62
CD (p= 0.05)	4.79	4.97	41.86	40.18	8.61	7.88

Table 3: Number of branches plant⁻¹ at 2nd, 4th and 6th month after planting in nerium (*Nerium oleander* L.) cultivars

Cultivars	Number of branches plant ⁻¹					
	Month after planting					
	2 nd		4 th		6 th	
	Primary	Secondary	primary	Secondary	Primary	Secondary
Red	2.19	5.92	2.40	5.83	2.40	6.93
White	2.93	6.66	3.13	7.32	3.13	7.99
Pink	1.99	4.73	2.53	5.26	2.73	6.13
Yellow	1.73	3.93	2.13	4.33	2.16	4.66
Mean	2.21	5.31	2.55	5.69	2.61	6.43
SEd	0.18	0.20	0.53	0.19	0.099	0.24
CD (p=0.05)	0.39	0.44	NS	0.41	0.21	0.53

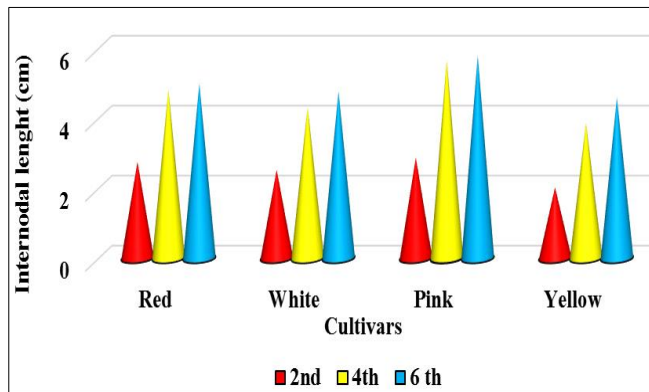


Fig 1: Internodal length (cm) at 2nd, 4th and 6th month after planting in nerium (*Nerium oleander* L.) cultivars

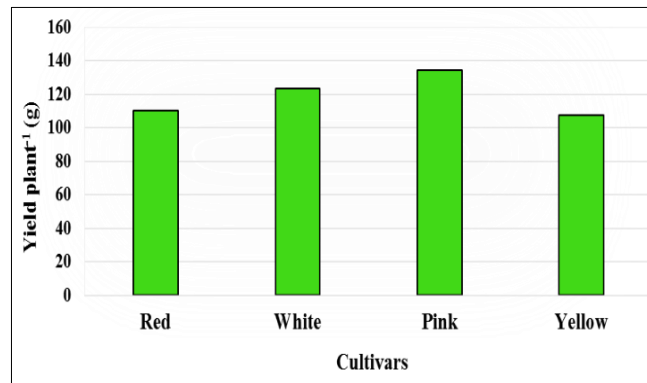


Fig 3: Yield plant⁻¹ in nerium (*Nerium oleander* L.) cultivars (from October 2016 to March 2017)

Table 4: Leaf length (LL), leaf width (LW), and petiole length (PL) in nerium (*Nerium oleander* L.) cultivars

Cultivars	LL (cm)	LW (cm)	PL (cm)
Red	19.39	2.04	0.90
White	20.27	2.11	0.92
Pink	19.58	2.59	0.93
Yellow	18.39	1.86	0.82
Mean	19.41	2.15	0.89
SEd	0.54	0.07	0.06
CD (p= 0.05)	1.24	0.17	NS

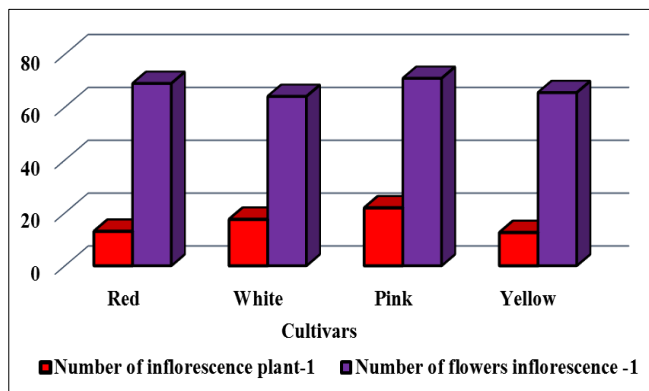


Fig 2: Total number of inflorescence plant⁻¹ and Number of flowers inflorescence⁻¹ at 6th month after planting in nerium (*Nerium oleander* L.) cultivars.

Table 5: Flower diameter, corolla tube length, and pedicel length in nerium (*Nerium oleander* L.) cultivars

Cultivars	Flower diameter (cm)	Corollatube length (cm)	Pedicel length (cm)
Red	4.84	1.98	0.64
White	4.71	1.76	0.66
Pink	5.04	2.15	0.75
Yellow	4.74	1.84	0.61
Mean	4.83	1.93	0.67
SEd	0.08	0.06	0.04
CD (p= 0.05)	0.18	0.14	NS

Table 6: Hundred bud weight (gm) in nerium (*Nerium oleander* L.) cultivars

Cultivars	100 bud weight (gm)
Red	16.06
White	15.80
Pink	20.26
Yellow	15.22
Mean	16.84
SEd	0.21
CD (p= 0.05)	0.47

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