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Research Article

Studies on morphological characteristics and categorization of nerium accessions based on utility

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Abstract
An experiment was conducted to evaluate the performance of nerium accessions and their categorization based on colour and uses. Field experiment was conducted at the "Botanical garden, Department of Floriculture and Landscaping, Tamil Nadu Agricultural University, Coimbatore". Thirteen nerium accessions were collected and coded named as ACC-1 to ACC-13. Significant variations in vegetative and flowering related traits were observed among the accessions. Out of the thirteen accessions, ACC-6 recorded the maximum number of primary branches (6.17), leaf area (29.67cm^2), number of flowers per plant (16) and yield per plant per year (245.89 g), whereas, plant height (176.11cm) and shelf life (3.73 days) was maximum in ACC-10. From among the thirteen accessions, the desired one could be identified easily for aspecific purpose, since Nerium is vegetatively propagated and selected for defined traits vegetati-ve, flowering and flower qualities (flower form, colour).

Keywords
Nerium, morphological traits, categorization and usage

Introduction

Flowers are symbolic of beauty, love and tranquility. They form the soul of a garden and convey the message of nature to mankind. Flowering shrubs are an important component in any garden. Flowers have been admired and used by human kind not just for their aesthetic values, but also for various other uses including their medicinal and food values (Ali *et al*., 2015).

Nerium is an evergreen shrub species which belongs to Apocynaceae family, native to Northern Africa and the Mediterranean region. Globally, it is well acclaimed as an ornamental shrub due to its abundant and long lasting flowering habit and its potential to tolerate heat, salinity and drought. Nerium flowers are commonly used for worship in household and temples. Several varieties have become very popular owing to their fragrant showy blooms, in spite of the poisonous quality of the sap of nerium plants. The flowers are available throughout the year, but peak season coincides with the rainy days. Pink single, pink double, deep rose, white single and deep rosy red flowers are popular (Ponni, 2004). Nerium is also known for its medicinal uses (Adome*et al*., 2003).

Flower colour is the most important trait of nerium and consumer demand varies with the flower colour. In recent days, nerium occupies a significant place in large parks, housing developments, city green areas, along highways and community gardens. The aim of the present study was to evaluate the performance of nerium accessions and their categorization for colour and usage.

Materials and Methods

Experiment was conducted in Randomized Block Design with three replications and each replication had five plants each of the thirteen accessions. Data were recorded on plant height, number of branches per plant, leaf area, chlorophyll content, days to flower bud emergence, number of flowering branches per plant, number of flowers per branch, yield and shelf life. Data collected were analysed statistically.
The list of 13 Nerium accessions arelisted in Table 1.

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

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Plant height varied significantly among the 13 accessions, throughout the experimental period (Table 2). ACC-10 (176.11 cm) was vigorous in growth in terms of plant height. ACC-9 (52.70 cm) recorded minimum plant height. Plant height being a genetically controlled factor, it varied among the genotypes and it was also influenced by the growing environmental conditions, production technology and cultural practices. Similar variation in plant height due to cultivars was also observed in Crossandra by Priyanka*et al*. (2017),China aster by Munikrishnappa (2013) and gladiolus by Pasha *et al*. (2015); Chourasia*et al*. (2015).

Significant variation with respect to number of primary branches produced per plant was noticed (Table 2). Number of branches was maximum in ACC-6 (6.17) while, the ACC-8 (3.0) recorded minimum branches. The difference in number of branches could be attributed to the genetic makeup of the cultivars. Increased number of branches leads to production of more number of leaves and in turn it will enhance the yield of flowers by improving the source and sink relationship. Similar trend was noticed by Gupta *et al*. (2015) in dahlia and Chowdhuri*et al*. (2015) in different China aster genotypes and Ramachandrudu and Thangam (2010) in Crossandra.

Leaf area was significantly influenced by the accessions. Among the 13 accessions, leaf area was maximum in ACC-6 (29.67cm^2) and least in ACC-9 (9.43 cm^2). Leaves are the functioning units for photosynthesis and the chlorophyll content of leaf influences more the growth and flower yield. Similar variation was also observed by Anop*et al*. (2010) in gerbera, Priyanka*et al*. (2017) in Crossandra and Shaukat*et al*. (2015) in Gladiolus.

Chlorophyll content varied significantly among the nerium accessions. Maximum chlorophyll content was noticed in ACC-6 (86.3) whereas lowest was noticed in ACC-13(32.5) at mature stage (Table 2). Similar findings were reported in rose by Shahrin*et al*. (2015). This variation in chlorophyll percentage might be attributed to genotypic differences, as reported earlier by Thomas and Lekharani, (2008) in orchids. Chlorophyll content in leaf enhanced photosynthetic activity, which produce carbohydrates. Carbohydrates serve as energy source for growing bud and flower opening. The ultimate effect of all these factors might have resulted in production of long and firm flower stalks, and larger sized flower buds (Tarannum, 2014).

Yield parameters decide the significance and suitability of a particular genotypes for commercial cultivation and significant difference was noticed for all the yield parameters (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-6 (70days) followed by ACC-9 (91days), whereas, the most delayed flower bud appearance was recorded in ACC-11(120 days). This indicated that it might be primarily due to the different genetic constitution of the genotypes and secondary contribution of the prevailing environmental conditions. In similar studies, Shaukat*et al*. (2015) in Gladiolus and Srilatha*et al*. (2015) in Chrysanthemum also recorded variation among the varieties of flower bud emergence.

Maximum numbers of flowers per plant was produced in ACC-6 (16), whereas, the minimum number of flowers was in ACC-3(5.3). Flower yield per plant (386.17g) per year was recorded highest in ACC-10, whereas, it was recorded minimum in ACC-9 (56.45 g). The higher yield might be due to increased morphological parameters like plant height, more number of leaves and leaf area which help in production of more photosynthates resulting in greater accumulation of dry matter which in turn leads to production of more number of flowers per plant. Similar results were observed in Dahlia by Gupta *et al*. (2015), China aster by Tirakannanavar*et al*. (2015), Rajiv (2014) in Chrysanthemum, Ramachandrudu and Thangam (2010); Priyanka*et al*.(2017) in Crossandra and Shahrin*et al*. (2015) in Rose.

Significant variations among the accessions was observed for shelf life of flowers. The longest shelf life was registered in ACC-10 (3.73 days) followed by ACC-12 (3.06 days). This might be due to the variation in genetic make up leading to differential accumulation of carbohydrates and also due to disparity in sensitivity to ethylene as reported earlier in Chrysanthemum by Patil*et al*. (2017).

- **Loose flower purpose:** On the basis of evaluation results in numbers of flowers and flower yield.
- **Ornamental purpose:** Based on the morphological evaluation results in plant height, number of primary branches, leaf area and number of flower per plant.

- **According to color:**Colour was measured by visual observation.

Considering the above results, it was observed that in ACC- 6 there was a significantly increase in production of more flowers, number of primary branches and flower yield, and also it is used as loose flower (Table 4). Other nerium accessions also showed significant variations in morphological observations, all nerium accessions are used for ornamental purpose. Hence, growth and yield performance and morphological categorization of these thirteen nerium accessions by colour and usage may help the breeder to select the parent for the improvement of the nerium.

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Table 1. List of accessions studied

Accession No.	Source of collection	Colour of flower	Flower type (Single/Double)
Acc.No: 1	Beemanagari- KKM	Pure white	Single
Acc.No: 2	Panamarathan patty- SLM	White	Single
Acc.No: 3	Thirupathisaram- KKM	Baby pink	Single
Acc.No: 4	Paiyur- DMP	Red	Single
Acc.No: 5	Beemanagari- KKM	Red	Single
Acc.No: 6	Rasipuram- NKL	Pink	Single
Acc.No: 7	Aralvaimozhi- KKM	Dull pink	Single
Acc.No: 8	Avarakulam- KKM	Yellow	Single
Acc.No: 9	TNAU- CBE (dwarf)	Mauve	Single
Acc.No: 10	Rasipuram- NKL	Pink	Double
Acc.No: 11	Karunkulam- KKM	Red	Double
Acc.No: 12	Palakkad -KL	White	Double
Acc.No: 13	Kadiyam - AP-Variegated leaves	Pink	Double

KKM-Kanyakumari, **SLM**-Salem, **DMP**-Dharmapuri, **CBE**- Coimbatore, **NKL**-Namakkal, **DNL**- Dindigul, **KL**- Kerala, AP-Andhra pradesh

Table 2. Evaluation of Nerium accessions for growth parameters

Accession No.	Plant height(cm)	Number of primary branches/plant	Leaf area (cm^2)	Chlorophyll content (SPAD)
Acc.No: 1	128.63	4.67	24.98	78.5
Acc.No: 2	119.55	5.83	27.03	86.5
Acc.No: 3	121.38	3.33	24.59	53.8
Acc.No: 4	106.73	3.17	23.26	75.3
Acc.No: 5	95.13	4.00	24.68	81.7
Acc.No: 6	137.84	4.83	29.67	86.3
Acc.No: 7	144.34	6.17	23.16	64.7
Acc.No: 8	104.88	3.00	29.51	76.6
Acc.No: 9	52.70	3.67	9.43	41.3
Acc.No: 10	176.11	5.67	24.89	82.5
Acc.No: 11	126.28	3.67	22.22	80.7
Acc.No: 12	107.79	4.33	24.55	83.2
Acc.No: 13	108.21	3.87	17.99	32.5
Mean	117.65	4.32	23.53	71.04
SE d	2.11	0.07	0.54	1.40
CD (0.05)	4.36	0.14	1.11	2.89

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Table 3.Evaluation of Nerium accessions for flower yield parameters

Accession No.	Days to flower bud emergence (days)	Number of flowering branches/plant	Number of flowers/ branch	shelf life (days)	Yield / plant(g)/year
Acc.No: 1	104.03	10.33	10.50	2.03	168.13
Acc.No: 2	96.15	8.67	7.51	2.53	174.68
Acc.No: 3	107.34	7.67	5.25	2.46	162.72
Acc.No: 4	101.16	6.67	12.72	2.30	193.08
Acc.No: 5	109.27	8.34	6.32	2.16	176.26
Acc.No: 6	90.19	17.50	16.00	2.87	245.89
Acc.No: 7	98.23	7.76	5.88	2.49	198.74
Acc.No: 8	120.14	8.84	6.63	2.07	166.82
Acc.No: 9	91.04	6.54	5.50	2.62	56.45
Acc.No: 10	120.21	9.14	7.50	3.73	386.17
Acc.No: 11	120.17	7.53	5.96	2.93	258.38
Acc.No: 12	98.12	8.63	6.08	3.06	276.16
Acc.No: 13	98.26	6.16	5.98	3.08	165.25
Mean	103.84	8.68	7.86	2.64	201.87
SE d	2.02	0.20	0.20	0.06	4.00
CD (0.05)	4.17	0.42	0.42	0.12	8.25

Table 4. Categorization of nerium accessions based on its uses

Loose flower purpose	ACC- 4, 6, 7
Ornamental purpose	
Hedge and screening	ACC- 7, 10, 11, 12, 13
Ornamental shrubs	ACC-1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13
Pot plant and edge	ACC- 9
Nerium accessions according to colour	
White	ACC-1, 2, 12
Red	ACC- 4, 5, 11
Pink	ACC-6, 7, 10, 13
Yellow	ACC-8
Baby pink	ACC-3
Mauve	ACC-9

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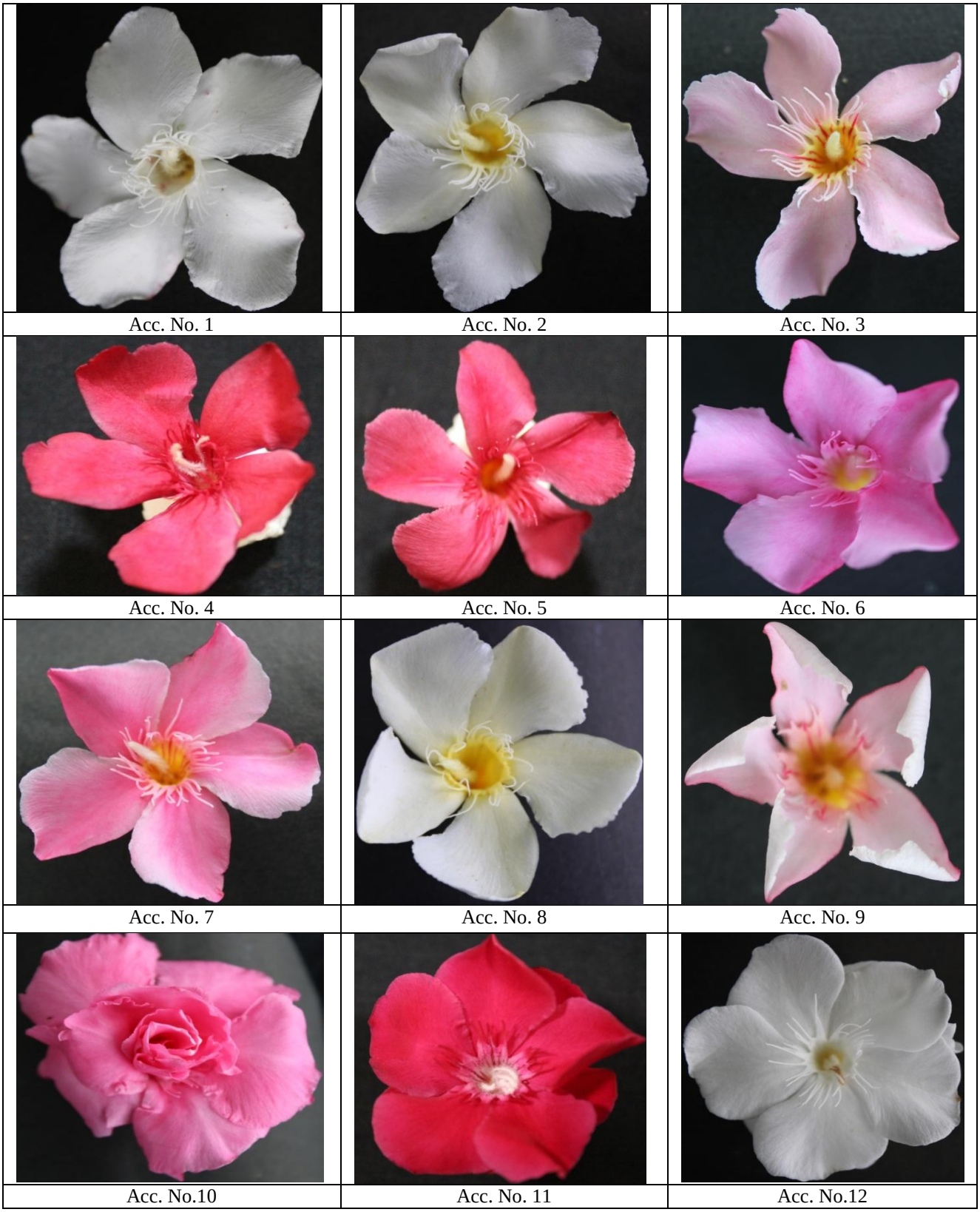

Fig.1.Pictorial representation on nerium accessions