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Studies on phenotypic characterization of *Nerium species* in Chhattisgarh plain

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Abstract
The work was carried out during the year 2021-22 in different genotypes of *Nerium* planted within the premises of Indira Gandhi Krishi Vishwavidyalaya, Raipur. The experimental materials utilized for the study consisting eight genotypes of Nerium named as RLC-1, RLC- 2, RLC-3, RLC-4, RLC-5, RLC-6, RLC-7 and RLC-8. Experiment was conducted in Randomized Block Design (RBD) with four replications. The morphological observations were analysed as descriptors provided by UPOV for the conduct of DUS test on *Nerium* (2009), published by UPOV, Geneva. Morphological characters of Nerium genotypes revealed that, characters like stem: branching, leaf blade: incurving of margin, leaf blade: profile in cross section were similar in all genotypes whereas other characters show variations with respect to parameters under study.

Keywords: Nerium, DUS, UPOV, characterization

Introduction
Nerium (*Nerium oleander* L.) is an evergreen shrub or small tree in *Apocynaceae* family (Kiran and Prasad, 2014; Yadav *et al*., 2013) [5, 9]. The *Apocynaceae* is a diverse and species rich family in the order *Gentianales*. Nerium oleander is widely grown as an ornamental plant in tropical, subtropical and temperate regions due to its profuse flowering and long-lasting nature with moderate hardiness. Nerium plant grows tall, with erect stems that spread outward as they mature; first year stems have a glaucous bloom, while mature stems have a greyish bark. The leaves are dark-green and narrow. 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) [7]. Nerium is also known for its medicinal uses (Adome *et al*., 2003) [1]. The fruit is a long narrow capsule which splits open at maturity to release numerous downy seeds. Nerium plant is medicinally important because decoction of the leaves has been applied externally in the treatment of scabies and to reduce swellings. The aqueous leaf extract of *Nerium oleander* exhibited ovicidal and larvicidal properties against *Anopheles stephensi*. The root powder is an external remedy for hemorrhoids and ulcer. Leaves and bark extracts act as insecticide and rat poison (Farooqui and Tyagi 2018). In recent days, nerium occupies a significant place in urban landscaping due to its spectacular flowers with different colors, drought resistance and also act as screening plant and windbreaks. Nerium flowers are used in special occasion due to its aesthetic value for making garlands and also play an important role in the worship of Lord Shiva in Hinduism.

Material and Methods
Experiment was conducted in a Randomized Block Design (RBD) with four replications. The experimental materials utilized for the current study consists of eight genotypes of Nerium named as RLC-1, RLC-2, RLC-3, RLC-4, RLC-5, RLC-6, RLC-7 and RLC-8 which was pre-established as avenue plant.

Table 1: List of genotypes used in the study

Genotypes	Flower colour	Petal type	GPS coordinates
RLC-1	Pink colour	Compound	N 21°14'06.82'', E 081°42'31.47''
RLC-2	Pink colour	Single	N 21°14'09.55'', E 081°42'15.71''
RLC-3	Dark red	Single	N 21°14'05.73'', E 081°42'31.47''
RLC-4	Dark pink	Single	N 21°14'15.10'', E 081°42'42.43''
RLC-5	White	Compound	N 21°14'08.07'', E 081°42'21.36''
RLC-6	Whitish pink	Single	N 21°14'10.72'', E 081°42'42.64
RLC-7	Light yellow	Single	N 21°12'46.29'', E 081°44'45.38''
RLC-8	Dark red	Compound	N 21°14'16.86'', E 081°42'16.08

The morphological observations were analysed using descriptors provided by UPOV for the conduct of DUS test on Nerium (2009), published by UPOV, Geneva. Qualitative characters were observed visually. The characters obtained from the mentioned guidelines were documented as following observations: - Plant: growth type, Plant: growth habit, Leaf: colour, Leaf blade: incurving of margins, Leaf blade: profile in cross section, Inflorescence: curvature of upper part, Flower bud: shape, Flower: colour, Petal: attitude of upper part, Petal: shape, Petal: margin, Petal: main colour of upper side, Petal: colour at base of lobe on outer side, Corolla throat: colour of external side, Corolla throat: petaloids, Corolline appendage: crown attitude, Corolline appendage: laciniation, Corolla throat: main colour of inner side (excluding eye zone), Corolla throat: distribution of secondary colour of inner side, Calyx: colour, Sepal: position in relation to corolla tube, Time of beginning of flowering.

Result and Discussion

According to DUS classification for Plant growth habit four genotypes (57%) were classified under semi-upright, three (29%) were classified under spreading and one (14%) was classified under upright growth habit. Similar results were found by Asha *et al.*, (2016) in chrysanthemum. Based on plant growth type six genotypes (75%) categorized under normal and two (25%) under dwarf. Similar variation observed by Panwar *et al.*, (2012) [6] and Sood *et al.*, (2011) [8] in rose and capsicum, respectively. Inflorescence: curvature of upper part of four genotypes (50%) grouped under medium and four (50%) under strong. Flower bud: shape of four genotypes (50%) were classified under Rhombic, two (25%) under Broad elliptic, two (25%) under Narrow elliptic. Petal: attitude of upper part four (50%) were classified under semi erect, three (38%) under horizontal and one (13%) under erect. Petal: shape of four genotypes (50%) were classified under type1, three (38%) under type 3 and one (13%) classified under type4. Petal: margin of three genotypes (38%) were classified under sinuate, two (25%) under entire, two (25%) under lobed and one (13%) under dentate. Corolla throat: colour of external side of two genotypes (25%) were categorized under pinkish white, two (25%) were categorized under red, one (13%) under light yellow, one (13%) under pink, one (12%) under medium yellow and one (12%) under orange yellow. Based on Corolla throat: petaloids only one (12%) categorized under present and remaining seven (88%) categorized under absent. Corolline appendage: crown attitude of five genotypes (62%) were categorized under semi erect, two (25%) under erect and one (13%) under horizontal. Corolline appendage: laciniation of four genotypes (50%) were grouped under medium, three (38%) under strong and one (12%) under weak. Based on Corolla throat: main colour of inner side (excluding eye zone) two genotypes (25%) grouped under whitish yellow, two (25%) under light pink, two (25%) under medium pink, one (13%) under pink red and one (12%) under yellow colour. Corolla throat: distribution of secondary colour of inner side of two genotypes (25%) categorized under even, two (25%) under striped, two (25%) under multi striped, one (13%) striped and striated and one (12%) under striated. Calyx: colour of three genotypes (37%) categorized under reddish brown, two (25%) under only green, two (25%) under green and red and one (13%) under only red. Sepal: position in relation to corolla tube of four genotypes (50%) grouped under moderately reflexed, three (37%) under adpressed or slightly reflexed and one (13%) under strongly reflexed.

Table 2: Morphological descriptions of different genotypes of Nerium for characterization and classification

S. N.	Genotypes	Plant: growth type	Plant: Growth habit	Stem: Branching	Leaf blade: Incurving of margins	Leaf blade: Profile in cross	Inflorescence: Curvature of upper	Flower bud: Shape	Flower: colour
1.	RLC-1	N	S	T	ASI	F	M	BE	MDP
2.	RLC-2	N	SU	T	ASI	F	SR	RH	MDP
3.	RLC-3	N	SU	T	ASI	F	M	RH	PR
4.	RLC-4	N	SU	T	ASI	F	SR	RH	MDP
5.	RLC-5	N	U	T	ASI	F	SR	NE	W
6.	RLC-6	D	S	T	ASI	F	M	RH	LP
7.	RLC-7	N	S	T	ASI	F	SR	NE	W
8.	RLC-8	N	SU	T	ASI	F	M	BE	PR

N= Normal SU= Semi upright ASI= Absent or slightly incurved SR= Strong
D= Dwarf U= Upright F= Flat BE= Broad elliptic
S= Spreading T= Ternate M= Medium NE= Narrow elliptic
RH= Rhombic MDP= medium to dark pink PR= Pink red W= Whitish
LP= Light pink

Table 3: Show the petal Attitude Shape colour on base lobe and corolla throat

S. N.	Genotypes	Petal: Attitude of upper part	Petal: Shape	Petal: margin	Petal: colour at base of lobe on outer side	Corolla throat: colour of external side	Corolla throat: petaloids	Corolline appendage: crown attitude
1.	RLC-1	SE	T3	L	P	R	PRT	SE
2.	RLC-2	SE	T1	S	P	P	AB	E
3.	RLC-3	E	T1	S	PP	PW	AB	E
4.	RLC-4	HZ	T1	EN	PP	OY	AB	SE
5.	RLC-5	SE	T3	EN	WY	LY	AB	SE
6.	RLC-6	HZ	T1	S	PW	PW	AB	SE
7.	RLC-7	SE	T3	D	LY	MY	AB	HZ
8.	RLC-8	HZ	T4	L	R	R	AB	SE

SE = Semi erect T3 = Type 3 EN = Entire T1 = Type 1 S = Sinuate
E = Erect T4 = Type 4 D = Dentate PW = Pinkish white R = Red
HZ = Horizontal L = Lobed P = Pink LY = Light yellow Y = Yellow
OY = Orange yellow MY = Medium yellow PRT = Present AB = Absent PP = Purplish pink

Table 4: Corolla throat: main colour of inner side Sepal: Position in relation to corolla tube

S.N.	Genotypes	Corolla throat: main colour of inner side (excluding eye zone)	Coralline appendages: Laciniation	Corolla throat: Distribution of secondary colour	Calyx: Colour	Sepal: Position in relation to corolla tube
1.	RLC-1	MP	SR	STD	GR	SRR
2.	RLC-2	MP	M	MS	R	ASR
3.	RLC-3	PR	WK	STR	RB	MR
4.	RLC-4	WY	M	STD	GR	ASR
5.	RLC-5	WY	M	EV	G	ASR
6.	RLC-6	LP	M	SAS	RB	MR
7.	RLC-7	Y	SR	EV	G	MR
8.	RLC-8	LP	M	MS	RB	MR

STD = Striped SAS = Striped and striated ASR = Adpressed or slightly reflexed MP = Medium pink
STR = Striated GR = Green and red MR = Moderately reflexed WY = Whitish yellow
MS = Multi striped RB = Reddish brown SRR = Strongly reflexed LP = Light pink
EV = Even G = Green WK = Weak

RLC-1 **RLC-2** **RLC-3**

RLC-4 **RLC-5** **RLC-6**

RLC-7 **RLC-8**

Plate 1: Plant growth type and Plant growth habit

RLC-1 **RLC-2** **RLC-3**

RLC-4 **RLC-5** **RLC-6**

RLC-7 **RLC-8**

Plate 2: Stem colour and branching pattern

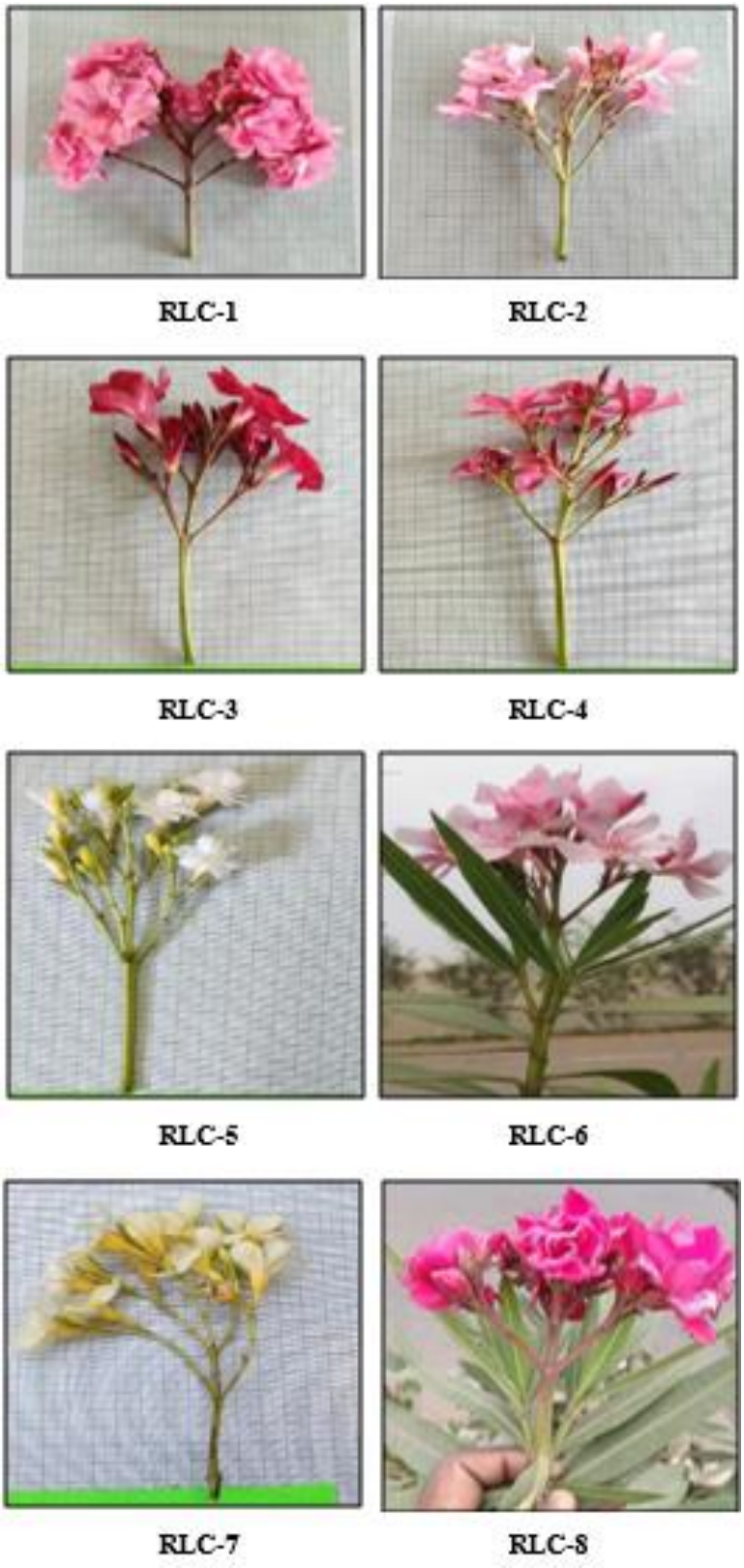


Plate 3: Inflorescence: Curvature of upper part

Plate 4: Flower bud: shape (Left to right RLC-1 to RLC-8 respectively)

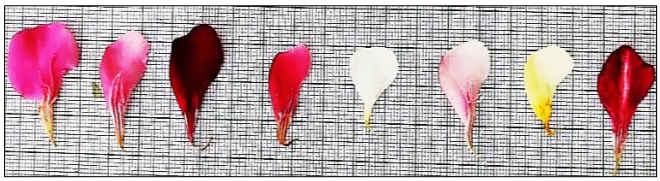


Plate 5: Petal shape and margin (Left to right RLC-1 to RLC-8 respectively)

Plate 6: Corolla throat petaloids

RLC-1 **RLC-2**

RLC-3 **RLC-4**

RLC-5 **RLC-6**

RLC-7 **RLC-8**

Plate 7: Corolline appendage: laciniation

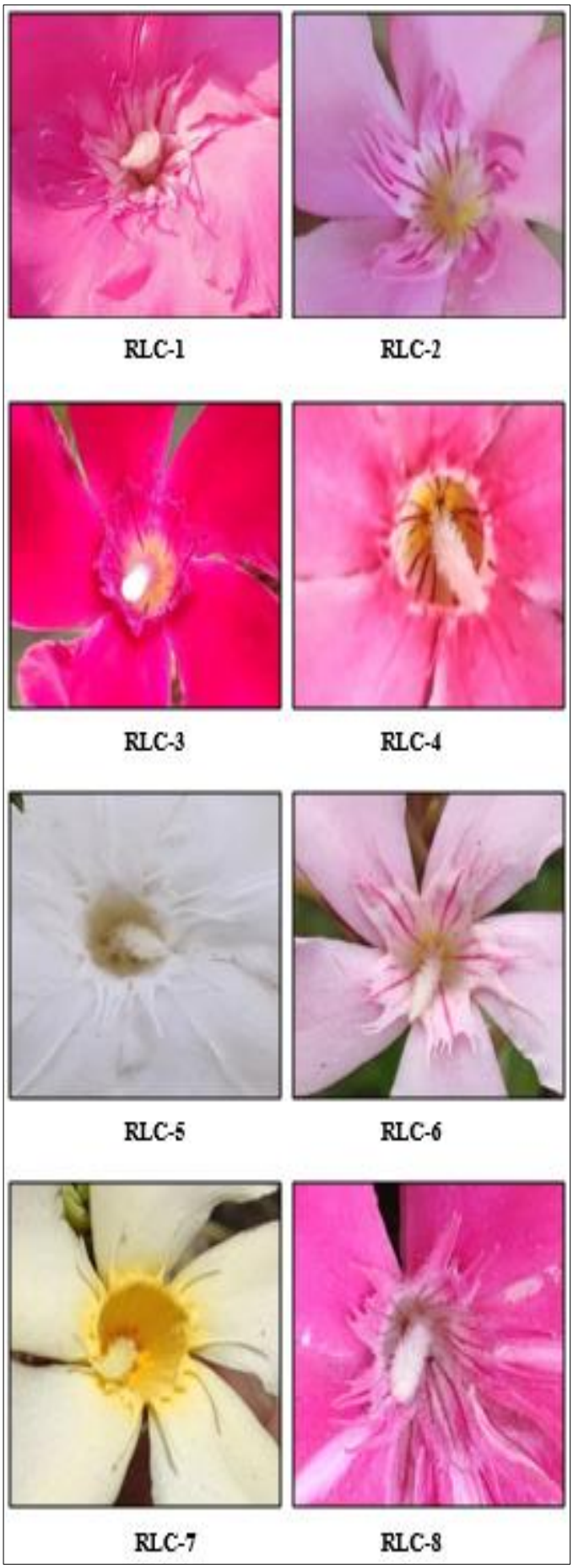


Plate 8: Corolla throat: Distribution of secondary colour of inner side and main colour of inner side (excluding eye zone)

RLC-1

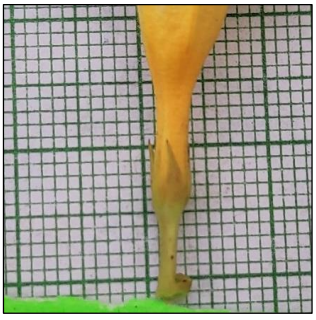
RLC-2

RLC-3

RLC-4

RLC-5

RLC-6



RLC-7

RLC-8

Plate 9: Calyx: colour and Sepal: position in relation to corolla tube

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