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Standardization of pruning season and application of growth substance for yield maximization of nerium (*N. oleander* l.) cv pink single

VIJAI ANANTH. A[1], RAMESH KUMAR. S.[2] AND ANBARASU. M.[3]

[1]Department of Horticulture, JSA College of Agriculture and Technology, Avatti, Tittakudi, Cuddalore - 606108, Tamil Nadu, India

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ABSTRACT

A field experiment was carried out to standardize pruning season (January 2019 and September 2020) and growth substance for quality yield in Nerium (Nerium oleander L.) pink single cultivar. There were five treatments viz., GA_3 @ 150ppm, CCC @ 800ppm, MH @ 750 ppm, Ethrel @ 2000 ppm Alar 1500 ppm, and water spray as control along with three-year-old plants were pruned, season 1 - January and season 2 - September has done with 90cm height, laid out in RBD with three replication. The season of January pruning and GA_3 @ 150 ppm (T_1) foliar application registered significantly highest plant height (173.5 cm), number of primary branches per plant (42.20), number of leaves per plant (1233.2), leaf area (32.74 cm^2), leaf area index (1.93 cm), fresh weight of plants (2975.5 g $plant^{-1}$) and dry matter production (434.1 g $plant^{-1}$). The highest yield attributes of flowers per plant (1672.8), flower diameter (4.83 cm), single flower weight (0.49 g), duration of flowering (223.22 days), flower yield per plant (0.82 kg), flower yield per plot (7.19 kg) and flower yield ha^{-1} (7.98 tonnes) were recorded in the treatment of January pruning along with an application of A_3 @ 150 ppm (T_1). It was followed by September pruning and CCC @ 800 ppm (T_7). The result revealed that the season of pruning in January with the growth substance of GA_3 application increased the growth and yield of Nerium (Nerium oleander L.) pink single cultivar.

Keywords: Nerium, pruning, season, growth substance, flower yield.

INTRODUCTION

Nerium oleander L. is commonly known as Nerium belongs to the Apocynaceae family one of the major l [illegible] waterlogging conditions. The flowers are available throughout the year, but the best in the rainy season. The Nerium species are Pink single, pink double, deep rose, white single and white double forms. Several varieties have become very popular as cultivated shrubs of their fragrant showy blooms and despite the poisonous quality of the sap. Uses of growth substances in Nerium are considered essential to induce flower blooming in current season growth. Hence, the growth substances should be adjusted to the specific requirements of plants during the various stages of growth to maximize quality yield (Mirheidari *et al.,* 2021). Pruning is a common and constructive technique for a variety of ornamental plants under natural exposed sunlight or greenhouse conditions. The flower is initiated shortly after the start of axillary bud growth. The importance of Nerium is due to presence of a cardiotonic substance inleaves named oleandrin. It has anti-inflammatory and stimulant properties. The root, bark, and seeds contain cardio-active glycosides, formally designated neriodorin, neriodorein, and karabin which are anti-inflammatory and stimulants and are used for pain relief. Planning of season and growth substances in Nerium is considered essential to inducing flower blooming in current season growth. Therefore the present investigation was carried out to study the effect of pruning season and growth regulator's application for yield maximization in Nerium (*N. oleander* L.) pink single cultivar.

MATERIALS AND METHODS

The experiment was carried out in the Department of Farm Management, JSA College of Agriculture and Technology, Cuddalore District, Tamil Nadu (Latitude: 11’5’’N, Longitude: 79’ E, Altitude: 64 M -MSL). The experimental soil was sandy clay loam with pH 8.34, organic carbon 4 kg^{-1}, available nitrogen 243 kg ha^{-1}, phosphorus 11.2 kg ha^{-1}, and potassium 227 kg ha^{-1}. The test crop was Nerium (*N. oleander* L.) Pink single cultivar and the experiment was laid out in randomized block design with three replications. There were two factors *viz*., pruning seasons and growth

Corresponding author Email: vijaicool007@gmail.com, [2]Department of Horticulture, Annamalai University, Annamalainagar, Chidambaram, Cuddalore, [3]Department of Agronomy, School of Agricultural Sciences, Bharath Institute of Higher Education and Research, #173 Agharam Road, Selaiyur, Chennai

substances with a water spray as twelve possible combinations. The three years old plants were pruned at a height of 90 cm from the base. The pruning season adopted was twice the first week of January 2019 and 2020 and the first week of September 2019 and 2020 as per the treatment schedule. Farmyard manure (10 kg plant^{-1}) was applied as basal immediately after pruning and irrigated. The five growth substances *viz*., GA_3, CCC, MH, Ethrel, and Alar at various concentrations and control were adopted in twelve treatments. The plants were sprayed with an aqua solution of five growth substances using of knapsack sprayer as per the treatment on the 30th and 60th days after pruning. Biometric observations were recorded on various growth, flowering, and yield parameters. The data were analyzed statistically and the critical difference was worked out at 0.5% probability (Panse and Sukhatme, 1989).

RESULTS AND DISCUSSION

Results of the present study revealed that all the growth attributes were significantly influenced by the season of pruning and growth substance application except Alar. Among two seasons January pruning recorded comparatively higher values of growth attributes. The highest plant height (173.5 cm), number of primary branches per plant (42.2), number of leaves per plant (1233.2), leaf area (32.7 cm^2), leaf area index (1.93 cm), fresh weight of plants (2975.5 g plant^{-1}) and dry matter production (434.1 g plant^{-1}) were recorded in the treatment of January pruning and GA_3 @ 150 ppm (T_1). The next best treatment based on these values was September pruning and GA_3 @ 150 ppm (T_7). Pruning is commonly used to increase light interception. Temperature determines the quantity and quality of fruits produced. The higher temperature at the fruit development stage speeds up maturity, fruit size, and quality (Bhuwon Sthapit *et al.,* 2012). Enhancement of growth attributes in January pruning might be due to the enhanced light exposure, temperature, and optimum moisture level in the soil which favored the growth of Nerium plants. Comparatively higher cloudy conditions and the influence of more rainy days that existed during the months after pruning the plants in September might be the reason for the reduction in growth attributes in treatments with September pruning. In wet and cloudy years the carbohydrate supply and demand effects may be more dominant (Lin and Hsu, 2004). The influence of growth substance on growth attributes of Nerium in both seasons validates the report of Vahid *et al*., (2004) who observed changes in plant growth in different seasons due to GA_3, Alar, Kinetin, NAA, and CCC application.

Table 1: Standardization of pruning season and growth regulators for growth parameters in *N.oleander* L. (Pink single)

Treatments	Plant height (cm)	Number of primary branches	Number of leaves	Leaf area (cm^2)	Leaf area index (cm)	Inter nodal length (cm)	Fresh weight (g plant^{-1})	Dry matter production (g plant^{-1})
T_1	173.5	42.2	1233.2	32.74	1.93	8.96	2975.5	434.1
T_2	165.6	37.1	1120.8	28.28	1.59	7.78	2806.2	407.6
T_3	163.9	35.8	1068.3	28.62	1.39	6.82	2755.4	399.0
T_4	159.3	36.5	1104.0	27.46	1.48	7.20	2788.9	403.8
T_5	156.6	26.4	906.8	25.38	1.18	6.34	2178.0	324.0
T_6	167.2	28.4	829.2	30.12	1.09	8.23	1957.7	277.2
T_7	170.3	39.6	1208.9	32.40	1.87	8.59	2853.3	416.4
T_8	162.2	33.3	976.8	27.71	1.37	6.81	2417.6	361.2
T_9	160.5	34.2	1023.0	27.52	1.38	6.57	2738.8	394.9
T_{10}	156.0	29.7	872.2	26.36	1.16	7.05	2053.7	304.2
T_{11}	153.8	33.2	941.9	24.27	1.29	6.08	2394.3	343.1
T_{12}	161.2	25.9	781.5	30.41	1.07	7.98	1845.0	266.9
SEd	3.82	0.79	23.63	0.67	0.03	0.17	58.29	8.49
CD (P=0.05)	8.13	1.68	50.28	1.42	0.07	0.37	124.02	18.05

*Mean values of season 1 - January, 2019 and 2020 Pruning and *season 2 - September, 2019 and 2020 Pruning, *T_1-Season 1 + GA_3 @ 150 ppm, T_2 -Season 1 + CCC @ 800 ppm, T_3 -Season 1 + MH @ 750 ppm, T_4 -Season 1 + Ethrel @ 2000 ppm, T_5 -Season 1 + Alar @ 1500 ppm, T_6 -Season 1 + water spray, T_7 -Season 2 + GA_3 @ 150 ppm, T_8 -Season 2 + CCC @ 800 ppm, T_9 -Season 2 + MH @ 750 ppm, T_{10} -Season 2 + Ethrel @ 2000 ppm, T_{11} -Season 2 + Alar @ 1500 ppm, T_{12} -Season 2 + water spray*

The yield attributes were significantly influenced by the season of pruning and growth substance application. The January pruning registered the earliest flowering (94.0 days) with GA_3 @ 150 ppm application (T_1) to stimulate both growth parameters and health-promoting phytochemicals content in the plant (Mirheidari *et al*., 2021 a). The next best treatment based on early flower emergence was January pruning and CCC @ 800 ppm (T_2). Flowering was much delayed in control plots pruned during September. The highest values of yield attributes like the number of flowers per plant (1672.8), flower diameter (4.83 cm), single flower weight (0.49 g), duration of flowering (223.2 days), flower yield per plant (0.82 kg), flower yield per plot (7.19 kg) and flower yield ha^{-1} (7.98 tonnes) were recorded in the treatment of January pruning along with an application of GA_3 @ 150 ppm (T_1). The next best treatment based on these values was September pruning and CCC @ 800 ppm (T_7). The gibberellins are involved in several plant development processes and promote several desirable effects including stem elongation, uniform, and early flowering, increased flower number and size (Al-Khassawneh *et al*., 2006).

Table 2: Standardization of pruning season and growth regulators for yield parameters in *N. oleander* L. (Pink single) (mean values of September 2019 and 2020)

Treatments	Days to first flowering	Number of flowers per plant	Flower diameter (cm)	Single flower weight (g)	Duration of flowering (Days)	Flower yield (kg $plant^{-1}$)
T_1	94.0	1672.8	4.83	0.49	223.2	0.82
T_2	101.6	1579.6	4.52	0.46	218.8	0.73
T_3	104.4	1396.3	4.37	0.45	213.9	0.62
T_4	103.9	1442.2	4.44	0.45	215.0	0.64
T_5	111.7	1392.0	4.34	0.45	213.7	0.62
T_6	108.4	1232.5	4.25	0.40	198.6	0.48
T_7	100.6	1316.1	4.42	0.46	212.2	0.60
T_8	116.5	1276.8	4.29	0.43	205.5	0.54
T_9	119.1	1264.3	4.21	0.42	196.4	0.53
T_{10}	114.9	1272.2	4.06	0.43	209.4	0.54
T_{11}	120.5	1270.0	4.08	0.42	200.1	0.53
T_{12}	116.5	1202.4	4.28	0.40	191.9	0.47
SEd	2.57	31.95	0.102	0.010	4.89	0.014
CD (P=0.05)	5.47	67.99	NS	0.022	10.41	0.040

***Mean values of **season 1 -** January, 2019 and 2020 Pruning and ***season 2 -** September, 2019 and 2020 Pruning*

The use of plant growth regulators helped to improve the plant and support obtaining a good size and number of flowers in the next generation. It determines important physiological changes such as cell division and expansion and induces and promotes flowering (Da Silva Vieira *et al*., 2010 Rameshkumar *et al*., 2013). The best pruning time and effect of different plant growth regulators opined that the longest flowering period was associated with pruning time (Vahid *et al*., 2004 a). Pruning has a definite role in regulating flower production and season-influenced yield parameters. The results are in association with the finding of Hamid and Ahmad (2013) in rose.

From the results it may be inferred that the pruning of plants at 90 cm height during January season with growth regulator of GA_3 @ 150 ppm applied as foliar spray got the earliest blooming, more number of flowers per plant, maximum flower width, weight, and most elevated flower yield of *Nerium oleander* L. Pink single cultivar.

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