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RESEARCH ARTICLE

EFFECT OF PLANT GROWTH REGULATORS ON GROWTH AND YIELD OF PERIWINKLE [*CATHARANTHUS ROSEUS* (L.) G. DON] CV. ROSE PURPLE FLOWERED

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ABSTRACT

The study on the effect of plant growth regulators on growth and yield of Periwinkle [*Catharanthus roseus* (L.) G. Don] cv. Rose purple flowered was carried out in the medicinal unit, Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai nagar, Tamil Nadu. This experiment is carried out in Randomized block design with 10 different treatments replicated thrice. The experiment comprised of control and three growth regulators with their three levels *viz.*, Gibberllic acid @100, 200 and 300 ppm, Naphthalene acetic acid @50, 100 and 150 ppm, Cycocel @ 250, 500 and 750 ppm were applied as foliar application. Observations of biometric characters like plant height, number of branches plant^{-1}, number of leaves plant^{-1}, leaf area, total chlorophyll content, dry matter production (kg ha^{-1}), number of flowers plant^{-1}, dry leaf yield plant^{-1} (g), total dry leaf yield plant^{-1} (g), dry leaf yield plot^{-1} (g) and dry leaf yield ha^{-1} (kg) on final harvest were observed. The treatments significantly influenced the growth and yield of periwinkle and the results revealed that application of GA_3 @ 300 ppm in the treatment (T_3) recorded the maximum performance on growth and yield characters. Hence this treatment was found as superior than the rest in and ultimately increasing the dry leaf yield (2784.16 kg ha^{-1}) when compare to control.

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INTRODUCTION

Periwinkle [*Catharanthus roseus* (L.) G. Don] synonym (*Vinca rosea* L., *Lochnera rosea* Reich.) is a tropical plant native to Madagascar, belonging to the family Apocynaceae. This crop is mostly cultivated for valuable alkaloids present in leaves and roots. More than 80 alkaloids have been isolated and the total alkaloid content of the root varies from 2 to 3 per cent, whereas leaf contains one per cent and a very small amount was found in flowers (Barbara Lata, 2007). The leaf alkaloids particularly vincristine and vinblastin possess anticancerous activities whereas the root alkaloids such as ajmalicine, serpentine and reserpine possess hypotensive, sedative and tranquilizing properties. It bears glossy leaves, pink or white flowers and is usually cultivated in Tamil Nadu, West Bengal and Karnataka. About 4500 tonnes of roots, stems and leaves are exported annually (Rajamani, 2004). The need for improving the production of periwinkle crop has increased because of its valuable alkaloids. Plant growth regulators are the organic chemical compounds which modify or regulate physiological process in an appreciable measure in plants when used in small concentrations. They are readily absorbed and move rapidly through tissues when applied to different parts of the plant. The various research workers have reported that the application of foliar spray of growth regulators like GA_3 , NAA and CCC helps to produce the good quality of medicinal crops. Plant growth regulators have been widely used in many medicinal crops *viz.*, Gibberellic acid, NAA and Cycocel have been reported to be remarkably successful in production and gaining momentum (Al-khassa Wreh *et al*.,2006).

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Considering the above facts, it is an imperative need to ascertain and standardize the package of practices to improve the productivity of this crop by using growth regulators.

MATERIALS AND METHODS

The present study on the effect of Plant growth regulators on growth and yield of Periwinkle [*Catharanthus roseus* (L.) G. Don] was conducted in the medicinal Unit of Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Cuddalore District of Tamilnadu, India. As per the treatment details shown in the table 1, the experiment was laid out in Randomized Block Design with 10 treatments and replicated three times. Twenty five days old uniform healthy seedlings were transplanted in to the experimental field. The seedlings were planted in a uniform spacing of 30 cm x 30 cm in the plots. The inorganic nutrients (90:90:75 kg of NPK ha^{-1}) recommended fertilizer dose were applied during the last ploughing. Foliar application of required quantity of Gibberllic acid @ 100, 200 and 300 ppm, NAA @50, 100 and 150 ppm, CCC @ 250, 500 and 750 ppm we prepared in different concentrations and given in two sprays starting from 30 and 90 days after transplanting. The observations are recorded on the selected five plants for each treatment in each replication and the mean data is statistically analyzed (Panse and Sukhatme 1985).

RESULTS AND DISCUSSION

Growth is one of the essential parameter determines the yield attributes of any crop.

Table 1. Effect of Plant growth regulators on growth parameters of Periwinkle [*Catharanthus roseus* (L.) G. Don] cv. Rose purple flowered

Treatment no.	Plant height (cm)	Number of branches plant^{-1}	Number of leaves plant^{-1}	Leaf area (cm^2)	Chlorophyll content (mg g^{-1})	Dry matter production (g plant^{-1})
T_1-GA_3@100 ppm	51.51	13.27	371.27	18.75	0.337	43.45
T_2- GA_3@200ppm	50.42	12.67	358.58	18.57	0.318	42.81
T_3 -GA_3@300ppm	53.12	14.66	388.19	18.96	0.350	44.32
T_4-NAA @50 ppm	45.62	10.46	299.06	17.68	0.294	39.82
T_5-NAA@100ppm	49.29	12.51	345.89	18.36	0.310	42.15
T_6-NAA@150ppm	48.21	11.91	340.76	18.18	0.321	41.92
T_7-CCC @250ppm	47.10	11.37	315.40	17.99	0.302	41.25
T_8-CCC @500ppm	46.01	10.69	302.71	17.75	0.310	40.60
T_9-CCC @750ppm	52.65	13.88	383.96	18.92	0.346	44.11
T_{10}- control	39.51	7.65	198.37	12.50	0.199	32.18
S.ED	0.53	0.29	6.30	0.11	0.006	0.34
CD(P=0.05)	1.08	0.58	12.67	0.23	0.013	0.70

Table 2. Effect of Plant growth regulators on dry leaf yield parameters of Periwinkle [*Catharanthus roseus* (L.) G. Don] cv. Rose purple flowered

Treatment no.	Number of flowers plant^{-1}	Dry leaf yield (g plant^{-1})	Total dry leaf yield (g plant^{-1})	Dry leaf yield (g plot^{-1})	Dry leaf yield (kg ha^{-1})
T_1- GA_3@100ppm	42.74	17.84	41.81	926.57	1542.40
T_2- GA_3@200ppm	50.31	18.11	43.73	1453.85	2423.09
T_3 - GA_3@300ppm	59.44	18.82	45.06	1670.49	2784.16
T_4- NAA @50 ppm	42.54	17.53	42.40	911.62	2025.02
T_5- NAA@100ppm	47.78	18.33	43.12	1324.53	2207.55
T_6- NAA@150ppm	54.31	18.54	44.31	1493.18	2488.64
T_7-CCC @250ppm	40.23	17.15	41.32	1156.00	1925.89
T_8-CCC @500ppm	45.27	18.06	42.99	1245.87	2076.45
T_9-CCC @750ppm	37.62	18.76	44.90	1659.83	2766.39
T_{10}- control	56.88	16.18	27.37	678.75	1507.73
S.ED	1.24	0.19	1.06	13.27	60.92
CD(P=0.05)	2.49	0.39	2.12	26.54	121.87

In general the growth parameters were significantly varied due to *Per se* and interaction effects of growth promoting treatments. The maximum growth obtained at the T_3 with application of GA_3 @ 300 ppm followed by treatment T_9 (CCC @ 750 ppm). It was minimum in T_{10} control . The results of the present investigation on the growth parameters (Table 1) *viz.,* plant height (53.12 cm), number of branches (14.66) , number of leaves (388.19), leaf area (18.96 cm^2), chlorophyll content (0.350 mg g^{-1})and dry matter production (44.32). The results evinced that the growth were influenced by spraying with Gibberllic acid. GA_3 plays an important role in the growth and development of plants. Gibberllins are a rather diverse group of plant substances that enhance any physiological or biochemical process in plants. The use of GA_3 for boosting the growth and vigor of various horticultural plants is very old and well documents .The present results could also be due to enhanced photosynthesis augmented by increase in growth parameters due to growth regulator application particularly GA_3 as reported by Prashanth *et al.,*(2006) in Floribunda roses and Saraswathy (2003) in Ashwangandha. It is clear with foliar application of Gibberillic acid @ 100 ppm recorded maximum number of flowers per plant and dry leaf yield per plant (59.44 and 18.82 g plant^{-1}) as compared to control.

It might have also caused stimulated effect on elongation of cells due to increasing amount of CO_2 and C:N ratio in GA_3 treated plants. NAA and CCC application delayed the growth and yield than GA treatments. It might be due to retardation of vegetative growth and consequently minimizing in the yield than the GA treatments Rakesh *et al*.,(2003). The increase in number of leaves might be due to production of large number of lateral at early stage. Performance of the crop with respect to yield parameters is much important for crop like periwinkle as they are economically valued for their medicinal properties. A perusal of the data indicated with foliar application of Gibberillic acid @ 300 ppm remarkably taken maximum yield of Periwinkle were observed with different treatments. Significantly minimum yield were registered in the plants with out spraying with plant growth regulators (T_{10}).Among all treatments ,T_3 foliar application of Gibberlic acid @300 ppm recorded the highest dry leaf yield of (2784.16 kg ha^{-1}) followed by the treatment T_9 with the foliar application of cycocel @ 750 ppm which received (2766.39 kg ha^{-1}) respectively. The data in respect of leaf yield per plot yield ha^{-1} clearly indicates that all the treatments of growth regulators increased the yield of leaf as compared to control.

Similar results have been reported by Baskaran and Misra (2007) in Gladiolus and Shakila Arumugam *et al*.,(2007) in Basil. Based on the above facts and results of the present studies on the effect of foliar application of plant growth regulators on Periwinkle, it is revealed that foliar application of Gibberillic acid @ 300 ppm was found to be superior than other treatments in increasing the growth and yield.

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