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RESEARCH ARTICLE

EFFECT OF INTEGRATED WEED MANAGEMENT ON GROWTH, FLOWERING AND LEAF YIELD OF PERIWINKLE [*CATHARANTHUS ROSEUS* (L.) G. DON] IN THE COASTAL ECOSYSTEM OF CAUVERY DELTA REGION

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ABSTRACT

An investigation was carried out to find the effect of integrated weed management on growth, flowering and leaf yield in Periwinkle at medicinal plants unit, Department of Horticulture, Faculty of agriculture, Annamalai university, Annamalainagar. This study was conducted in randomized block design with three replication of 12 treatments with and without the combination of three herbicides *viz*., Alachlor 1.5 kg ha^{-1}, Pendimethalin 1.5 kg ha^{-1} and Fluchlorin 1.5 kg ha^{-1}, sugarcane trash mulching @ 12 t ha^{-1} and hand weeding on 45, 90 and 120 days after planting. The growth parameters *viz*., plant height (92.18 cm), number of branches $plant^{-1}$ (14.68), number of leaves (565.96) and leaf area (21.82 cm^2). The flower and leaf yield parameters *viz*., number of flowers (59.44), fresh leaf yield per plant (113.70 g), total fresh leaf yield per plant (331.70 g), fresh leaf yield per plot (22111.12 g), fresh leaf yield per hectare (36851.87 kg), total chlorophyll content (0.499 mg g^{-1}), crop dry matter production (66.43 g $plant^{-1}$) were registered to be the highest in the treatment T_{12}. From the experiment, application of Fluchlorin @ 1.5 kg ha^{-1} along with sugarcane trash mulching @ 12 t ha^{-1} and two hand weeding on 45 and 90 DAT could adjudged as the best treatment in improving the growth and leaf yield of periwinkle.

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INTRODUCTION

Medicinal plants have been used virtually by mankind as a source of medicine since time immemorial. Recently, traditional medicines are gaining appreciation in all segments of society. India has one of the world's most sophisticated indigenous medicinal cultures with an unbroken tradition coming down across more than four millennia. It is one among the twelve mega diversity centers with a unique biotic wealth, of which 15,000 to 20,000 species are medicinal plants. Indian Systems of Medicine (ISM) use around 2500 plants species belonging to more than 1000 genera. About 800 species are used by industry of which approximately 25 per cent are cultivated. Of the above mentioned commercially grown medicinal crops, Periwinkle [*Catharanthus roseus* (L.) G. Don] is a tropical medicinal and ornamental plant native to Madagascar, which belongs to the family Apocynaceae. Nowadays this crop is familiar for the content of valuable alkaloids present in leaves and roots. There are more than 100 alkaloids have been identified. The total alkaloid content of the root varies from 2 to 3 per cent, whereas leaf contains one per cent and a very small quantity was found in flowers (Barbara Lata, 2007).

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The leaf contains alkaloids *viz.,* vincristine and vinblastin possess anticancerous activities whereas the root alkaloids such as ajmalicine, serpentine and reserpine possess hypotensive, sedative and tranquilizing properties. Having gained handful information of the aforesaid medicinal crop, many progressive farmers have started diversifying their agriculture by undertaking the cultivation of Periwinkle on a large scale in India. The need for improving the production of periwinkle crop has increased because of its valuable amount of alkaloids. In the view to the above facts, it is necessary to standardize the package of practices to improve the productivity of this crop, which include integrated weed management. These practices will certainly improve the yield of this crop whereby the farmers can accept the cultivation of periwinkle which will gain greater income than other medicinal crops. Hilterthro, weed control techniques in the field before and after planting through appropriate approaches have proclaimed to be an integrated method of improving soil fertility, crop growth and yield.

MATERIALS AND METHODS

Field experiments were conducted at medicinal plants unit, Department of horticulture, Faculty of agriculture, Annamalai university, Annamalai Nagar, Cuddalore district, Tamil Nadu.

Table 1. Treatment details

	Treatment details
T_1	Unweeded check
T_2	Hand weeding thrice on 45, 90 and 120 DAT
T_3	Sugarcane trash mulching @ 12 t ha^{-1}
T_4	Alachlor @ 1.5 kg ha^{-1}
T_5	Pendimethalin @ 1.5 kg ha^{-1}
T_6	Fluchloralin @ 1.5 kg ha^{-1}
T_7	Alachlor @ 1.5 kg ha^{-1} + two hand weeding each on 45 and 90 DAT
T_8	Pendimethalin @ 1.5 kg ha^{-1} + two hand weeding each on 45 and 90 DAT
T_9	Fluchloralin @ 1.5 kg ha^{-1} + two hand weeding each on 45 and 90 DAT
T_{10}	Alachlor @ 1.5 kg ha^{-1} + sugarcane trash mulching @ 12 t ha^{-1} + two hand weeding each on 45 and 90 DAT
T_{11}	Pendimethalin @ 1.5 kg ha^{-1} + sugarcane trash mulching @ 12 t ha^{-1} + two hand weeding each on 45 and 90 DAT
T_{12}	Fluchloralin @ 1.5 kg ha^{-1} + sugarcane trash mulching @ 12 t ha^{-1} + two hand weeding each on 45 and 90 DAT

Table 2: Effect of integrated weed management 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})	Photosynthetic rate (µ mol CO_2 m^{-2} s^{-1})
T_1	62.75	10.64	313.28	17.87	0.402	13.04
T_2	88.52	13.93	537.18	21.30	0.467	16.36
T_3	75.37	11.13	528.18	19.53	0.407	13.47
T_4	77.21	11.50	442.57	19.76	0.411	13.86
T_5	78.60	11.78	456.99	19.99	0.418	14.27
T_6	80.44	12.23	471.38	20.24	0.427	14.64
T_7	82.23	12.59	485.69	20.48	0.435	15.45
T_8	84.04	12.97	500.17	20.70	0.447	15.46
T_9	85.86	13.35	512.56	20.93	0.463	15.85
T_{10}	86.72	13.56	522.79	21.06	0.467	15.97
T_{11}	90.33	14.29	551.54	21.55	0.476	16.76
T_{12}	92.18	14.68	565.96	21.82	0.489	17.21
S.ED	0.89	0.17	7.70	0.10	0.008	0.19
CD(P=0.05)	1.79	0.35	14.35	0.21	0.016	0.39

Table 2. Effect of integrated weed management on leaf yield parameters of Periwinkle [*Catharanthus roseus* (L.) G. Don]

Treatment no.	Number of flowers $plant^{-1}$	Fresh leaf yield (g $plant^{-1}$)	Total Fresh leaf yield (g $plant^{-1}$)	Fresh leaf yield (g $plot^{-1}$)	Fresh leaf yield (kg ha^{-1})
T_1	31.36	92.67	271.85	18121.52	30202.54
T_2	54.37	109.76	320.46	21361.86	35603.10
T_3	35.16	95.06	278.48	18563.47	30939.12
T_4	37.67	97.05	284.15	18941.43	31569.06
T_5	40.23	99.02	289.79	19317.40	32195.66
T_6	42.74	100.97	295.07	19669.36	32782.27
T_7	45.27	102.94	300.97	20062.66	33437.76
T_8	47.78	104.89	306.53	20933.28	34055.48
T_9	50.31	106.84	312.08	20803.25	34672.08
T_{10}	51.87	107.77	314.71	20978.56	34964.28
T_{11}	56.88	111.71	326.01	21731.82	36219.71
T_{12}	59.44	113.70	331.70	22111.12	36851.87
S.ED	1.24	0.99	2.69	188.60	299.16
CD(P=0.05)	2.49	1.99	5.38	376.33	598.36

The experiments were laid out in a randomized block design with 12 treatments with and without the combination of three herbicides *viz.,* Alachlor 1.5 kg ha^{-1} , Pendimethalin 1.5 kg ha^{-1} and Fluchlorin 1.5 kg ha^{-1} , sugarcane trash mulching @ 12 t ha^{-1} and hand weeding on 45, 90 and 120 days after planting and replicated thrice. The treatment schedule was presented in Table 1. The experimental plot was thoroughly ploughed and the clods were crushed, weeds were removed later than bunds and channels were prepared. Thirty six plots are formed with a plot size of 1.30 x 1.90 m were formed. Uniform and healthy seedlings were transplanted at a spacing of 30 cm x 30 cm to the main field. Application of organic manures *viz.,* Vermicompost @ 3.75 t ha^{-1} were applied before planting. Plants were irrigated whenever necessary. Five plants are randomly selected from each plot were tagged for the purpose of recording observations on growth and leaf yield parameters. The data were subjected to statistical analysis as suggested by Panse and Sukhatme, 1978. Data of three replications were tabulated and recorded.

RESULTS AND DISCUSSION

Growth parameters: Growth is one of the essential parameters which determine the yield attributes in any crop. The results of the present investigation revealed that significant differences were recorded on the growth parameters *viz*., plant height, number of branches, number of leaves and leaf area. It can be inferred from the data tabulated in Table 2. Among the different integrated weed management practices, integration of manual, chemical and accomplished by covering the soil by mulches is a process which is highly useful and beneficial in the production system of root alkaloid in periwinkle. Mulching suppresses weed growth and improves crop yield (Hossain *et al*., 2008). Pre-emergence fluchloralin help to save the crop from severe weed competition at an early age (Singh and Tripathi, 1988). All the weed management treatments significantly improved the growth characters over the unweeeded check. The increase in growth parameters due to application of Fluchlorin @ 1.5 kg ha^{-1} along with sugarcane

trash mulching @ 12 t ha^{-1} and two hand weeding on 45 and 90 days after planting. In these treatments, the effective control of weeds reduced the competition for nutrition and moisture which ultimately brought about increased plant growth characters. The growth parameters *viz*., plant height (92.18 cm), number of branches $plant^{-1}$ (14.68), number of leaves (565.96) and leaf area (21.82 cm^2). The increase in growth parameters is due to the effect of herbicide along with mulching. This was in accordance with the findings of Anwar *et al*. (2001) in Palmarosa and Hossain *et al*. (2008) in Turmeric.

Leaf yield parameters: Yield is a complex phenomena which can be controlled both by morphological and physiological parameters and it can also be manipulated by either genetics factors or cultural operations. The major yield components of periwinkle are mainly leaves and application of these Fluchlorin, sugarcane trash mulching and hand weeding significantly influenced the leaf yield components which are directly related in increasing the total alkaloid content which are commercially used. In the present investigation, Table 3 shows the flower and leaf yield parameters *viz*., number of flowers (59.44), fresh leaf yield per plant (113.70 g), total fresh leaf yield per plant (331.70 g), fresh leaf yield per plot (22111.12 g), fresh leaf yield per hectare (36851.87 kg), total chlorophyll content (0.499 mg g^{-1}), crop dry matter production (66.43 g $plant^{-1}$) were registered in the treatment which received the combined application Fluchlorin @ 1.5 kg ha^{-1} along with sugarcane trash mulching @ 12 t ha^{-1} and two hand weeding on 45 and 90 days after transplanting. This may be attributed to fact that under increasing fertility levels by the application of inorganic fertilizers there would be luxuriant growth of the plant, which lead to production of more number of branches, leaves and ultimately resulting in higher root yield ha^{-1}. Integration of cultural, mechanical and other weed control practices offers better management of all types of weeds. The results are similar to the findings of Gill *et al*. (2000) in Turmeric and Kajod Mal *et al.* (2005) in Cauliflower. The integrated weed management system is basically an integration of effective, dependable and workable weed management practices that can be used economically by the producers as a part of sound farm management system. It can be interfered from the data tabulated in Table (2) that there were significant differences among the various treatments with regard to chlorophyll content and Photosynthetic rate. Incorporation of vermicompost promotes the lush growth of plants which may be due to the presence of plant growth promoters like auxins and cytokinins in vermicompost which are responsible for cell division and cell elongation. This was due to the positive role played by nutrients on growth and metabolic of plants, which increased the accumulation of chlorophyll content. Sugarcane trash mulching might have provided a continuous supply of moisture control of weeds which might have enabled the leaf area duration to extend, thus providing an opportunity for the plants to increase the photosynthetic rates, which could have led to the higher accumulation of dry matter and chlorophyll content. Similar findings were also reported by Kiranjit Kaur *et al*. (2008) in Turmeric and Hundal *et al* (2000) in Tomato. Based on the present investigation, it can be concluded that the combined use of Fluchlorin @ 1.5 kg ha^{-1} along with sugarcane trash mulching @ 12 t ha^{-1} and two hand weeding on 45 and 90 DAT can be considered as the best integrated weed management practice for maximum growth and leaf yield of Periwinkle.

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