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EFFECT OF ORGANIC MANURES AND MICRONUTRIENTS ON GROWTH AND FLOWERING ATTRIBUTES OF ROSE *CV.* ANDHRA RED (*ROSA CENTIFOLIA*)

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Abstract

A field experiment was conducted to study the effect of organic manures and micronutrients on growth and yield of Rose *cv.* Andhra Red (*Rosa centifolia*) in Andakudi village, Papanasam Taluk, Tanjore District, Tamilnadu during 2017-2018. The experiment was conducted by using different sources of nutrients *viz.*, farmyard manure, vermicompost and poultry manure were applied in the soil, whereas micronutrients mixture *viz.,* $ZnSO_4$, $FeSO_4$, $MnSO_4$ and B @ 0.5% each were given as foliar application. It was carried out in the randomized block design with three replications comprising 14 treatments. Observation on various vegetative and flowering parameters were assessed. Among all the treatments, it was significantly increased all the vegetative and flowering parameters which recorded the highest value in plant height, number of laterals, number of leaves plant^{-1}, leaf area (cm^2) at 45 and 90 days after pruning, total chlorophyll content (CCI), days taken for first flowering, number of flowers plant^{-1}, single flower weight (g), volume of flower (ml) and flower weight plant^{-1} (kg) with the application of vermicompost @ 2 Kg bush^{-1} along with foliar application of micronutrient mixture ($ZnSO_4$ + $FeSO_4$ + $MnSO_4$ + B each @ 0.5 % foliar spray) followed by poultry manure @ 10 kg bush^{-1} with combination of micronutrient mixture. Hence, it could be concluded that the treatment combination of vermicompost @ 2 Kg bush^{-1} along with micronutrient mixture was found to have pronounced effect on maximizing growth and profuse flowering in rose *cv.* Andhra red in field condition when compare to other treatments.

Key words: vermicompost, rose, micronutrient, Andhra red, poultry manure.

Introduction

Rose is a symbol of affection, elegance, inspiration, spirituality and source of aesthetic gratification for human beings. It belongs to the family Rosaceae and genus Rosa, which contains 200 species and more than 1800 cultivar (Gudin, 2000). The species that have entered into the ancestry of our present day varieties are *R. centifolia, R. damascena, R. gallica, R. chinensis* etc. *R. centifolia* is a loose growing shrub of medium vigour. Rose is top most flowers in global floriculture trade. The rose flowers play an important role in event decoration and add charm to different occasion. Flowers are large fully double with overlapping petals deep pink with a slight purplish hue towards center, highly fragrant and solitary. Species rose are cultivated mainly for loose flower, making garlands, extraction of essential oil, preparation of rose water and gulkand. Among traditional roses, 'Edward and Andhra Red' are very popular varieties all over the country (Manimaran *et al*., 2017). Today, nutrient management is viewed skeptically in relation to the sustainable horticulture and environmental perfection. As we have already entered in 21st century, attention is focused on issues related to sustainable horticulture development and there will be an increasing interest to convert the concept of sustainability into practical reality. More recently, attention is focused on the global environmental problems. India being an agricultural country with diverse agro climatic conditions has a great potential for rose flowers. In traditional horticulture, soil productivity depended mainly on natural fertility of the soil. Among the organic sources *viz.,* farmyard manure, vermicompost and poultry manure application of farmyard manure is a store-house of plant nutrients which improves the physico-chemical properties of the soil, thereby it is very useful for the sustainable crop productivity as well as soil fertility and productivity.

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Today chemical fertilizers are very expensive being mostly used to meet the nutrient requirements of horticultural crops. Hence, the present study has been taken up to ascertain the extent of utility of organic manures and micronutrients on growth and flowering of Rose *cv.* Andhra red was taken up with a view to elicit and elucidate the information on the above side facts with the following objective in order to study the effect of organic nutrients and micronutrient mixture on vegetative growth and flowering of Rose *cv.* Andhra Red.

Materials and Methods

The present study was conducted in a farmer's field at Andakudi village, Papanasam Taluk, Tanjore district during 2017-2018. Rose cv, Andhra Red (*Rosa centifolia*) widely grown in Tanjore District was utilized for the experiment. One and half year old plants were used for this experiment which was planted at a spacing of 2m between rows and 1m between plants. The rose plants were uniformly topped at 30 cm and weak, diseased shoots were also removed during the first week of November, 2017. The plants were manured with organic manures *viz.,* farm yard manure @ 2.5 and 5 kg bush^{-1}, vermicompost @ 1 and 2 kg bush^{-1}and poultry manure @ 5 and 10 kg bush^{-1} were incorporated as per the treatment schedule shown in table 1. The recommended dose of inorganic fertilizer *viz*., nitrogen, phosphorus and potassium were applied in the form of urea, single super phosphate and muriate of potash @ 6:12:12 g of NPK per plant. Foliar application of 0.5% micronutrient mixture was applied at 30, 45 and 60 days after pruning. For foliar application required quantity of micronutrient mixture ($ZnSO_4$, $FeSO_4$, $MnSO_4$ and B) were dissolved in distilled water to make up 0.5 % concentration and this respective formulations were used for the experiment. Regular cultural operations were carried out with irrigation twice in a week depending on soil moisture conditions. Need based plant protection measures were adapted to control pest and diseases. Weeding and earthing up operations was done whenever found necessary. Fully opened

Table 1: Effect of organic manures and micronutrients on growth parameters of Rose *cv.*Andhra Red (*Rosa centifolia*)

Treatments		Plant height (cm)		Number of lateral plant^{-1}		Number of leaves plant^{-1}		Leaf area (cm^2)		Chlorophyll content index (CCI)
		45 DAP	90 DAP	45 DAP	90 DAP	45 DAP	90 DAP	45 DAP	90 DAP	
T_1	FYM @ 2.5 kg bush^{-1}	35.41	54.54	10.36	17.89	65.83	84.67	15.30	20.33	1.09
T_2	FYM @ 5 kg bush^{-1}	40.26	59.69	11.83	20.51	69.81	95.71	16.17	23.80	1.26
T_3	Vermicompost @ 1 Kg bush^{-1}	37.07	56.27	10.86	18.8	67.20	88.38	15.62	21.52	1.14
T_4	Vermicompost @ 2 Kg bush^{-1}	41.82	61.35	12.26	21.37	71.13	99.36	16.45	24.96	1.32
T_5	Poultry manure@ 5 kg bush^{-1}	35.50	54.62	10.42	17.96	65.91	84.73	15.37	20.40	1.11
T_6	Poultry manure @10 kg bush^{-1}	38.68	57.99	11.32	19.66	68.50	92.04	15.88	22.66	1.18
T_7	Micronutrient mixture ($Zn SO_4$+ $Fe SO_4$+ $Mn SO_4$ + B each @ 0.5 % foliar spray)	43.41	63.04	12.72	22.26	72.47	103.05	16.75	26.11	1.39
T_8	FYM @ 2.5 kg bush^{-1} + Micronutrient mixture	46.61	64.70	13.20	23.13	73.78	106.69	17.04	27.25	1.45
T_9	FYM @ 5 kg bush^{-1} + Micronutrient mixture	48.22	68.09	14.15	24.88	76.42	114.05	17.57	29.57	1.58
T_{10}	Vermicompost @ 1 Kg bush^{-1} + Micronutrient mixture	49.82	69.76	14.61	25.74	77.74	117.73	17.85	30.72	1.65
T_{11}	Vermicompost @ 2 Kg bush^{-1} + Micronutrient mixture	51.52	71.54	15.16	26.72	79.15	121.52	18.22	31.96	1.76
T_{12}	Poultry manure @ 5 kg bush^{-1} + Micronutrient mixture	45.02	66.38	13.68	23.99	75.11	110.36	17.30	28.41	1.53
T_{13}	Poultry manure @10 kg bush^{-1} + Micronutrient mixture	49.90	69.84	14.70	25.83	77.82	117.82	17.92	30.80	1.67
T_{14}	Control- RDF (6:12: 12 g of NPK bush^{-1})	31.89	49.18	8.71	14.98	58.24	75.83	13.84	18.47	1.02
	S.ED	0.78	0.82	0.22	0.42	0.65	1.83	0.13	0.56	0.01
	CD(p= 0.05)	1.57	1.65	0.44	0.84	1.29	3.65	0.25	1.12	0.03

Table 2: Effect of organic manures and micronutrients on flowering parameters of Rose *cv.* Andhra Red (*Rosa centifolia*)

Treatments		Days taken for first flowering	Number of flowers plant^{-1}	Single flower weight (g)	Number of petals flower^{-1}	Flower weight plant^{-1} (kg)
T_1	FYM @ 2.5 kg bush^{-1}	69.33	285.02	2.67	59.70	1.300
T_2	FYM @ 5 kg bush^{-1}	64.98	343.76	3.31	66.39	1.823
T_3	Vermicompost @ 1 Kg bush^{-1}	67.81	304.68	2.91	61.99	1.475
T_4	Vermicompost @ 2 Kg bush^{-1}	63.55	363.35	3.54	68.57	1.998
T_5	Poultry manure@ 5 kg bush^{-1}	69.21	285.17	2.73	59.82	1.300
T_6	Poultry manure @ 10 kg bush^{-1}	66.40	324.20	3.10	64.17	1.649
T_7	Micronutrient mixture ($ZnSO_4$+ $FeSO_4$+ $MnSO_4$ + B each @ 0.5 % foliar spray)	62.13	382.98	3.78	70.78	2.172
T_8	FYM @ 2.5 kg bush^{-1} + Micronutrient mixture	60.69	402.55	3.99	71.96	2.346
T_9	FYM @ 5 kg bush^{-1} + Micronutrient mixture	57.83	441.60	5.40	76.36	2.695
T_{10}	Vermicompost @ 1 Kg bush^{-1} + Micronutrient mixture	56.38	461.12	5.61	78.56	2.870
T_{11}	Vermicompost @ 2 Kg bush^{-1} + Micronutrient mixture	54.84	481.23	5.98	80.98	3.044
T_{12}	Poultry manure @ 5 kg bush^{-1} + Micronutrient mixture	59.25	422.08	4.18	74.15	2.521
T_{13}	Poultry manure @ 10 kg bush^{-1} + Micronutrient mixture	56.29	461.69	5.70	78.75	2.870
T_{14}	Control- RDF (6:12: 12 g of NPK bush^{-1})	74.82	259.63	2.48	48.87	0.952
	S.ED	0.70	9.73	0.09	1.08	0.03
	CD (p= 0.05)	1.40	19.47	0.18	2.17	0.06

flowers were harvested during early morning hours. The observations are recorded on the randomly selected five plants from each treatment in each replication and the mean data is statistically analyzed. The data were subjected to statistical analysis as suggested by Panse and Sukhatme (1984).

Results and Discussion

Plant nutrition is of unique importance and is known to play a decisive role in growth and all round development of the crop.. The world elite society is giving emphasis on utilization of organic wastes for cultivation of flower crop and making most effective measure to save the environment to some extent. The Rose *cv.* Andhra Red is widely cultivated for the loose flower purpose. Production of rose mainly depends on the nutrients status of the soil as this crop is a perennial crop it is maintained in the field for more than one year. Organic inputs are the cheap source of nutrients, which are available in enormous quantity as biological waste. The supply of micronutrients along with organic nutrients combined with appropriate crop management practices is important for obtaining higher yield and quality of flowers.

Growth Parameters

Growth is one of the essential parameter which determines the yield attributes of any crop. The results of the present investigation revealed that there were significant differences on the growth parameters *viz.,* plant height, number of lateral shoots plant^{-1}, number of leaves and leaf area in rose. Among the growth attributes observed, the plant height was found to be markedly influenced by various treatments that tested. It was recorded the highest due to the application of vermicompost @ 2 Kg bush^{-1} along with micronutrient mixture ($ZnSO_4$+ $FeSO_4$+ $MnSO_4$ + B each @ 0.5 % foliar spray) which recorded in the treatment (T_{11}) with the maximum height of 51.52 cm and 71.54 cm at 45 and 90 DAP. The least value was recorded in T_{14} control. This may be due to the accelerated mobility of the photosynthates from the source to the sink due to the readily available nitrogen from the organic nutrients and

micronutrients. Another reason might be due to the better nutritional status of the plants which was favored by the treatments. The highest plant height was due to vermicompost and micro nutrients *viz*., $ZnSO_4$, $FeSO_4$, $MnSO_4$ and B which might have enhanced the microflora and enzymatic activity which might have augmented the plant growth and development. This study are in close agreement with the findings of Weena Nilawonk and Arnat Tancho (2015) in Jasmine, Yathindra *et al.,* (2016) in Bird of paradise. The treatment (T_{11}), application of vermicompost @ 2 Kg $bush^{-1}$ along with micronutrients mixture *viz*., $ZnSO_4$+ $FeSO_4$+ $MnSO_4$ + B (each @ 0.5 % foliar spray) recorded the highest number of laterals (15.16 and 26.72) at 45 and 90 DAP. Whereas the least number of laterals (8.71 and 14.98) at 45 and 90 DAP was recorded in the treatment T_{14} (control). The highest number of leaves per plant (79.15 and 121.52 at 45 and 90 DAP respectively) and the least values were recorded in the treatment (T_{14}). Similar results of increased number of laterals and number of leaves were due to the application of vermicompost @ 2 Kg $bush^{-1}$ + micronutrient mixture ($ZnSO_4$+ $FeSO_4$+ $MnSO_4$ + B each @ 0.5 % foliar spray). The results are similar to the findings of Manimaran *et al*., (2018) in Gundumalli and Sendhilnathan *et al.,* (2019) in celosia. The maximum leaf area (18.22 and 31.96 cm^2 at 45 and 90 DAP) in the best treatments (T_{11}) could be due to combined application of organic and micronutrients and the least leaf area (13.84 and 18.47 cm^2) was recorded in the treatment T_{14} control. The reason for increased leaf area is due the application of appropriate quantity of organic manure by which vermicompost owing to its surplus nutritive content enhanced beneficial soil microflora and increase the plant growth. Hence, it can be used as a best source of organic nutrients for production of flower crops. Application of micronutrients also have a significant role in increasing leaf area. This trend was in concurrence with the findings of Suresh and Sendhilnathan, (2017) in Thuduvalai and Karuppaiah (2019).

The increased chlorophyll content index (1.76 CCI) was recorded due to the application of vermicompost @ 2 Kg $bush^{-1}$ + micronutrient mixture ($ZnSO_4$+ $FeSO_4$+ $MnSO_4$ + B each @ 0.5 % foliar spray) and chlorophyll content index (1.02 CCI) was recorded in the treatment T_{14} control. Application of vermicompost increased the microbial biomass, humic materials and other plant growth influencing substances such as plant growth hormones, produced by microorganism during vermicomposting and dehyonagnose activity in soil. Similar results on increased chlorophyll content index due to the application of vermicompost were also reported by Sendhilnathan *et al.,* (2017) in Gundumalli.

Flowering Parameters

Minimum number of days taken for first flowering was observed in T_{11} with the application of Vermicompost @ 2 Kg $bush^{-1}$ along with micronutrients mixture ($ZnSO_4$ + $FeSO_4$ + $MnSO_4$ + B each @ 0.5 % foliar spray). The application of organic nutrients and micronutrients significantly influenced the days taken for commencement of flowering (Fig.3) which registered the early commencement of flowering (54.84 days), whereas the days taken for commencement of flowering was delayed (74.82 days) and least value (T_{14}) was recorded in the control. Increasing trend in early flowering might be due to the better utilization of vermicompost along with micronutrients. This may be due to the accelerated mobility of the photosynthetic from the source to the sink due to the readily available form of nutrients in vermicompost and micronutrients. Another reason might be due to the better nutritional status of the plants which was favored by the treatments. The reasons for early commencement of flowering in the best treatment was due to quick availability of nutrients in organic manures and foliar application of micronutrients vigorously activated the vegetative development of plants and quick uptake of nutrients by the plants have better performance. Similar findings were also reported by Sharma *et al*., (2010) in carnation and Patel *et al.,* (2011) in marigold.

The use of foliar application of micronutrient spray led to the increase in number of flowers $plant^{-1}$ (481.23), single flower weight (5.98 g), number of petals $flower^{-1}$ (80.98) and flowers weight $plant^{-1}$ (3.044 g) with the application of vermicompost @ 2 Kg $bush^{-1}$ along with foliar application of micronutrient mixture ($ZnSO_4$ + $FeSO_4$ + $MnSO_4$ + B each @ 0.5 % foliar spray) followed by poultry manure @ 10 kg $bush^{-1}$ with combination of micronutrient mixture. The analyzed results indicated that the responses of the foliar application of micronutrient mixture encourages the growth and development of rose could be related with a constitutive increased net photosynthetic rate due to the high content of chlorophyll and the improved chloroplast ultra-structure. Finally, the increase in the flowering parameters in the best treatments could be due to the direct supplied nutrients through vermicompost along with foliar application of micronutrients application. Improvement in growth and flower characters due to efficient role of vermicompost with micronutrient application might basically be due to enhanced photosynthetic and other metabolic activities related to cell division and elongation. The findings are in accordance with Ehsan Mohammadpour *et al.,* (2012) in Marigold and Priyanka *et al*., (2018) in Crossandra.

Conclusion

Based on the present investigation, it can be concluded that application of vermicompost @ 2 Kg bush[1] along with foliar spray of micronutrient mixture ($ZnSO_4$+ $FeSO_4$+ $MnSO_4$ + B each @ 0.5 % foliar spray) could be considered as the best treatment for the improved performance in growth and flowering attributes of Rose *cv.* Andhra Red (*Rosa centifolia*) under open field condition.

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