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Influence of Fertigation and Biological Inputs on Yield Attributes of Edward Rose

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A B S T R A C T

An experiment was conducted to evaluate the effect of fertigation and consortium of biological inputs on yield attributes and flower yield of Edward Rose in Coimbatore from 2015 to 2020. The treatment combination consisted of three levels of the recommended dose of fertilizer through fertigation (RDFTF) gradients (125,100 and 75 per cent NPK), (RDF @ 178: 178: 356 kg NPK ha^{-1}), recommended dose of microbial consortium which contains Azospirillum and Phosphobacteria (MC) @ 12.5 kg ha^{-1}, foliar spray of Panchagavya (3 and 4%) and humic acid (0.4 and 0.5%) were laid out in randomized block design and replicated twice. The results revealed that the yield attributes viz., number of flowers $plant^{-1}$ (2.10), single flower weight (2.42 g), 100 flower weight (242.47 g), number of flowers $plot^{-1}$ day^{-1} (12.61), weight of flower $plot^{-1}$ day^{-1} (30.58 g), number of flowers $plot^{-1}$ $year^{-1}$ (4603.56), yield of flowers $plot^{-1}$ $year^{-1}$ (11.16 kg), number of flowers ha^{-1} $year^{-1}$ (3836303), yield of flowers ha^{-1} $year^{-1}$ (9302 kg), were highest in the treatment with 100 per cent of RDFTF + MC @ 12.5 kg ha^{-1} + 4 per cent Panchagavya + 0.5 per cent humic acid (T_{12}) when compared to the Control (T_{19}). The results were found to be on par with the treatment which received 100 per cent of RDFTF + MC @ 12.5 kg ha^{-1} + 3 per cent Panchagavya + 0.5 per cent humic acid (T_{10}).

***Key words*:** Edward rose, Fertigation, Microbial consortium, Panchagavya, Humic acid, Yield attributes

Rose, the "Queen of flowers" is an important flower crop, grown commercially in several parts of the country. The commercial cultivation of Edward rose (*Rosa bourboniana* Desp.) is however restricted to only few states, namely Uttar Pradesh and Tamil Nadu. Edward rose is mainly cultivated for the fresh flower production in Tamil Nadu and for perfumery in the state of Uttar Pradesh. Now a days, there is a custom of offering and exchange of flowers on all social occasions, in places of worship and their use for adornment of hair by women and for home decoration [1]. During the past 2-3 decades, floriculture has assumed a commercial status and the production and marketing of various flowers and various floriculture products as a commercial activity has become the major source of gainful and quality employment to many people [2]. Hence, the present research work has been undertaken to study the effect of fertigation, microbial consortium, Panchagavya and humic acid on growth and yield of Edward Rose.

MATERIALS AND METHODS

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Field experiment was conducted at Appanaickenpalayam village, Periyanaickenpalayam block of Coimbatore district during 2015-2020. The initial soil characters of the experimental field were analyzed. The experimental field has sandy clay loam soil texture with medium soil carbonate content with a soil pH of 8.07 and the soil Electrical Conductivity of 0.25 mmhos. The bio-inoculants used for the study are Azospirillum and Phosphobacteria (as Microbial Consortium), Panchagavya and Humic Acid. The research trial consisted of 19 treatments as given in the treatment details were carried out in randomized block design with two replications. Four years old plants which are having similar growth nature and pruned during October were selected for the study purpose. The experimental plot was divided into 19 plots of 12 sq. m (6 m × 2 m) each for two replications. There are six plants in each plot. Drip system was laid out with suitable materials to carryout various treatments as per the experimental design various yield parameters were observed.

Four-year old rose bushes of uniform size were selected and they were hard pruned during the month of October 2015. The cut ends were smeared with copper oxy – chloride after pruning as a prophylactic measure against fungi. Microbial consortium was applied as soil application by mixing the consortia with well decomposed FYM. The recommended dose of fertilizer, 178:178:356 kg of NPK ha^{-1} was given through the drip system. Periodical fertigation, weeding, plant protection and harvesting of flowers were carried out systematically.

Biometrical observations on yield and yield attributes viz., No. of flowers plant^{-1}, single flower weight, weight of flower plot^{-1} day^{-1} (g), hundred flowers weight(g), number of flowers plot^{-1} year^{-1}, weight of flowers plot^{-1} year^{-1} (g), flower yield (numbers) and flower yield (tonnes) were measured in each treatment and replication wise and averaged. The data thus obtained were subjected to statistical analysis as suggested by Panse and Sukhatme [3]. The critical differences were worked out at five per cent ($p < 0.05$) probability level.

Treatment details

Treatment No.	Treatment details
Treatment - 1	125% Recommended dose of fertilizers through fertigation (RDFTF)
Treatment - 2	125% RDFTF + Microbial consortium (MC) @ 12.5 kg ha^{-1}
Treatment - 3	125% RDFTF + MC @ 12.5 kg ha^{-1} + 3% Panchagavya + 0.4% Humic Acid
Treatment - 4	125% RDFTF + MC @ 12.5 kg ha^{-1} + 3% Panchagavya + 0.5% Humic Acid
Treatment - 5	125% RDFTF + MC @ 12.5 kg ha^{-1} + 4% Panchagavya + 0.4% Humic Acid
Treatment - 6	125% RDFTF + MC @ 12.5 kg ha^{-1} + 4% Panchagavya + 0.5% Humic Acid
Treatment - 7	100% RDFTF
Treatment - 8	100% RDFTF + MC @ 12.5 kg ha^{-1}
Treatment - 9	100% RDFTF + MC @ 12.5 kg ha^{-1} + 3% Panchagavya + 0.4% Humic Acid
Treatment - 10	100% RDFTF + MC @ 12.5 kg ha^{-1} + 3% Panchagavya + 0.5% Humic Acid
Treatment - 11	100% RDFTF + MC @ 12.5 kg ha^{-1} + 4% Panchagavya + 0.4% Humic Acid
Treatment - 12	100% RDFTF + MC @ 12.5 kg ha^{-1} + 4% Panchagavya + 0.5% Humic Acid
Treatment - 13	75% RDFTF
Treatment - 14	75% RDFTF + MC @ 12.5 kg ha^{-1}
Treatment - 15	75% RDFTF + MC @ 12.5 kg ha^{-1} + 3% Panchagavya + 0.4% Humic Acid
Treatment - 16	75% RDFTF + MC @ 12.5 kg ha^{-1} + 3% Panchagavya + 0.5% Humic Acid
Treatment - 17	75% RDFTF + MC @ 12.5 kg ha^{-1} + 4% Panchagavya + 0.4% Humic Acid
Treatment - 18	75% RDFTF + MC @ 12.5 kg ha^{-1} + 4% Panchagavya + 0.5% Humic Acid
Treatment - 19	100% RDF as Soil application – Control

RDF: NPK 178:178:356 kg ha^{-1}

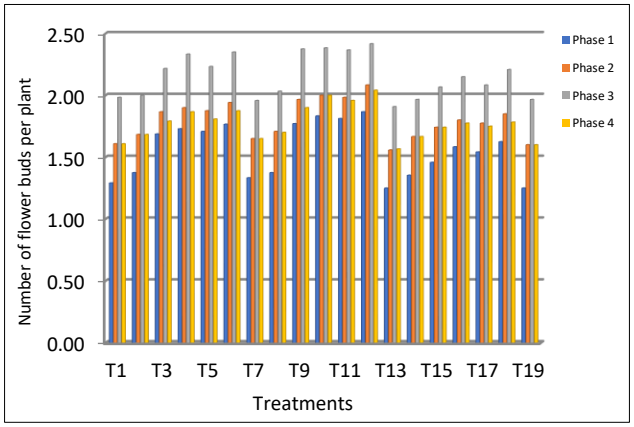

Chart 1 Influence of fertigation and consortium of biological inputs on number of flower buds per plant

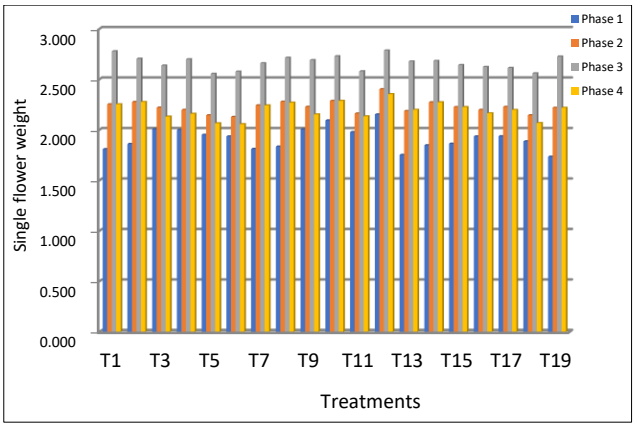

Chart 2 Influence of fertigation and consortium of biological inputs on single flower weight

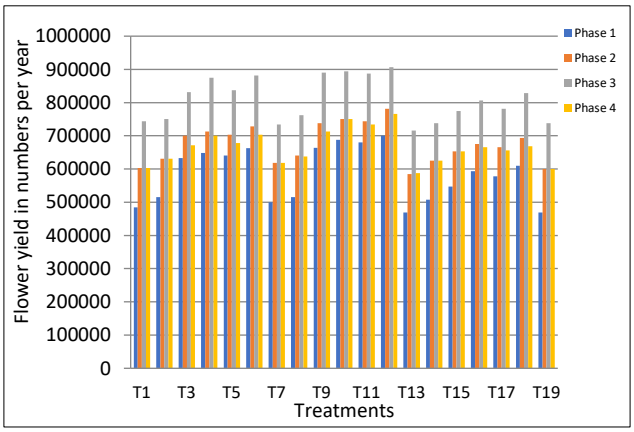

Chart 3 Influence of fertigation and consortium of biological inputs on flower yield in numbers per year

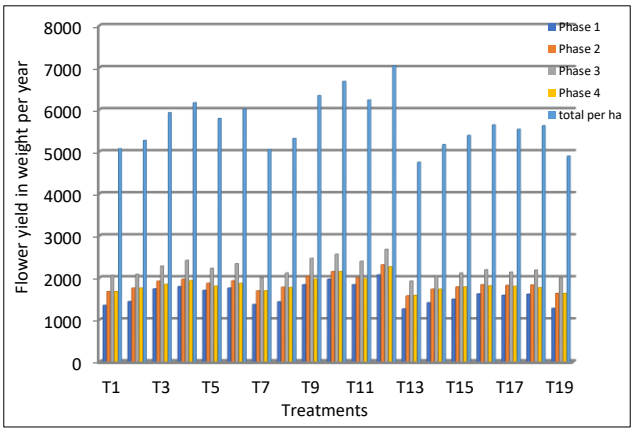

Chart 4 Influence of fertigation and consortium of biological inputs on flower yield in weight per year

RESULTS AND DISCUSSION

The results (Table 1) revealed that the yield attributes viz., number of flowers plant^{-1} (2.10) (Chart 1), single flower weight (2.42 g) (chart 2), 100 flower weight (242.47 g), number of flowers plot^{-1} day^{-1}(12.61), weight of flower plot^{-1} day^{-1} (30.58 g), number of flowers plot^{-1} year^{-1} (4603.56), yield of flowers plot^{-1} year^{-1} (11.16 kg), number of flowers ha^{-1} year^{-1}

(3836303) (Chart 3), yield of flowers ha^{-1} year^{-1} (9302 kg) (Chart 4), were highest in the treatment with 100 per cent of RDFTF + MC @ 12.5 kg ha^{-1} + 4 per cent Panchagavya + 0.5 per cent Humic acid (T_{12}) when compared to the control (T_{19}), which recorded the least values of number of flowers plant^{-1} (1.60), single flower weight (2.23 g), 100 flower weight (222.55 g), number of flowers plot^{-1} day^{-1} (9.63), weight of flower plot^{-1} day^{-1} (21.42 g), number of flowers plot^{-1} year^{-1} (3513.13), yield of flowers plot^{-1} year^{-1} (7.82 kg), number of flowers ha^{-1} year^{-1} (2927604), yield of flowers ha^{-1} year^{-1} (6515 kg) (Plate 1). The results were found to be on par (Table 2) with the treatment which received 100 per cent of RDFTF + MC @ 12.5 kg ha^{-1} + 3 per cent Panchagavya + 0.5 per cent Humic acid (T_{10}). Apart the control plot, the treatment T_{13} which received 75 per cent of RDF recorded the least parameters which may be due to the availability of insufficient quantity of fertilizers for the flower yield attributes.

Table 1 Influence of fertigation and consortium of biological inputs on plant yield and plot yield attributes

Treatments	Plant yield and Plot yield attributes				
	No. of flower plant^{-1}	Single flower (gm)	100 flower weight (gm)	No. of flower plot^{-1} day^{-1}	Flower weight plot^{-1} day^{-1} (gm)
T_1	1.62	2.27	227.43	9.74	22.15
T_2	1.69	2.28	228.02	10.11	23.06
T_3	1.89	2.25	225.00	11.34	25.52
T_4	1.96	2.26	226.50	11.74	26.60
T_5	1.91	2.18	218.01	11.44	24.93
T_6	1.98	2.18	217.51	11.90	25.88
T_7	1.65	2.24	223.99	9.89	22.15
T_8	1.70	2.27	227.49	10.23	23.26
T_9	2.00	2.27	227.00	12.02	27.28
T_{10}	2.05	2.35	235.01	12.33	28.97
T_{11}	2.03	2.21	221.41	12.18	26.97
T_{12}	2.10	2.42	242.47	12.61	30.58
T_{13}	1.57	2.20	220.48	9.43	20.78
T_{14}	1.66	2.27	227.01	9.98	22.66
T_{15}	1.75	2.24	223.99	10.51	23.55
T_{16}	1.83	2.23	223.09	10.96	24.46
T_{17}	1.79	2.24	224.46	10.73	24.07
T_{18}	1.87	2.17	216.54	11.20	24.25
T_{19}	1.60	2.23	222.55	9.63	21.42
Mean	1.82	2.25	225.16	10.77	24.66
SE(m)	0.04	0.07	7.17	0.24	0.81
SE(d)	0.06	0.10	10.15	0.34	1.15
C.D.	0.12	NS	NS	0.71	2.43

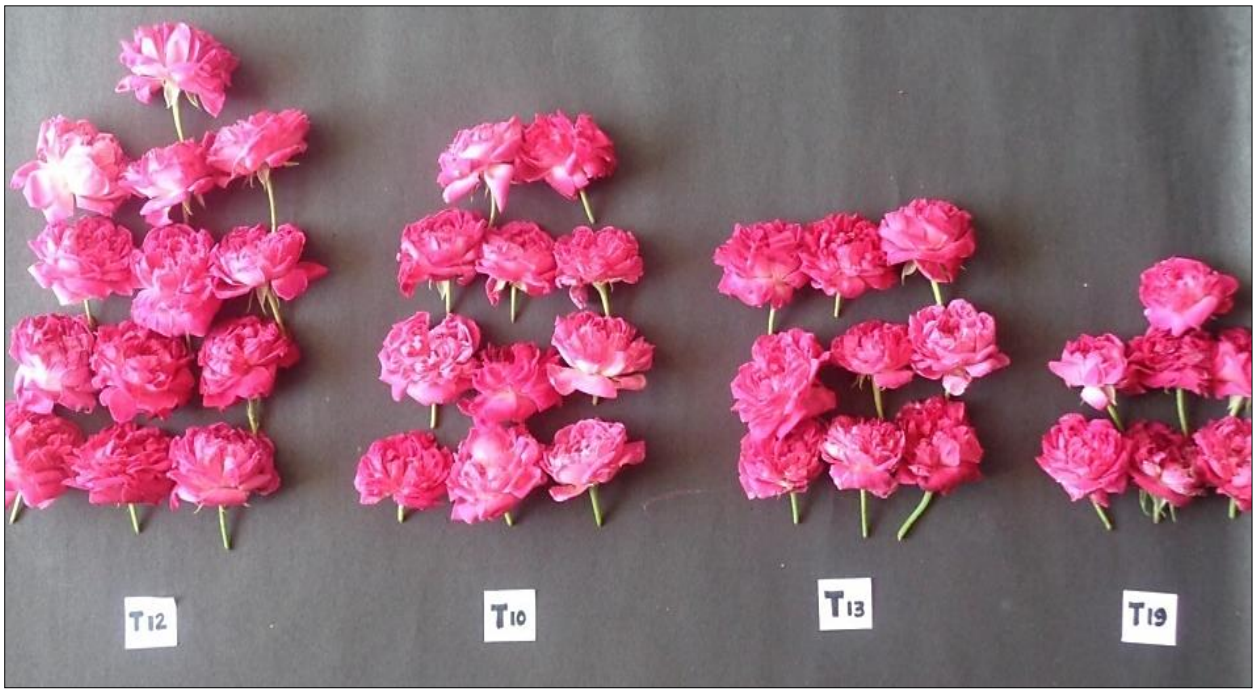

Plate 1 Comparison of Edward rose flowers of best treatments with control

Table 2 Influence of fertigation and consortium of biological inputs on yield hectare^{-1} attributes on yield hectare^{-1}

Treatments	No. of flower Plot^{-1} year^{-1}	Flower yield plot^{-1} year^{-1}(g)	No. of. flower ha^{-1} year^{-1}	No. of flower- per cent increase over control	Flower yield ha^{-1} year^{-1} (kg)	Flower yield- per cent increase over control
T_1	3554.19	8083.38	2961823	1.17	6736	3.44
T_2	3691.06	8416.54	3075885	5.06	7014	7.66
T_3	4140.47	9315.94	3450391	17.86	7763	19.18
T_4	4286.47	9708.77	3572057	22.01	8091	24.20
T_5	4174.69	9101.09	3478906	18.83	7584	16.43
T_6	4343.50	9447.71	3619583	23.64	7873	20.86
T_7	3608.94	8083.84	3007448	2.73	6737	3.42
T_8	3732.13	8490.27	3110104	6.23	7075	8.62
T_9	4386.84	9957.98	3655703	24.87	8298	27.39
T_{10}	4498.63	10572.36	3748854	28.05	8810	35.24
T_{11}	4446.16	9844.16	3705130	26.56	8203	25.99
T_{12}	4603.56	11162.38	3836302	31.04	9302	42.82
T_{13}	3440.13	7584.79	2866771	-2.08	6321	-2.96
T_{14}	3643.16	8270.42	3035964	3.70	6892	5.80
T_{15}	3837.06	8594.75	3197552	9.22	7162	9.96
T_{16}	4001.31	8926.62	3334427	13.90	7439	14.15
T_{17}	3914.63	8786.83	3262188	11.43	7322	12.43
T_{18}	4088.00	8852.12	3406667	16.36	7377	13.22
T_{19}	3513.13	7818.30	2927604	0.00	6515	0.00
Mean	3930.39	9000.96	3329124.18		7501	
SE(m)	87.05	295.83	72608.42		247	
SE(d)	123.28	418.38	102683.81		349	
C.D.	260.88	885.76	217402.06		738	

The increase in the yield and various other yield attributes were because of the additional inputs of microbial consortia, Panchagavya and humic acid along with the recommended dose of fertilizers. The combined effect of them resulted in desirable yields. This finding was in confirmation with the results of Kabir *et al.* [4] and Palanisamy *et al.* [5] who have reported that the micronutrient mixture and humic acid combination had enhanced the plant height in gerbera. Leaf is considered as an important functional unit of plant which contributes to the formation of assimilates. Rodrigo and Adams [6] observed a strong positive correlation between leaf number and yield of crop plants. The increased number of leaves plant^{-1} and increased leaf length might be due to fertigation along with foliar spray of humic acid and panchagavya which in turn led to higher number of leaves plant^{-1}. These results were similar with the finding of Sujatha *et al.* [7] in gerbera. Similarly, Shibles and Weber [8] suggested that larger leaf area development aids in the effective interception of sun light leading to high dry matter production. Greater leaf width aids the plant to synthesize more metabolites exhibiting high photosynthetic rate during the period of growth and development [9]. Higher availability of nitrogen leads to increased rate of meristematic activity, resulting in enhanced plant growth parameters [10].

Application of 20 g of N m$^{2-1}$ improved the quality of spikes in Tuberose and also application of 200 kg of N ha^{-1} increased the growth parameters in Tuberose Cv. Double [11]. Vegetative and floral characters were increased in Tuberose by the application of 400 kg of N ha^{-1} [12]. Baboo and Singh [13] reported highest flower yield (329.7 q ha^{-1}) in Marigold with the application of nitrogen @ 375 kg ha^{-1}. Such boosting effect was due to higher accumulation of carbohydrates in flower heads and thus increased flower size. Plants received with higher dose of phosphorus bloomed faster (50.2 days) when compared to control (58.2 days). The higher dose of P (210 kg ha^{-1}) also produced maximum flower yield (317.21 q ha^{-1}) than lower levels of phosphorus and control. Nitrogen at 400 kg ha^{-1} resulted in maximum flower yield and improved flower quality, more number of primary and secondary shoots as well as increased weight of pruned shoots. In cut flower, however, longest vase life, increased flower diameter, enhanced water uptake and improved fresh and dry weight were recorded with the treatment of 500 kg of nitrogen. The same dose of nitrogen gave minimum rate of respiration during cut flower development over other treatments [14].

CONCLUSION

From the overall findings, it could be concluded that the treatment combination with 100 per cent of RDFTF along with MC @ 12.5 kg ha^{-1} and 4 per cent Panchagavya and 0.5 per cent Humic acid recorded maximum yield and yield attributes besides growth, flower, physiological and other quality parameters.

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