Roll of Integrated Nutrient Management on Enhancement of Early Flowering, Flower Quality and Yield on Chrysanthemum cv. MDU-1

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ABSTRACT: *An investigation was undertaken to study the effect of integrated nutrient management on enhancement of early flowering, flower quality and yield of chrysanthemum cv.MDU-1 at Floriculture Complex, Department of Horticulture, Faculty of Agriculture, Annamalai University. The experiment was laid out in Randomized block design with three replication and 11 treatments with different combinations of inorganic fertilizers (75% RDF, 100% RDF), soil applied organic manures (FYM @ 25 t ha^{-1} and Vermicompost @ 5 t ha^{-1}) and organic foliar sprays (Panchakavya @ 3%, humic acid @ 0.2% and EM 1:1000 dilutions). All the characters showed the significant difference among all the treatments except flower diameter. Among all the treatments tested, 75% RDF + Vermicompost @ 5 t ha^{-1} + Humic acid 0.2 % (T_9) recorded the earlier days to first flower bud appearance, days taken to fifty per cent flowering increased flower diameter, single flower weight, number of flowers per plant and flower yield per plant. This was followed by 75% RDF + Vermicompost @ 5 t ha^{-1} + 3% panchakavya (T_7).*

Key Words: *Chrysanthemum, humic acid, EM, RDF, vermicompost andpanchakavya.*

I. Introduction

Chrysanthemum (*Dendranthemagrandiflora*Tzvelev), a member of Asteraceae family, featuring among the leading flowers of the word and commonly called as 'Queen of East' is the symbol of royalty in Japan. Recently, garland chrysanthemum is becoming attractive to the growers as well as users, as it has great potential for local and export market (Kamanna*et al*., 2010). There has been a constant demand for chrysanthemum flowers particularly from European markets during winter months and throughout the year in our country. In India, 11.05 lakh hectares of area under chrysanthemum cultivation with a production of flowers are estimated to be 106.76 thousand MT of loose flowers and 6.03 lakh numbers of cut flowers in 2014-2015 (Anon., 2016). In India, chrysanthemum occupied a place of pride, both as commercial loose flower crop and as a popular cut flower. In India, it is commercially cultivated in Karnataka, Tamil Nadu, Maharashtra, west Bengal, Himachal Pradesh, Punjab, Rajasthan, Gujarat and Delhi.

In general, plant nutrients are supplied through chemical fertilizers. The continuous use of chemical fertilizers has led to an imbalance of nutrients in soil which has adversely affected the soil health, affecting the yield and quality of the produce. Therefore, the integrated nutrient management is need for the sustainable crop production. INM practices involving judicious combination of organic manures, bio-fertilizers and chemical fertilizers can be feasible and viable for sustainable agriculture on a commercial and profitable scale. In addition they are eco-friendly, easily available and cost effective. Though chrysanthemum is a potential crop of Tamil Nadu, its yield and quality levels are low especially in coastal region and hence there is a need to standardize the optimum dose of nutrients through integrated nutrient management for enhancement of early flowering, flower yield and its quality. Keeping thisinview,thepresent investigationwasundertakentostudy the influence of integrated nutrientmanagement on enhancement of early flowering, flower quality and yield of chrysanthemum cv.MDU-1.

II. Materials and methods

The field experiment was carried out at the Floriculture complex in Department of Horticulture, Faculty of Agriculture, Annamalai University. An experiment was laid out in Randomized Block Design with three replications and 11 treatments. Theschedule is given below,

T_1 - 100 % RDF (125:120:20 kg NPK ha^{-1}) control
T_2 - 100 % RDF + FYM @ 25 t ha^{-1}
T_3 - 75 % RDF + FYM @ 25 t ha^{-1}
T_4 - 100 % RDF + Vermicompost @ 5 t ha^{-1}
T_5 - 75 % RDF + Vermicompost@ 5 t ha^{-1}
T_6 - 75 % RDF + FYM @ 25 t ha^{-1}+ Panchakavya 3%

T_7 - 75 % RDF + Vermicompost @ 5 t ha^{-1} + Panchakavya 3%
T_8 - 75 % RDF + FYM @ 25 t ha^{-1}+ Humic acid 0.2%
T_9 - 75 % RDF + Vermicompost@ 5 t ha^{-1}+ Humic acid 0.2%
T_{10} - 75 % RDF + FYM @ 25 t ha^{-1} + EM (1:1000 dilutions)
T_{11} - 75 % RDF + Vermicompost@ 5 t ha^{-1}+ EM (1:1000 dilutions)

One month old seedlings of chrysanthemum cv. MDU-1 with uniform growth were transplanted at a spacing of 30 x 30 cm. FYM and vermicompost were added at the time of land preparation. While, foliar application of organic substances like HA, panchakavya and EM were applied as per treatments on 30, 60 and 90 DAP. Whereas, chemical fertilizers, a basal dose of half N, full P_2O_5 and K_2O were applied as per treatments at the time of transplanting through urea, SSP and muriate of potash. The remaining half dose of nitrogen was applied on 30 DAP. The observations on flowering, quality and yield parameters of garland chrysanthemum cv. MDU-1 were recorded and analysed statistically as per the method given by Panse and Sukhatme (1978).

III. RESULT AND DISCUSSION:

III. 1 Effect of integrated nutrient management on days taken to first flower bud appearance and Days to fifty per cent flowering in chrysanthemum cv. MDU-1

The ultimate target of research in flower crop is to get early flowering and increased yield with better quality. Chrysanthemum flowers are normally produced in a dominant central stem initially and later in side lateral stems. Introduction of early flowering could result in higher flower counts. Therefore, days to first flower bud appearance and days taken to fifty per cent flowering were studied and the results indicated the significant effect on all the treatments of chrysanthemum cv. MDU-1(table 1). The earliness in flowering and fifty per cent flowering was recorded in 75 % RDF + vermicompost @ 5 t ha^{-1} + humic acid 0.2 % (T_9) with 91.27 and 117.36 days respectively. The next best values were observed in 75% RDF + vermicompost @ 5 t ha^{-1} + panchakavya 3 % (T_7) with 92.46 and 118.47 days respectively. Whereas, the maximum number of days taken for first flower bud appearance (108.23 days) and days to fifty per cent flowering (129.56 days) were noticed with T_1 (100 % RDF- control). Similar findings were reported earlier by MamtaBohra and Ajit Kumar (2014) and Verma*et al*. (2011) in chrysanthemum. The best values for flowering parameters like early flowering and fifty per cent flowering due to application of vermicompost with its presence of readily available plant nutrients, plant growth hormones, vitamins, enzymes, antibiotics and number of beneficial microorganisms (UshaKumari*et al.,* 2006). Further it may be due to humic acid, which alter the permeability of plant membranes and also form stable complexes with metal ions and thereby increased the availability of nutrients to ants (Vaughan and Malcolm, 1982).

III. 2 Effect of integrated nutrient management on flower quality parameters of chrysanthemum cv. MDU-1

The data on the flower diameter and single flower weight recorded significantly difference over the control(table 2).The higher flower diameter (3.97 cm) and single flower weight (1.40 g) were recorded in the treatment T_9 (75 % RDF + vermicompost@ 5 t ha^{-1}+ humic acid 0.2 %). This was followed by 75 % RDF + vermicompost@ 5 t ha^{-1}+ panchakavya3 % (T_7) with the values of 3.88 cm and 1.36 g of flower diameter and single flower weight respectively. The lesser flower diameter (3.32) and the lower single flower weight (1.08g) were recorded with 100 % RDF – control (T_1). Similar observations were also made earlier by Fan *et al*. (2015) in chrysanthemum and Nikbakht*et al.* (2015) in gerbera. This may be due to the influence of vermicompost with its richness of both micro and macro nutrients besides having certain plant growth promoters, various organic acids, humus forming microbes and sustained availability of nutrients throughout the crop period by the nitrogen fixers present in it. This corroborates the findings of Jayaparadha and Shakila (2002) in celosia.

III. 3 Effect of integrated nutrient management on yield parameters of chrysanthemum cv. MDU-1

Yield is a complex phenomenon which is controlled by the interaction of morphological and physiological parameters and it can also be manipulated by genetic factors or cultural operations. The data on yield parameters like the number of flowers $plant^{-1}$, flower yield $plant^{-1}$ and flower yield $plot^{-1}$showed significant difference among all the treatments (table 3). The maximum number of flowers $plant^{-1}$ (120.12), flower yield $plant^{-1}$ (168.16 g) and flower yield $plot^{-1}$ (1.68 kg) were recorded in 75 % RDF + vermicompost@ 5 t ha^{-1}+ humic acid 0.2 % (T_9). While the minimum number of flowers $plant^{-1}$ (89.22), flower yield $plant^{-1}$(96.35 g) and flower yield $plot^{-1}$ (0.96 kg) were noticed with 100 % RDF (125:120:20 kg NPK ha) control(T_1). Similar observations were also made earlier by Sankari*et al.* (2015) in gladiolus, Saba AmbreenMemon (2014) in petunia and Haripriya*et al.* (2002) in tuberose. This increased yield due to foliar

spray of humic acid may be attributed to quinine groups, which act as hydrogen acceptors and serve as activators of oxygen during photosynthesis and stimulate the plant growth, resulting in higher yield (Chamani*et al*., 2008).

IV. Reference

1. Anonymous (2016). National Horticultural Board (NHB), New Delhi.
2. Chamani, E., D. C. Joyce and A.Reihanytabar (2008). Vermicompost Effects on the Growth and Flowering of Petunia hybrida'Dream Neon Rose'. American-Eurasian J. Agric. & Environ. Sci., **3 (3):** 506-512.
3. Fan, H., T. Li, X. Sun and C. Zheng (2015). Effects of humic acid derived from sediments on the postharvest vase life extension in cut chrysanthemum flowers. Postharvest Biology & Tech., **101:**82–87**.**
4. Haripriya, K., S. Kamalakannan, C. T. Sathappan, T. Umamaheshwari and P. Poonkodi (2002). Influence of humic acid on flower production in tuberose (PolianthestuberosaL.). **In:** National seminar on Recent trends on the use of humic substances for sustainable Agriculture, Department of Soil Science and Agrl. Chemistry, Annamalai University during February, 27-28.p.13.
5. Jayapradha, P and A. Shakila (2002). Effect of nitrogen and potassium on growth and yield of celosia (Celosia plumose L.). South Indian Hort., **50(4-6):** 649-652.
6. Kamanna, B.C., T.H. Shankarappa and G.S. Arun Kumar (2010). Evaluation of fungicides for the management of chrysanthemum leaf blight caused by Alternariaalternata (Fr.) Keissler. Plant Archives, **10(2):** 595-597.
7. MamtaBohra and Ajit Kumar (2014). Studies on effect of organic manures and bioinoculants on vegetative and floral attributes of chrysanthemum cv. Little Darling. Int. Quarterly J. Life Sci., **9(3):** 1007-1010.
8. Nikbakht, A., M. Kafi, M. Babalar, P. Y. Xia, A. Luo and N. Etemadi (2015). Effect of humic acid on plant growth, nutrient uptake, and postharvest life of gerbera.J. Plant Nutrition, **31(12):**2155-2167.
9. Panse, V. G. and P. V. Sukhatme (1978). Statistical methods for Agricultural workers. ICAR, New Delhi.
10. Saba AmbreenMemon, Muhammad HanifBaloch and Riaz Ahmed Baloch (2014). Influence of humic acid and macronutrients ($MgSO_4$ + S) application on growth and yield of petunia (Petunia milliflora). J. Agrl. Tech., **10(6):** 1501-1516.
11. Sankari, A., M. Anand and R. Arulmozhiyan (2015). Effect of biostimulants on yield and post harvest quality of Gladiolus cv. White prosperity.Asian J. Hort., **10(1):** 86-94.
12. UshaKumari, K., M. S. Sailajakumari and P. C. Sheeba (2006). Vermicompost: A potential organic nutrient source for organic farming. 18th world congress of soil science, Pennsylvania, USA.
13. Vaughan, D. and R. E. Malcolm (1982). Soil organic matter and biological activity. MartenusNijhoff, Dr. W. Junk Publishers, DorDrecht., p.253-260.
14. Verma, S. K., G. Angadi, V. S. Patil, A. N. Mokashi, J. C. Mathad and U. V. Mummigatti (2011). Growth, yield and quality of chrysanthemum (Chrysanthemum morifolium Ramat.) cv. Raja as influenced by integrated nutrient management. Karnataka J. Agrl. Sci., **24(5):** 681-683.

Table 1. Effect of integrated nutrient management on days taken to first flower bud appearance and Days to fifty per cent flowering in chrysanthemum cv. MDU-1

Treatment No.	Treatments	Days taken tofirst flower bud appearance	Days to fifty per cent flowering
T_1	100 % RDF (125:120:20 kg NPK ha)	108.23	129.56
T_2	100 % RDF + FYM @ 25 t ha^{-1}	105.48	125.55
T_3	75 % RDF + FYM @ 25 t ha^{-1}	107.16	127.12
T_4	100 % RDF + Vermicompost @ 5 t ha^{-1}	99.72	123.74
T_5	75 % RDF + Vermicompost @ 5 t ha^{-1}	100.46	124.48
T_6	75 % RDF + FYM @ 25 t ha^{-1} + Panchakavya @ 3%	96.35	120.28
T_7	75 % RDF + Vermicompost @ 5 t ha^{-1} + Panchakavya @ 3%	92.46	118.47
T_8	75 % RDF + FYM @ 25 t ha^{-1} + Humic acid @ 0.2%	93.78	118.98
T_9	75 % RDF + Vermicompost @ 5 t ha^{-1} + Humic acid @ 0.2%	91.27	117.36
T_{10}	75 % RDF + FYM @ 25 t ha^{-1} + EM @ 1:1000 dilution	101.23	125.48
T_{11}	75 % RDF + Vermicompost @ 5 t ha^{-1} + EM @ 1:1000 dilution	98.70	121.43
S. Ed		**0.48**	**0.21**
CD (p = 0.05)		**1.01**	**0.45**

Table 2. Effect of integrated nutrient management on flower quality parameters of chrysanthemum cv. MDU-1

Treatment No.	Treatments	Flower diameter (cm)	Single flower weight (g)
T_1	100 % RDF (125:120:20 kg NPK ha)	3.32	1.08
T_2	100 % RDF + FYM @ 25 t ha^{-1}	3.43	1.15
T_3	75 % RDF + FYM @ 25 t ha^{-1}	3.38	1.12
T_4	100 % RDF + Vermicompost @ 5 t ha^{-1}	3.56	1.25
T_5	75 % RDF + Vermicompost @ 5 t ha^{-1}	3.52	1.22
T_6	75 % RDF + FYM @ 25 t ha^{-1} + Panchakavya @ 3%	3.75	1.29
T_7	75 % RDF + Vermicompost @ 5 t ha^{-1} + Panchakavya @ 3%	3.88	1.36
T_8	75 % RDF + FYM @ 25 t ha^{-1} + Humic acid @ 0.2%	3.81	1.33
T_9	75 % RDF + Vermicompost @ 5 t ha^{-1} + Humic acid @ 0.2%	3.97	1.40
T_{10}	75 % RDF + FYM @ 25 t ha^{-1} + EM @ 1:1000 dilution	3.48	1.18
T_{11}	75 % RDF + Vermicompost @ 5 t ha^{-1} + EM @ 1:1000 dilution	3.65	1.27
S. Ed		**0.10**	**0.006**
CD (p = 0.05)		**0.21**	**0.012**

Table 3. Effect of integrated nutrient management on yield parameters of chrysanthemum cv. MDU-1

Treatment No.	Treatments	Number of Flowers $plant^{-1}$	Flower yield $plant^{-1}$(g)	Flower yield $plot^{-1}$ (kg)
T_1	100 % RDF (125:120:20 kg NPK ha)	89.22	96.35	0.96
T_2	100 % RDF + FYM @ 25 t ha^{-1}	93.64	107.68	1.07
T_3	75 % RDF + FYM @ 25 t ha^{-1}	91.62	102.61	1.02
T_4	100 % RDF + Vermicompost @ 5 t ha^{-1}	103.34	129.17	1.29
T_5	75 % RDF + Vermicompost @ 5 t ha^{-1}	99.83	121.79	1.21
T_6	75 % RDF + FYM @ 25 t ha^{-1} + Panchakavya @ 3%	111.18	143.42	1.43
T_7	75 % RDF + Vermicompost @ 5 t ha^{-1} + Panchakavya @ 3%	117.29	159.51	1.59
T_8	75 % RDF + FYM @ 25 t ha^{-1} + Humic acid @ 0.2%	115.34	153.40	1.53
T_9	75 % RDF + Vermicompost @ 5 t ha^{-1} + Humic acid @ 0.2%	120.12	168.16	1.68
T_{10}	75 % RDF + FYM @ 25 t ha^{-1} + EM @ 1:1000 dilution	95.47	112.65	1.12
T_{11}	75 % RDF + Vermicompost @ 5 t ha^{-1} + EM @ 1:1000 dilution	106.59	135.36	1.35
S. Ed		**0.83**	**2.18**	**0.02**
CD (p = 0.05)		**1.75**	**4.56**	**0.04**