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EFFECT OF FOLIAR APPLICATION OF ORGANIC AND MICRONUTRIENTS ON CERTAIN GROWTH AND PHYSIOLOGICAL CHARACTER OF AFRICAN MARIGOLD (*Tagetes erecta* L.) CV. BENZ TALL.

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ABSTRACT

The present investigation entitled “Effect of foliar application of organic and micronutrients on certain growth and physiological character of African marigold (*Tagetes erecta* L.) cv. Benz tall” was carried out at floriculture yard, Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar during 2018-2019. The different treatments combination of FAA, Vermiwash, Panchagavya, ZnSO₄ and FeSO₄ in different ratios. The data was analysed statistically which showed significantly effect of T₁₀ (Fish Amino Acid @ 3% + ZnSO₄ @ 0.6 %) over control value. The maximum values plant spread, leaf area, number of nodes plant⁻¹, inter nodal length, chlorophyll content were observed in 25th & 50th DAT foliar spray of Fish Amino Acid @ 3% + ZnSO₄ @ 0.6 %. These finding lead towards beneficial and commercially feasible for the effective cultivation of African marigold (*Tagetes erecta* L.) cv. Benz tall under open field condition in the coastal ecosystem.

Keywords: African marigold, FAA, Vermiwash, Panchagavya, Micronutrient.

Introduction

African marigold is one of the most popular flowers in our country and used extensively on religious and social functions in different forms, flowers are sold in the market as loose flower or as garlands making. Which belongs to the genus *Tagetes*, family Asteraceae. It was described as genus by Carl Linnaeus in 1753. The genus is native of South of Mexico, but some species have naturalized around the world. It is easy in cultivation, wide adaptability to varying soil and climatic condition, long duration of flowering and attractively colours flower of excellent keeping quality. Marigold can be grown in all seasons i.e., rainy, winter and summer. Though it's an introduced flower crop in India considering acceptability under Indian Origin (Desai, 1967), marigold is a herbaceous annual or perennial whose height ranges between 30 to 110 cm with crop duration of 3 to 4 months. It is commercially cultivated for loose flowers, as a source of carotenoid pigment and for extraction of xanthophylls used in industries. Carotenoid extraction from marigold flowers is used in poultry feed preparation to intensify the yellow color of egg yolk and broiler skin. Apart from animal food additives carotenoid extract is being used in pharmaceuticals, food supplements and colorants in cosmetics.

Plant nutrients play major role in production of flower crops in open and under protected cultivation. Micro nutrients are very important for the quality of flower crops and over come the physiological disorder. Foliar application

of organic and micro nutrients are readily absorbed and utilized more efficiently. Organic and micro nutrients improving the soil structure and physiochemical property and flower yield and also it's a synthesis of plant hormones and biostimulants. The vermiwash could also contained enzymes (protease, amylase, urease and phosphatase) which could be helpful for the plant growth. Vermiwash also contained nitrogen fixing bacteria like *Azotobacter* sp., *Agrobacterium* sp. and *Rhizobium* sp. and some phosphate solubilizing bacteria (Amita Chattopadhyay 2014). Panchagavya, an organic product, has the potential to play the role of promoting growth and providing immunity in plant system. It contains macronutrients, essential micronutrients, many vitamins, essential amino acids. Flowering and yield of plant increased in Rose cv. Top Secret might be due to the increased availability and uptake of nutrients, water, increased activity of GA, IAA and cytokinins in Panchagavya (Barad *et al.*, 2019). Foliar spray of fish amino acid increased the cell division and metabolic activity resulting in higher plant height at all the growth stages and also increase N availability in soils and improve crop yields while sustaining water quality. FAA application as a source of nitrogen fertilizer had a great role in enhancing the metabolism processing due to the importance of nitrogen in building carbohydrates, protein and fats in the plant tissues (Su Su Shwe and Myat Myat Moe 2018). Zinc favours the storage of more carbohydrates through photosynthesis and iron involves in synthesis of plant hormones and also plays

an important role in chlorophyll synthesis, photosynthesis and respiration. This may be the attributing factor for the positive effectiveness of optimum dose of zinc and iron on reducing juvenile phase of the plant in marigold 'F1 Hybrid Yellow' (Patokar *et al.*, 2017). The use of foliar spray of organic and micronutrient has brought about sort of revolution in the floriculture industry. Present research work was planned to investigate the best effect of organic and micronutrients of African marigold under open field condition in the coastal ecosystem

Materials and Methods

The experiment was conducted in agro-climatic conditions of Annamalai nagar at floriculture yard, Department of Horticulture, Annamalai University, Chidambaram region feature a moderately warm with hot summer climate with maximum temperature is 25.3⁰ C minimum temperature 17⁰ C, RH is 82 % with annual rainfall is 877 mm and consider good for African marigold cultivation. Twenty five days old seedlings are transplanted in the main field. The healthy and uniform seedling are selected for transplanting. The treatment were replicated three times during the month of Nov-Feb. Randomized blok design was used to evaluate the result statistically and LSD (Least significant different) @ 5% were calculated according to the method described by Panse and Sukhatme (1978).

Result and Discussion

Growth character

Plant spread (cm²): The data on plant spread are shown in table 1. The plant spread at different stages of growth differed significantly. Among the various treatment, the maximum plant spread was observed in Fish Amino Acid @ 3% + ZnSO₄@ 0.6 % (T₁₀) at 62.80 cm² which was on par with T₆ (Panchagavya @3% + ZnSO₄ @ 0.6%) and followed by T₂ (Vermiwash @ 3% + ZnSO₄ @ 0.6 %). The minimum value was found to be in T₁₃ (control) @ (42.27 cm²).

Number of nodes plant⁻¹: The data with respect to number of nodes plant⁻¹ are presented in table 1. Among the treatments plant treated with Fish Amino Acid @ 3% + ZnSO₄ @ 0.6 % (T₁₀) showed the highest number of nodes plant⁻¹ @ 29.53 which was on par with T₆ (Panchagavya @3% + ZnSO₄ @ 0.6 %) and followed by T₂ (Vermiwash @ 3% + ZnSO₄ @ 0.6%). The minimum number of nodes plant⁻¹ was observed in control (T₁₃).

Inter nodal length (cm): The data with respect to the inter nodal length are furnished in table 1. The inter nodal length significantly by the effect of various treatments. The maximum inter nodal length at 6.05 cm was observed in Fish Amino Acid @ 3% + ZnSO₄ @ 0.6 % (T₁₀) which was on par with T₆. The minimum number of branches at 3.87 cm were recorded in T₁₃ (control).

Physiological Characteristics

Chlorophyll content (mg g⁻¹): The data pertaining to the effect of various treatments on chlorophyll content are furnished in table 2. Among the various treatments, T₁₀ (Fish Amino Acid @ 3% + ZnSO₄ @ 0.6 %) recorded more chlorophyll content 3.29 mg g⁻¹ and this was on par with T₆ (3.22 mg g⁻¹). The least number of flower (1.45 mg g⁻¹) were recorded in T₁₃ (control).

Leaf area (cm²): The data regarding leaf area obtained by the impact of various treatments are presented in table 2. The highest value (54.09 cm²) was observed in T₁₀ (Fish Amino Acid @ 3% + ZnSO₄ @ 0.6 %). The next highest value in leaf area (53.10 cm²) was recorded in T₆ (Panchagavya @ 3% + ZnSO₄ @ 0.6 %). The treatment T₁₃ (control) recorded the lowest value (33.99 cm²).

Enhanced growth parameters observed in present experiment due to foliar application of organic and micronutrients promote nutrients availability and plant uptake, increase crop growth and physiological characters, reduce inputs of chemical fertilizers and minimize environmental risks. The plant spread might be due to Zinc and FAA which favors storage of more carbohydrates through photosynthesis which results in wider plants (Syed *et al.*, 2016 in marigold and Dianarose Garcia 2016 in egg plant). The increase in the number of nodes plant⁻¹ with organic and micro nutrient application might be attributed to synthesis of tryptophan which promotes intensity of auxins leading to more cell division and cell elongation, meristematic activity of the tissue and expansion of cells, enhanced the availability of macronutrients and also increased number of internodes. Altaf Hussain *et al.*, 2020 in marigold. Increased the synthesis of auxin, utilization of carbohydrate and it is also responsible for increment in lignin of cell wall which could be a factor for increase internodal length of plant [and protein synthesis which ultimately enhanced the vegetative growth parameter. Increase in chlorophyll content might be due to zinc which enhances the functioning of photosystem and increase the chlorophyll content of leaves (Sahil Bhandari 2012).

Hence these results were supported by the previous finding of Halder *et al.* (2007) in *Gladiolus*, Khakifa *et al.* (2011) in *Iris*, Karuppaiah 2014 in *chrysanthemum*, (Tanvi *et al.*, 2017) in *chrysanthemum*, Prasanth *et al.*, 2017 and Anil *et al.*, 2018 African marigold, Vignesh (2018) in *tuberosa* Priyanka *et al.* (2019) in *Rice* for better growth and physiological character like plant spread, inter nodal length, number of nodes plant⁻¹, leaf area and chlorophyll content.

Table 1 : Effect of foliar application of organic and micronutrients on growth character of African marigold (*Tagetes erecta* L.) cv. Benz tall – F1 Hybrid

Treatments	Plant spread (cm)	Number of nodes	Inter nodal length (cm)
T ₁ -Vermiwash @ 3% + ZnSO ₄ @ 0.4%	49.97	24.91	4.69
T ₂ -Vermiwash @ 3% + ZnSO ₄ @ 0.6 %	60.02	29.27	5.76
T ₃ -Vermiwash @ 3% + FeSO ₄ @ 0.3 %	54.98	27.14	5.23
T ₄ -Vermiwash @ 3% + FeSO ₄ @ 0.6 %	44.63	22.73	4.22
T ₅ -Panchagavya @ 3% + ZnSO ₄ @ 0.4%	52.15	25.83	4.88
T ₆ -Panchagavya @ 3% + ZnSO ₄ @ 0.6%	62.21	29.12	5.96
T ₇ -Panchagavya @ 3% + FeSO ₄ @ 0.3 %	57.18	28.03	5.45
T ₈ -Panchagavya @ 3% + FeSO ₄ @ 0.6 %	46.78	23.63	4.41
T ₉ -Fish Amino Acid @ 3% + ZnSO ₄ @ 0.4%	52.80	26.24	4.98
T ₁₀ -Fish Amino Acid @ 3% + ZnSO ₄ @ 0.6 %	62.80	29.53	6.05
T ₁₁ -Fish Amino Acid @ 3% + FeSO ₄ @ 0.3 %	57.84	28.44	5.53
T ₁₂ -Fish Amino Acid @ 3% + FeSO ₄ @ 0.6 %	47.79	24.02	4.49
T ₁₃ -Control	42.27	20.74	3.87
S.Ed	1.05	0.39	0.06
CD (p = 0.05)	2.11	0.78	0.13

Table 2 : Effect of foliar application of organic and micronutrients on physiological character of African marigold (*Tagetes erecta* L.) cv. Benz tall – F1 Hybrid

Treatments	Leaf area (cm ²)	Chlorophyll content (mg g ⁻¹)
T ₁ -Vermiwash @ 3% + ZnSO ₄ @ 0.4%	2.09	41.09
T ₂ -Vermiwash @ 3% + ZnSO ₄ @ 0.6 %	3.01	50.95
T ₃ -Vermiwash @ 3% + FeSO ₄ @ 0.3 %	2.55	45.99
T ₄ -Vermiwash @ 3% + FeSO ₄ @ 0.6 %	1.65	36.19
T ₅ -Panchagavya @ 3% + ZnSO ₄ @ 0.4%	2.28	43.22
T ₆ -Panchagavya @ 3% + ZnSO ₄ @ 0.6%	3.22	53.10
T ₇ -Panchagavya @ 3% + FeSO ₄ @ 0.3 %	2.76	48.09
T ₈ -Panchagavya @ 3% + FeSO ₄ @ 0.6 %	1.86	38.66
T ₉ -Fish Amino Acid @ 3% + ZnSO ₄ @ 0.4%	2.35	43.87
T ₁₀ -Fish Amino Acid @ 3% + ZnSO ₄ @ 0.6 %	3.29	54.09
T ₁₁ -Fish Amino Acid @ 3% + FeSO ₄ @ 0.3 %	2.82	48.84
T ₁₂ -Fish Amino Acid @ 3% + FeSO ₄ @ 0.6 %	1.90	38.96
T ₁₃ -Control	1.45	33.99
S.Ed	0.08	1.04
CD (p = 0.05)	0.16	2.08

Conclusion

In light of the above discussion, it concluded that foliar application of Fish Amino Acid @ 3% + ZnSO₄ @ 0.6 % @ 25th and 50th day after transplanting was found better in increasing growth and physiological character of African marigold cv. Benz tall.

References

- Altaf, H.; Ghulam, N.; Muhammad, I.; Khan, M.N.; Khan, W.; Hilal, S.Z.M.; Ali, Y. and Khan, A. (2020). Effect of zinc and iron on growth, flowering and shelf life of marigold under the agro-climatic conditions of Sawabi Altaf. Pure Appl. Biol., 9(1): 180-192.
- Amita, C. (2014). Effect of vermiwash and vermicompost on an ornamental flower (*Zinnia sp*). Journal of Horticulture., 1: 1-3.
- Anil, K.S.; Sisodia, A.; Sisodia, V. and Kirti, A. (2018). Effect of foliar application of boron and zinc on growth and flowering characters in African marigold cv. Pusa Narangi Ganda. J. of Ornamental Hort., 21 (1 and 2): 1-6.
- Barad, R.G.; Karetha, K.M.; Mishra, S. and Yogitha (2019). Effect of Biostimulants and Micronutrients Grade on Yield and Quality of Rose cv. Top Secret under Protected condition. Chem. Sci.Rev. and Lett., 8 (32): 323-328.
- Desai, B.L. (1967). Seasonal flowers, ICAR Publication, New Delhi. pp 53-56.
- Dianarose Garcia Lacaden, (2016). Organic fertilizer and different rates of Fish Amino Acid (FAA) on the growth and yield of eggplant (*Solanum melongena*). Quirino State University, Maddela.
- Halder, N.K.; Ahmed, R.; Sharifuzzaman, S.M.; Anzu-man-ara Bagam, K. and Siddiky, M.A. (2007). Effect of boron and zinc fertilization on corm and cormel production of Gladiolus in grey terrace soil of Bangladesh. Int. J. Sustain. Crop Prod., 2(5):85- 89.
- Kaaruppaiah, P. (2014). Effect of zinc and iron on growth, yield and quality of chrysanthemum (*Dendranthemum grandiflorum* Tzeuleu). Asian J. Hort., 9(1): 232-236.
- Khalifa, R.; Shaaban, S.H.A. and Rawia, A. (2011). Effect of foliar application of Zinc sulfate and Boric acid on growth, yield and chemical constituents of Iris plants. Ozean J. of Applied Sci., 4(2).

- Panse, V.G. and Sukhatme, P.V. (1978). Statistical methods for Agricultural workers, Indian Council of Agrl. Res., New Delhi, 3rd edn.
- Patokar, M.J.; Chopde, N. and Kuchanwar, O. (2017). Effect of micronutrients (Zn and Fe) as a foliar spray on growth and flower production of marigold. *Plant Archives*. 17(1): 312-314.
- Prasanth, K.P.; Sureshkumar, R.; Rajkumar, M. and Sendhilnathan, R. (2017). Effect of bioregulators on growth, yield and quality of African marigold (*Tagetes erecta* L.). Dept. of Hort., Faculty of Agriculture, Annamali university, Annamali Nagar.
- Priyanka, B.; Ramesh, T.; Rathika, S. and Blasubramaniam, P. (2019). Foliar application of fish amino acid and egg amino acid to improve the physiological parameters of Rice (*Oryza sativa* L.). *Int. J. Curr. Microbiol. App. Sci.*, 8(2): 3005–3009.
- Sahil, B. (2012). Effect of micro-nutrients and kno3 on plant growth and flower yield of marigold. Department of Floriculture and Landscaping, College of Agriculture, Punjab Agricultural University, Ludhiana.
- Su Su Shwe and Myat Myat Moe (2018). Different types and rates of Fish Amino Acid (FAA) on growth and yield of pumpkin. Myanmar Korea Conference Res. J.
- Shah, S.T.; Ullah, S.; Khan, N.; Sajid, M.; Rab, A.; Amin, N.U.; Iqbal, A.; Naeem, A.; Iqbal, M.; Saeed Ul-Haq, Rahman, S.; Shah, F.A. and Rawan, S. (2016). Effect of zinc as a foliar spray on growth and flower production of Marigold (*Tagetes erecta* L.). *Pure Appl. Biol.*, 5(4): 738-743.
- Tanvi, D.P., Viradia, R.R.; Tejashwini, C.R.; Patel, H.V. and Patel, U.R. (2017). Studies on effect of foliar application of micronutrient (Fe & Zn) on growth, flowering quality and yield of tuberose (*Polianthes tuberosa* L.) cv. Prajwal. *International J. of Chemical Studies*, 5(6): 93-97.
- Vignesh, K. (2018). Effect of growth regulator and foliar organics on growth and yield of tuberose (*Polianthes tuberosa* L.) Cv. Prajwal. Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar. (T.N.), India.